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Impact of Planter Type on Crop Performance & Yield

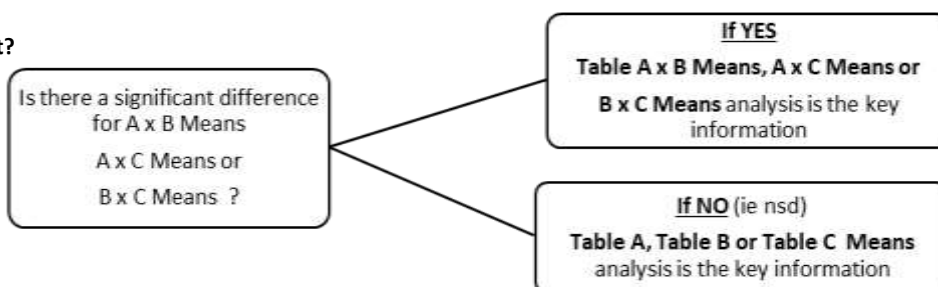
Trial ID: BB1901 Location: Goondiwindi Trial Year: 2019
Investigator: Brendan Burton

Objectives:	2019: To evaluate the impact of planter type on yield of winter cereals and chickpeas 2020: To evaluate the impact of crop type and stubble amount on fallow water efficiency (BB1901B)	
Crop Types:	Barley, Durum, Wheat, Chickpea	
Planter Types:	Boss Double Disc, Janke tyne with press wheel Both on 32 cm row spacing	
Target Populations:	Low, Medium, Standard and High Cereals: 30, 60, 90 and 120 plants/m ² Chickpeas: 10, 20, 30 and 40 plants/m ²	
Planting Dates:	22/05/2019 (DP1)	9/06/2020 (DP2 – BB1901B)
Harvest Dates:	25/10/2019	29/10/2020
Keywords:	Wheat, barley, durum, chickpeas, disc, tyne, plant population, yield	

NB: Trial designed and analysed as a Strip Plot

	In Simple Terms
Table of A Means:	Mean of 'Crop' performance with ALL 'Planter Type' treatments and 'Population' treatments
Table of B Means:	Mean of 'Planter Type' performance with ALL 'Crop' treatments and 'Population' treatments
Table of C Means:	Mean of 'Population' performance with ALL 'Crop' treatments and 'Planter Type' treatments
Table of A x B Means:	'Crop' performance with EACH 'Planter Type' treatment
Table of A x C Means:	'Crop' performance with EACH 'Population' treatment
Table of B x C Means:	'Planter Type' performance with EACH 'Population' treatment
Table of A x B x C Means:	'Crop' performance with EACH 'Planter Type' treatment and EACH population

How to interpret?



Key analyses highlighted in grey

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

Location: Goondiwindi

Trial Year: 2019

Assessment Date		13/06/2019	29/08/2019	25/10/2019
Assessment Type		EMERGENCE	NDVI	YIELD
Assessment Unit		/m ²	Ratio	t/ha
Plant-Evaluation Interval		22 DP1	99 DP1	156 DP1
Trt No.	Treatment			
TABLE OF A MEANS (Crop)				
1	Barley	55a	0.71a	1.99a
2	Durum	47b	0.58c	1.71b
3	Wheat	47b	0.59c	1.94a
4	Chickpea	23c	0.67b	1.34c
TABLE OF B MEANS (Planter Type)				
1	Disc	40b	0.64a	1.71b
2	Tyne	46a	0.63b	1.78a
TABLE OF C MEANS (Population)				
1	Low	21d	0.61b	1.58c
2	Medium	40c	0.65a	1.72b
3	Standard	49b	0.64a	1.82a
4	High	62a	0.65a	1.87a
TABLE OF A x B MEANS (Crop x Planter Type)				
1a	Barley, Disc	54-	0.71-	1.99a
1b	Barley, Tyne	57-	0.70-	1.99a
2a	Durum, Disc	43-	0.60-	1.66d
2b	Durum, Tyne	51-	0.57-	1.75c
3a	Wheat, Disc	41-	0.59-	1.88b
3b	Wheat, Tyne	53-	0.59-	1.99a
4a	Chickpea, Disc	21-	0.67-	1.30f
4b	Chickpea, Tyne	25-	0.67-	1.38e
TABLE OF A x C MEANS (Crop x Population)				
1a	Barley, Low	26gh	0.69bc	1.79-
1b	Barley, Medium	57c	0.71ab	2.04-
1c	Barley, Standard	56c	0.70abc	2.02-
1d	Barley, High	83a	0.72ab	2.13-
2a	Durum, Low	23h	0.57ef	1.63-
2b	Durum, Medium	39ef	0.61de	1.67-
2c	Durum, Standard	58bc	0.60ef	1.79-
2d	Durum, High	67b	0.55f	1.73-
3a	Wheat, Low	23h	0.56ef	1.78-
3b	Wheat, Medium	45de	0.61de	1.90-
3c	Wheat, Standard	54cd	0.59ef	2.03-
3d	Wheat, High	66b	0.60ef	2.05-
4a	Chickpea, Low	12i	0.60ef	1.11-
4b	Chickpea, Medium	20hi	0.66cd	1.27-
4c	Chickpea, Standard	27gh	0.69abc	1.42-
4d	Chickpea, High	33fg	0.74a	1.55-
TABLE OF B x C MEANS (Planter Type x Population)				
1a	Disc, Low	19-	0.61-	1.51d
1b	Disc, Medium	39-	0.65-	1.63c
1c	Disc, Standard	43-	0.65-	1.79b
1d	Disc, High	58-	0.67-	1.91a
2a	Tyne, Low	23-	0.60-	1.64c
2b	Tyne, Medium	41-	0.64-	1.81ab
2c	Tyne, Standard	55-	0.64-	1.84ab
2d	Tyne, High	67-	0.64-	1.83ab

DP1 = days after planting 1

Means followed by same letter do not significantly differ (P=.05, LSD)

t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

NB: A x B X C interaction not presented, as no significant differences were apparent

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

Location:

Goondiwindi

Trial Year:

2019

Assessment Date		26/10/2019	26/10/2019	26/10/2019	26/10/2019
Assessment Type		PROTEIN	MOISTURE	TEST WEIGHT	SCREENING
Assessment Unit		%	%	kg/hL	%
Plant-Evaluation Interval		157 DP1	157 DP1	157 DP1	157 DP1
Trt No.	Treatment				
TABLE OF A MEANS (Crop)					
1	Barley	14.6b	9.2a	64c	5.3b
2	Durum	14.2c	8.6c	80a	4.5c
3	Wheat	13.2d	9.0b	80a	5.5b
4	Chickpea	25.7a	7.7d	72b	6.1a
TABLE OF B MEANS (Planter Type)					
1	Disc	16.9-	8.6-	74-	5.4-
2	Tyne	16.9-	8.7-	74-	5.3-
TABLE OF C MEANS (Population)					
1	Low	16.7-	8.7-	74-	5.2-
2	Medium	17.1-	8.6-	73-	5.9-
3	Standard	16.9-	8.6-	74-	5.2-
4	High	16.9-	8.7-	74-	5.1-
TABLE OF A x B x C MEANS (Crop x Planter Type x Population)					
1a	Barley, Disc, Low	14.6-	9.3-	64-	5.1b-e
1b	Barley, Tyne, Low	14.5-	9.2-	64-	3.9def
1c	Barley, Disc, Medium	14.3-	9.2-	65-	4.6c-f
1d	Barley, Tyne, Medium	14.8-	9.2-	62-	5.4b-e
1e	Barley, Disc, Standard	14.1-	9.3-	63-	4.9c-f
1f	Barley, Tyne, Standard	15.2-	9.2-	63-	6.4abc
1g	Barley, Disc, High	14.8-	9.1-	63-	6.1a-e
1h	Barley, Tyne, High	14.8-	9.3-	64-	5.8b-e
2a	Durum, Disc, Low	14.1-	8.8-	80-	4.0def
2b	Durum, Tyne, Low	13.6-	8.7-	80-	4.7c-f
2c	Durum, Disc, Medium	14.7-	8.6-	79-	7.2ab
2d	Durum, Tyne, Medium	14.8-	8.5-	80-	4.0def
2e	Durum, Disc, Standard	14.2-	8.7-	80-	5.0b-e
2f	Durum, Tyne, Standard	14.6-	8.5-	80-	3.8ef
2g	Durum, Disc, High	13.8-	8.6-	81-	2.7f
2h	Durum, Tyne, High	13.9-	8.7-	80-	4.4c-f
3a	Wheat, Disc, Low	13.0-	9.1-	79-	5.6b-e
3b	Wheat, Tyne, Low	12.8-	9.1-	79-	5.8b-e
3c	Wheat, Disc, Medium	13.5-	9.0-	80-	6.4abc
3d	Wheat, Tyne, Medium	13.2-	8.9-	80-	5.5b-e
3e	Wheat, Disc, Standard	13.2-	8.9-	80-	5.6b-e
3f	Wheat, Tyne, Standard	12.9-	9.0-	81-	4.0def
3g	Wheat, Disc, High	13.3-	9.1-	81-	5.2b-e
3h	Wheat, Tyne, High	13.6-	8.9-	80-	5.8b-e
4a	Chickpea, Disc, Low	25.9-	7.6-	72-	6.4abc
4b	Chickpea, Tyne, Low	25.3-	7.9-	71-	6.0a-e
4c	Chickpea, Disc, Medium	25.9-	7.6-	69-	5.7b-e
4d	Chickpea, Tyne, Medium	25.7-	8.0-	70-	8.1a
4e	Chickpea, Disc, Standard	25.8-	7.6-	74-	5.5b-e
4f	Chickpea, Tyne, Standard	25.5-	7.9-	72-	6.1a-d
4g	Chickpea, Disc, High	25.6-	7.9-	73-	5.7b-e
4h	Chickpea, Tyne, High	25.7-	7.5-	72-	5.2b-e

DP1 = days after planting 1

Means followed by same letter do not significantly differ (P=.05, LSD)

t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

NB: A x B, A x C and B x C interactions not presented, as no significant differences were apparent

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

Location: Goondiwindi

Trial Year: 2019

Soil water at harvest year 1

Assessment Date	25/10/2019
Assessment Type	PAW
Assessment Unit	mm
Plant-Evaluation Interval	156 DP1
Trt No.	2019 Treatment
TABLE OF A MEANS (Crop)	
1	Barley 30b
2	Durum 31b
3	Wheat 28b
4	Chickpea 51a
TABLE OF B MEANS (Planter Type)	
1	Disc 36-
2	Tyne 35-
TABLE OF C MEANS (Population)	
1	Low 36-
2	Medium 35-
3	Standard 35-
4	High 34-

NB: No interactions presented, as no significant differences were apparent

Impact of crop on AMF (arbuscular mycorrhizal fungi)– NB only selected treatments evaluated

Description		AMFa		AMFb	
Assessment Date		24/01/2020	11/06/2020	24/01/2020	11/06/2020
Assessment Type		COUNT	COUNT	COUNT	COUNT
Assessment Unit		kDNA copies/g soil	kDNA copies/g soil	kDNA copies/g soil	kDNA copies/g soil
ARM Action Codes					AL
Trt No.	Treatment				
7	Barley, Tyne, Standard	49 a	22 -	4.2 -	0.6 -
15	Durum, Tyne, Standard	13 b	10 -	0 -	0 -
23	Wheat, Tyne, Standard	55 a	28 -	1.6 -	1.3 -
31	Chickpea, Tyne, Standard	42 a	26 -	2.6 -	1.1 -
LSD P=.05		28	nsd	nsd	nsd
Treatment Prob.(F)		0.09 (p = 10%)	0.38	0.18	0.68

NB site characterisation at planting indicated AMFa at 12 kDNA copies/ g soil with no detection of AMFb. There was a trace level of AMFd detected

Impact of crop on pathogen levels – NB only selected treatments evaluated

Pest Scientific Name		<i>Pratylenchus thornei</i>		<i>Pythium sp.</i>		<i>Macrophomina phaseolina</i>	
Pest Name		Root-lesion Nematode		Pythium		Charcoal Rot	
Assessment Date		24/01/2020	11/06/2020	24/01/2020	11/06/2020	24/01/2020	11/06/2020
Assessment Type		COUNT	COUNT	COUNT	COUNT	COUNT	COUNT
Assessment Unit		/g soil	/g soil	pgDNA/g soil	pgDNA/g soil	kDNA copies/g soil	kDNA copies/g soil
ARM Action Codes			AL			AL	AL
Trt No.	Treatment						
7	Barley, Tyne, Standard	4.3 -	2.0 -	2.7 -	3.0 -	8.3 b	3.4 -
15	Durum, Tyne, Standard	2.0 -	1.7 -	5.0 -	3.0 -	6.7 b	5.3 -
23	Wheat, Tyne, Standard	4.7 -	2.2 -	8.3 -	4.0 -	11.7 b	3.2 -
31	Chickpea, Tyne, Standard	0.7 -	1.4 -	3.7 -	5.7 -	34.0 a	12.0 -
LSD P=.05		nsd	nsd	nsd	nsd	17.2	nsd
Treatment Prob.(F)		0.12	0.78	0.40	0.92	0.03	0.36

Means followed by same letter do not significantly differ (P=.05, LSD)

nsd = No significant difference

Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

NB site characterisation at 2019 planting indicated *P thornei* at 3.5/g soil, *Pythium* at 6.2 pgDNA/g soil and *M phaseolina* at 9.9 kDNA copies/ g soil

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

Location:

Goondiwindi

Trial Year:

2019

ARM Action Codes

AL = Automatic log transformation of X+1

COMPLETE SPLIT-PLOT AOV						
13/06/2019						
EMERGENCE /m ² 22 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	45563.042959				
R	2	938.771566	469.385783	17.339	0.0012	
A	3	14101.479848	4700.493283	80.373	0.0001	5
ERROR A	6	350.901286	58.483548			
B	1	1126.867930	1126.867930	41.625	0.0002	2
AB	3	278.797150	92.932383	3.433	0.0724	5
ERROR B	8	216.573079	27.071635			
C	3	21594.053904	7198.017968	112.491	0.0001	5
AC	9	2792.212168	310.245796	4.849	0.0001	9
BC	3	350.513458	116.837819	1.826	0.1550	7
ABC	9	741.481781	82.386865	1.288	0.2683	13
ERROR C	48	3071.390788	63.987308			

COMPLETE SPLIT-PLOT AOV						
29/08/2019						
NDVI Ratio 99 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	0.629917				
R	2	0.138760	0.069380	93.231	0.0001	
A	3	0.264237	0.088079	63.261	0.0001	0.03
ERROR A	6	0.008354	0.001392			
B	1	0.004596	0.004596	6.176	0.0378	0.01
AB	3	0.005186	0.001729	2.323	0.1515	0.03
ERROR B	8	0.005953	0.000744			
C	3	0.033649	0.011216	6.158	0.0013	0.02
AC	9	0.056131	0.006237	3.424	0.0025	0.05
BC	3	0.002260	0.000753	0.413	0.7441	0.04
ABC	9	0.023357	0.002595	1.425	0.2043	0.07
ERROR C	48	0.087434	0.001822			

COMPLETE SPLIT-PLOT AOV						
25/10/2019						
YIELD t/ha 156 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	11.286971				
R	2	1.545961	0.772981	225.991	0.0001	
A	3	6.330799	2.110266	48.204	0.0001	0.15
ERROR A	6	0.262665	0.043778			
B	1	0.121026	0.121026	35.384	0.0003	0.03
AB	3	0.045113	0.015038	4.396	0.0417	0.06
ERROR B	8	0.027363	0.003420			
C	3	1.174817	0.391606	19.623	0.0001	0.08
AC	9	0.249191	0.027688	1.387	0.2203	0.16
BC	3	0.234712	0.078237	3.920	0.0139	0.12
ABC	9	0.337399	0.037489	1.879	0.0782	0.23
ERROR C	48	0.957924	0.019957			

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

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COMPLETE SPLIT-PLOT AOV 26/10/2019 PROTEIN % 157 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	2491.380000				
R	2	1.429375	0.714687	2.362	0.1563	
A	3	2467.014167	822.338056	13841.811	0.0001	0.2
ERROR A	6	0.356458	0.059410			
B	1	0.006667	0.006667	0.022	0.8857	0.3
AB	3	1.227500	0.409167	1.352	0.3248	0.5
ERROR B	8	2.420833	0.302604			
C	3	1.770833	0.590278	2.546	0.0669	0.3
AC	9	3.348333	0.372037	1.605	0.1408	0.6
BC	3	1.110833	0.370278	1.597	0.2023	0.4
ABC	9	1.568333	0.174259	0.752	0.6603	0.8
ERROR C	48	11.126667	0.231806			

COMPLETE SPLIT-PLOT AOV 26/10/2019 MOISTURE % 157 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	36.080000				
R	2	0.109375	0.054687	0.318	0.7363	
A	3	30.908333	10.302778	369.514	0.0001	0.1
ERROR A	6	0.167292	0.027882			
B	1	0.000417	0.000417	0.002	0.9619	0.2
AB	3	0.174583	0.058194	0.339	0.7982	0.4
ERROR B	8	1.375000	0.171875			
C	3	0.140833	0.046944	0.982	0.4092	0.1
AC	9	0.217500	0.024167	0.505	0.8633	0.3
BC	3	0.050417	0.016806	0.351	0.7882	0.2
ABC	9	0.641250	0.071250	1.490	0.1788	0.4
ERROR C	48	2.295000	0.047813			

COMPLETE SPLIT-PLOT AOV 26/10/2019 TEST WEIGHT kg/hL 157 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	4802.679896				
R	2	13.408958	6.704479	0.803	0.4809	
A	3	4434.692813	1478.230938	368.722	0.0001	1
ERROR A	6	24.054375	4.009063			
B	1	1.955104	1.955104	0.234	0.6414	1
AB	3	4.544479	1.514826	0.182	0.9060	3
ERROR B	8	66.766667	8.345833			
C	3	19.912813	6.637604	1.806	0.1588	1
AC	9	35.679271	3.964363	1.078	0.3957	2
BC	3	2.307813	0.769271	0.209	0.8895	2
ABC	9	22.900938	2.544549	0.692	0.7124	3
ERROR C	48	176.456667	3.676181			

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901

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COMPLETE SPLIT-PLOT AOV 26/10/2019 SCREENING % 157 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	212.209583				
R	2	1.172708	0.586354	0.735	0.5092	
A	3	32.200417	10.733472	20.179	0.0015	0.5
ERROR A	6	3.191458	0.531910			
B	1	0.081667	0.081667	0.102	0.7572	0.4
AB	3	4.577500	1.525833	1.913	0.2060	0.8
ERROR B	8	6.380833	0.797604			
C	3	9.252083	3.084028	1.601	0.2013	0.8
AC	9	23.460417	2.606713	1.354	0.2356	1.6
BC	3	1.252500	0.417500	0.217	0.8843	1.1
ABC	9	38.205000	4.245000	2.204	0.0381	2.3
ERROR C	48	92.435000	1.925729			

COMPLETE SPLIT-PLOT AOV Soil water to 1.5m 25/10/2019 PAW mm 156 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	17761.575481				
R	2	8008.790301	4004.395150	1253.228	0.0001	
A	3	8235.966534	2745.322178	34.972	0.0003	6
ERROR A	6	471.009348	78.501558			
B	1	16.654366	16.654366	5.212	0.0518	1
AB	3	7.360915	2.453638	0.768	0.5434	2
ERROR B	8	25.562118	3.195265			
C	3	64.179982	21.393327	1.689	0.1819	2
AC	9	65.451479	7.272387	0.574	0.8115	4
BC	3	34.098993	11.366331	0.897	0.4495	3
ABC	9	224.433235	24.937026	1.968	0.0642	6
ERROR C	48	608.068213	12.668088			

Impact of Planter Type on Crop Performance & Yield

Trial ID: BB1901 **Location:** Goondiwindi **Trial Year:** 2019

Conclusions:

This trial was established to determine the impact of planter type on performance and yield of barley, durum, wheat and chickpeas. All crops were planted with both a Boss double disc and a Janke tyne planter with press wheels on 22/05/19 with 80 kg/ha Granulock Supreme Z. Crop emergence was assessed 22 days after planting and NDVI readings taken 99 days after planting. Yield, EM38, stubble height and ground cover were all assessed at harvest, together with PreDicta B soil tests for impact on pathogens.

SAGI (Statistics for Australian Grains Industry) analysis found the following:

There was a significant increase in NDVI with increasing emergence counts in chickpeas but not in the cereals.

There was a significant increase in yield with increasing emergence counts for all crops sown with the disc sowing setup, and also for chickpea sown with the tyne.

As expected, there was a negative response in soil water remaining at harvest to the emergence counts.

There was a significant increase overall in ground cover to increased emergence.

NB means presented in the tables of results above are from an **analysis based on target populations**. SAGI analysed results on the basis of **actual emergence counts in each plot**.

In this trial, the tyne planter did not appear to have an inherent yield advantage over planting with disc seeder for barley, durum, wheat or chickpeas.

At harvest, chickpea plots had approximately 20mm more plant available soil water remaining compared to the cereals.

Limited sampling was undertaken to evaluate potential impact on AMF and soil pathogens. There was a trend ($p=10\%$) to reduced levels of AMFa following durum in late January 2020 but this was not significant in sampling in June 2020. Very low levels of AMFb were detected with no significant difference between crops. There was no detection of AMFb at this site in durum plots at either sampling date. There were no significant differences in *Pratylenchus thornei* or *Pythium* spp between crops. However significantly increased levels of the charcoal rot pathogen (*Macrophomina phaseolina*) were found in Jan 2020 following chickpeas.