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Row Spacing & Plant Population Impact on Fallow Efficiency

Trial ID: BB1903 Location: Boggabilla Trial Year: 2019
Investigator: Brendan Burton

Objective:	To evaluate the impact of crop row spacing and plant population on fallow efficiency
Crops:	2018: failed crop of PBA Hattrick chickpea 2019: barley cv. Spartacus (cover crop) 2020: barley cv. Planet
Plot Size:	18m wide x ~500m long (4 replicates)
Planting Dates:	2019: 11/06/2019 (DP1) 2020: 4/5/2020 (DP2)
Cover Crop Planting Configurations:	Standard configuration: 38cm rows at 90 plants/m ² Narrow row/high population: 19cm rows at 180 plants/m ²
Cover Crop Spray Out Date:	16/9/2019
Harvest Date:	15/10/2020
Keywords:	Fallow efficiency, row spacing, plant population, barley

Trial conducted in a very low stubble situation following a failed chickpea crop in 2018.

In 2019, the trial evaluated the impact of barley as a cover crop at standard grower practice (38cm rows and 90 plants/m²) compared to barley 'double planted' (19cm rows and 180 plants/m²). A fallow treatment was used as a reference.

In 2020, the trial was commercially planted with Planet barley to assess the impact from the 2019 treatments.

A PreDicta B soil test was conducted on the 13/6/2019. Site had ~5 *P. thornei* nematodes/g soil and ~48 kDNA copies of AMFa+b/ g soil. Initial soil moisture was also on the same date taken using both gravimetric samples and EM38. No suitable soil characterization could be found for accurate conversion to mm of soil water from the gravimetric cores. Starting EM38 readings were 112 mS/m at 1.5m depth, 98 mS/m at 0.75m and 85 mS/m at 0.375m.

Table 1: Impact from cover crop in 2019 on ground cover, stubble height and soil moisture. Assessed 29 days after barley sprayed out.

Situation		Fallow				
Assessment Date		25/10/2019				
Assessment Type		GROUND COVER	STUBBLE HEIGHT	EM38	EM38	EM38
Assessment Depth				1.5m	0.75m	0.375m
Assessment Unit		%	cm	mS/m	mS/m	mS/m
Trt No.	2019 Treatment					
1	Fallow	7 c	0 b	119 a	108 a	106 a
2	Standard configuration	41 b	34 a	87 b	77 b	83 b
3	Narrow row/high population	53 a	36 a	87 b	77 b	83 b
LSD P=.05		8.3	7.9	15.9	11.5	9.5
Treatment Prob.(F)=		0.0001	0.0001	0.0040	0.0008	0.0013

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

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

DP1 = Days after Planting 1, nsd = no significant difference

Unreplicated stubble dry matter cuts were taken on 25/10/2019. Treatment 2 ~5.7t/ha, Treatment 3 ~12.9t/ha

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Table 2: Impact from cover crop in 2019 on final soil moisture and fallow efficiency

Situation		Fallow 14/04/2020			Fallow 14/04/2020		
Assessment Date		Final EM38 readings			Fallow efficiency (Change in EM38 reading during 7 month fallow)		
Description		EM38 1.5m mS/m	EM38 0.75m mS/m	EM38 0.375m mS/m	EM38 1.5m mS/m	EM38 0.75m mS/m	EM38 0.375m mS/m
Assessment Type							
Assessment Depth							
Assessment Unit							
Trt No.	2019 Treatment						
1	Fallow	162 -	130 a	99 a	43 b	22 b	-8 b
2	Standard configuration	147 -	118 b	89 b	60 a	40 a	5 a
3	Narrow row/high population	144 -	115 b	85 b	57 a	38 a	3 a
LSD P=0.05		nsd	9.9	7.6	13.1	13.7	8.7
Treatment Prob.(F)=		0.0523	0.0210	0.0123	0.0974 (10%)	0.0302	0.0587 (10%)

Table 3: Impact from 2019 cover crop on 2020 crop yield

Crop		Barley
Variety		Planet
Assessment Date		15/10/2020
Assessment Type		YIELD
Assessment Unit		t/ha
Plant-Evaluation Interval		164 DP2
Trt No.	2019 Treatment	
1	Fallow	5.13 -
2	Standard configuration	4.74 -
3	Narrow row/high population	5.04 -
LSD P=0.05		nsd
Treatment Prob.(F)=		0.1640

nsd = No significant difference

Assessment Type

HEIGHT = height of barley stubble

EM38 = soil conductivity measurement

Assessment Unit

mS/m = millisiemens per metre

DP1 = days after planting 1 (2019)

DP2 = days after planting 2 (2020)

Row Spacing & Plant Population Impact on Fallow Efficiency

Trial ID: BB1903

Location: Boggabilla

Trial Year: 2019

Conclusions:

This paddock was planted on limited soil moisture (~45cm wet soil) following a failed chickpea crop in 2018. The commercial aim was primarily to grow some stubble, hoping to improve fallow efficiency for the 2020 crop. The barley cover crop treatments were sprayed out in September 2019. The remainder of the commercial paddock was taken through to harvest, only yielding ~0.4t/ha.

As expected, assessment ~1 month after spray out, showed a significantly lower EM38 reading (~soil moisture) in both cover crop treatments compared to the fallow. This was significant at all depths. However, there was no difference in the EM38 readings between the standard and narrow row/high population configurations.

Significantly increased groundcover % was provided by the narrow row/high plant population treatment compared to the standard configuration with both providing ~6-7 times the groundcover % of the fallow. There was no difference in stubble height between the two cover crop planting configurations but the narrow row/high population treatment provided ~ double the dry matter of the standard configuration (12.9 v 5.7t/ha).

During the 2019/20 fallow period, ~310mm of rain was recorded with a final EM38 assessment conducted in April 2020. There was no indication of any benefit in fallow efficiency from the narrow row/high population treatment compared to the standard planting configuration. Both cover crop treatments still had significantly less water than the fallow at both 0.375 and 0.75m depths. The change in EM38 from start to end of fallow (~fallow efficiency) showed no difference in fallow efficiency between the cover crop treatments but a significant increase at 0.75m compared to the fallow. There were clear trends ($p=10\%$) to improved fallow efficiency from both cover crop treatments compared to the fallow treatment at the other depths.

Despite only ~100mm of in-crop rain, yields of 4.7 to 5.1t/ha were achieved in 2020 with no significant difference between cover crop treatments and the fallow. Grain quality samples were not collected.

In this situation, the narrow row/high population planting configuration did not provide any benefit in fallow efficiency compared to the standard planting approach. Although the cover crops improved the fallow efficiency, they were still drier than the fallow treatment at planting in 2020.

Crop Description	
Crop 1 - 2019:	Barley cv. Spartacus
Planting Date:	11/06/2019
Planting Rate:	45 kg/ha
Planting Method:	Direct Drilled
Depth:	5 cm
Planting Equipment:	Disc
Row Spacing:	38.1 cm
Harvest Date:	16/09/2019
Planting Density:	90 Plants/m²
Soil Moisture:	Slightly wet
Harvest Equipment:	Failed Barley crop sprayed out
Crop 2 - 2020:	Barley cv. Planet
Planting Date:	4/05/2020
Planting Rate:	55 kg/ha
Planting Method:	Direct Drilled
Depth:	5 cm
Planting Equipment:	Tyne
Row Spacing:	38.1 cm
Harvest Date:	15/10/2020
Planting Density:	70 Plants/m²
Harvested Width:	12m
Harvested Length:	492m
Harvest Equipment:	Commercial Harvester