A farming systems study at Nindigully, South-West Queensland

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Abstract

Afarming systems trial was established on grey clay soil at Nindigully in south-west Queensland in 1996 to assess the effect of contrasting crop/crop and pasture/crop strategies on sustainable and profitable farming systems in the 600 mm, sub-tropical rainfall zone. Issues to be addressed in the trial are developed from meetings with growers and the trial is managed by a group representing grower, agribusiness, research, development and extension interests. Results under contrasting seasonal conditions in 1996 and 1997 have shown that profitable responses to N fertiliser addition can be obtained in winter cereals in this environment. Zero tillage improved wheat yields and gross margins. Grain and ley pasture legumes have performed well and contributed significantly to soil N status. The first sowings of ley pasture legumes were returned to fallow after 16 months production and will be sown to wheat in 1998.

Key words: Farming system, productivity, sustainability, profitability, rotation.

Afarming systems trial was established at Nindigully (28?29'S, 148?45'E) in south-west Queensland in 1996, as part of the GRDC project 'Sustainable Rotations and Cropping Practices for the Marginal Cropping Areas of north-west New South Wales and south-west Queensland. The aims of the trial are to assess the effect of contrasting crop/crop and pasture/crop strategies on sustainable and profitable farming systems in the 600 mm, sub-tropical rainfall zone, and to involve growers and agribusiness in target setting, decision making and management of the trial.

Prior to commencement of the trial, meetings were held to identify grower needs and to prioritise issues to be addressed by the farming systems trial. The information needs identified by the growers were broadly classified under the options of continuous winter cereal cropping (fertiliser, tillage), grain legume/cereal rotation , opportunity cropping (wheat, barley, chickpea, faba bean, canola), legume ley/cereal rotation, grass-legume ley/cereal rotation and permanent grass-legume pasture.

A management team representing grower, agribusiness, research, development and extension interests meets regularly to discuss operations, directions, management, outcomes and publicity of the trial. The trial is located on a coolibah grey clay soil which has been under cultivation since 1956. Winter crops and ley pastures (medics and lucerne) were sown in late May in 1996 and 1997. Summer ley pastures (Bambatsi panic and lucerne) were sown in February 1997 and January 1998.

Results and discussion

In 1996, there was 200 mm of available water and 60 kg/ha of nitrate-N in the soil profile to a depth of 1.2 m at sowing. Above average in-crop rainfall of 180 mm was received in 1996. In 1997, available soil water at sowing was 140 mm, while soil nitrate-N at sowing was 35, 65 and 75 kg/ha following wheat, chickpea and faba bean in 1996, respectively. In-crop rainfall in 1997 was below average at 117 mm, 62 mm of which was received after anthesis.

In both 1996 and 1997, wheat grain yield and protein content increased with increasing rates of N fertiliser addition, with the highest N rate resulting in the highest gross margins (Table 1). In 1996, grain protein content did not reach the level for prime hard classification (13%) even with the highest rate of N addition (90 kg N/ha), indicating that the N fertiliser application rate could have been higher for this relatively high-yielding crop.

Increases in barley grain yield and in protein level from non-malting to malting grade occurred with addition of 40kg N/ha in 1996, but in 1997, malting grade barley was produced with the extra N available in the soil from the preceding chickpea crop (Table 1).

Table 1 Grain yield and grain protein at 12% moisture content and gross margin for 1996 and 1997 winter crops in the farming systems trial at 'Dunkerry South' Nindigully

Crop	N fertiliser rate (N fertiliser + soil nitrate-N at sowing) (kg N/ha)		Grain yield (t/ha)		Grain protein (%)		Gross margin ($/ha)	
	1996	1997	1996	1997	1996	1997	1996	1997
Wheat following wheat	0 (60)	0 (35)	3.01	2.20	8.5	7.7	200	78
	30 (90)	40 (75)	3.50	2.70	9.2	9.9	250	159
	60 (120)	70 (110)	3.66	2.81	10.7	11.7	300	190
	90 (150)	100 (150)	3.82	2.94	12.3	13.1	370	237
Wheat following chickpea	-	0 (65)	-	2.56	-	10.6	-	184
	-	40 (105)	-	2.71	-	12.0	-	192
Barley following wheat	0 (60)	0 (35)	3.11	1.97	8.0	7.8	170	82
	40 (100)	-	3.68	-	10.2	-	450	-
Barley following chickpea	-	0 (65)	-	2.48	-	9.8	-	244
	-	20 (85)	-	2.48	-	10.9	-	227
Chickpea following barley	0 (60)	0 (35)	1.88	1.37	21.5	19.5	250	211
Fababean following wheat	0 (60)	0 (35)	2.21	0.70	25.5	21.6	310	-144
Canola following faba bean	-	0 (75)	-	1.27	-	23.7	-	180
	-	20 (95)	-	1.45	-	24.9	-	224

As expected, the yields of winter grain legumes were lower than those of winter cereals in both years (Table 1). However, gross margins from chickpea in both years and fababean in 1996 were similar to those from wheat with intermediate rates of N addition. Canola had similar yield and gross margin to chickpea in 1997.

In 1997, wheat yield from land that was zero tilled following the 1996 wheat crop was 22% higher than that from conventionally-tilled land due to slightly higher soil water storage under zero tillage.

The target for extra soil nitrate-N from pasture legumes is 75 kg/ha. For the May 1996 sowings, this target was achieved by spring 1997, and these pastures have been returned to fallow and will be sown to wheat in 1998.

Conclusions

Results to date show that profitable responses to N fertiliser addition can be obtained in this environment.? However, pre-sowing soil profile water and nitrate-N levels determine the target N rate in this environment.? Zero tillage offers potential for improving crop yields.? Grain and pasture legumes have performed well and made a significant contribution to soil N status.

The outcomes of the trial in the first two years have created much interest among growers in the area. Many growers have set up trials to examine how some of these pastures, rotations, cropping options, fertiliser inputs and tillage practices perform on their own properties and contribute towards profitable and sustainable farming systems in this marginal cropping area.

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