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TITLE: Nitrogen Fertilizers for Cereals in Different Rotations

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Nitrogen Fertilizer Requirement in Alternate Crop-Pasture Rotation
Badgingarra Research Station

Pasture Blocks (sampled 5/9/1990)

Block	Rotation	1989 Treatment	Per cent of total pasture			Total pasture dry matter (kg/ha)
			Clover	Grass	Other	
1	2:1	Crop	44	41	15	1,742
2	2:1	Pasture	39	52	9	1,512
5	1:1	Crop	23	60	17	1,512
7	1:1	Crop	32	40	28	1,658
8	2:1	Pasture	30	47	23	1,452
9	2:1	Crop	63	26	11	2,174

1990 Crop Blocks

Rotation	1990 Treatment on crop	Grain yield (kg/ha)
2 years pasture: 1 year crop	Nil	1,767
	Ammonium nitrate 38 kg/ha	2,086
	Ammonium nitrate 78 kg/ha	2,667
	Ammonium nitrate 112 kg/ha	2,619
	Ammonium nitrate 154 kg/ha	3,190
	Ammonium nitrate 224 kg/ha	2,929
1 year pasture: 1 year crop	Ammonium nitrate nil*	1,724
	Nil	881
	Ammonium nitrate 38 kg/ha	862
	Ammonium nitrate 78 kg/ha	1,190
	Ammonium nitrate 112 kg/ha	1,124
	Ammonium nitrate 154 kg/ha	967
	Ammonium nitrate 224 kg/ha	890
	Ammonium nitrate nil*	810

* 456 kg/ha ammonium nitrate applied with each crop up to 1988 - none since.

Soil Type: Grey gravelly sand over gravel at about 15-20 cm

History: Old clover land. All blocks were in clover pasture in 1977.

Crop: Dagger wheat 50 kg/ha

Sowing Date: June 19, 1990

Basal: Superphosphate 90 kg/ha

Comments:

Ammonium nitrate topdressed by combine immediately before sowing. 1:1 rotation crops very poor - extremely weedy with ryegrass and some brome grass. Some twisting of leaf tips. 2:1 crops - a little grass in plots. Leaf septoria quite bad in all crops. 1:1 rotation blocks accidentally grazed early.

Highest total pasture production levels were the first year pastures in the 2:1 rotation, followed by the 1:1 rotation, with the second year pastures in the 2:1 rotation giving lowest levels of production. The highest clover percentages were also found in the first year pastures of the 2:1 rotation. Lowest percentages were generally in the 1:1 rotation.

Grain yields were far higher with the 2:1 rotation than with the 1:1 rotation. The 1:1 rotation plots were much weedier than the 2:1 rotation plots and were more poorly grown. There was a response up to 154 kg/ha ammonium nitrate in the 2:1 rotation but only to 78 kg/ha in the 1:1 rotation.

Nitrogen Fertilizer Requirement in Alternate Crop-Pasture Rotation
Wongan Hills Research Station

Pasture Blocks (sampled 4/9/1990)

Block	Rotation*	1989 Treatment	<u>Per cent of total pasture</u>			Total pasture dry matter (kg/ha)
			Clover	Grass	Other	
1	1:1	Crop	53	26	21	1,101
3	2:1	Pasture	81	16	3	1,027
4	2:1	Crop	69	26	5	1,256
7	2:1	Crop	47	44	9	1,444
9	1:1	Crop	70	26	4	1,212
10	2:1	Pasture	91	9	0	1,464

* Because trial only started 1989, rotations not yet operative.

1990 Crop Blocks

Treatment	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Nil	5,924	3,658
Urea 25 kg/ha	6,527	3,857
Urea 50 kg/ha	6,511	4,086
Urea 75 kg/ha	6,537	4,083
Urea 100 kg/ha	6,290	3,848
Urea 150 kg/ha	7,588	4,015
Urea 300 kg/ha	6,745	3,982

Soil Type: Wongan yellow loamy sand

History: Old clover land. Whole area in clover 1988.

Crop: Reeves wheat 50 kg/ha

Sowing date: May 29, 1990

Basal: Superphosphate 90 kg/ha

Comments:

Few weeds in crops - a little ryegrass. Pastures well grazed.

Because this trial is only in its second year, the rotations are not yet operative. There was a crop vegetative response to the lowest urea rate (25 kg/ha), but the response to higher rates was variable and doubtful.

There was a grain yield response up to 50 kg/ha urea.

*86WH36/3288EX
Lupin/Wheat Rotation
Wongan Hills Research Station

Rotation	1989 Crop	Rate of urea on 1990 wheat crop (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Lupins-wheat	Lupins	0	2,657	2,845
		45	4,063	3,134
		90	4,214	3,300
		135	4,426	3,357
		270	4,529	3,268
Lupins-wheat-wheat	Wheat	0	1,022	1,061
		45	1,621	1,308
		90	2,194	1,808
		135	2,540	1,850
		270	2,890	1,857
Continuous wheat	Wheat	0	268	387
		45	1,175	692
		90	1,275	908
		135	1,064	831
		270	1,551	1,251

* Also with M. Sweetingham.

Soil type: Wongan yellow loamy sand

History: Cropped to wheat in 1985 on old clover land. Stubble of 1989 crop not burnt.

Crop: Reeves wheat 50 kg/ha

Sowing Date: May 31, 1990

Vegetative Sampling Date: September 24, 1990

Basal: Superphosphate 200 kg/ha

Comments:

Urea rates topdressed by cone seeder immediately before sowing. Few weeds in first crops after lupins. All other crops extremely weedy - mainly brome grass, some wild oats, 1989 lupins averaged 2.1 t/ha seed.

There was a vegetative response up to the highest urea rate on all rotations. The absolute response was least with continuous wheat, probably due to the difference in weeds. Dry matter yields were greatest for the first crop after lupins and least for continuous wheat.

There was a grain yield response to urea in all rotations. The response was up to 135 kg/ha in the lupin/wheat and lupin/wheat/wheat (2nd crop) rotations and up to the highest rate of urea (270 kg/ha) with continuous wheat. Yields were highest for the first crop after lupins and lowest for continuous wheat, with the second crop after lupins being intermediate.

*87N084/5196EX
Pea/Wheat Rotation
B. Carter, Konnongorring

Rotation	1989 Crop	Rate of urea on 1990 crop (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Peas-wheat	Peas	0	2,504	3,147
		40	3,260	3,357
		80	3,210	3,501
		160	2,886	3,362
Peas-wheat-wheat	Wheat	0	2,506	3,231
		40	3,011	3,445
		80	3,412	3,514
		160	3,304	3,564
Continuous wheat	Wheat	0	2,065	2,123
		40	2,462	2,861
		80	3,321	2,971
		160	3,515	3,528

* Also with I. Pritchard.

Soil type: Red-brown clay loam

History: Prior to 1987 - five successive wheat crops on old legume pasture country. Stubble of 1989 crops ploughed in.

Crop: Kulin wheat 45 kg/ha

Sowing Date: June 19, 1990

Vegetative Sampling Date: October 3, 1990

Basal: Superphosphate 99 kg/ha

Comments:

Urea rates topdressed by cone seeder immediately before sowing wheat. Few weeds in wheat crops. 1989 peas averaged 1.2 t/ha.

There was a dry matter response up to 40 kg urea/ha on the first crop after peas, up to 80 kg/ha on the second crop after peas and up to the highest rate (160 kg/ha) with continuous wheat. At lower N rates dry matter yields were lowest for continuous wheat, but the reverse was true at the highest urea rate.

There were grain yield responses to urea in all rotations. There was a response up to 80 kg/ha urea on the first crop after peas, up to 80-160 kg/ha on the second crop after peas and to the highest rate (160 kg/ha) with continuous wheat. Yields were higher for the second crop after peas than for the first crop, while yields were considerably lower with continuous wheat.

*86M39/5196EX
Pea/Wheat Rotation
Merredin Research Station

1989 Crop	Rate of urea on 1990 crop (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
	0	3,135	1,535
Peas	20	3,347	1,596
(P-W)	60	3,282	1,455
	100	3,529	1,470
	200	3,562	1,585
	0	2,063	1,135
Wheat	20	2,213	1,181
(Continuous wheat)	60	2,696	1,413
	100	3,172	1,539
	200	3,075	1,406

* Also with R. French.

Soil type: Red-brown gritty clay loam

History: Wheat in 1985 on old legume pasture land. Stubble of 1989 crops not burnt.

Crop: Gutha wheat 50 kg/ha

Sowing Date: June 11, 1990

Vegetative Sampling Date: October 2, 1990

Basal: Superphosphate 100 kg/ha

Comments:

Urea rates topdressed by cone seeder immediately before sowing. Very few weeds in most plots - a little barley grass in some plots. 1989 peas averaged 1.1 t/ha seed.

There was a dry matter response up to 100 kg/ha urea with continuous wheat, but the response was much less marked in the pea/wheat rotation, where there was a response to at least 20 kg urea/ha. Dry matter yields were considerably higher following peas than with continuous wheat.

There was little, or no grain yield response to urea in the pea/wheat rotation, but there was a response up to 100 kg/ha with continuous wheat.

*87N25/5196EX
Pea/Wheat Rotation
Newdegate Research Station

Rotation	1989 Crop	Rate of urea on 1990 crop (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Peas-wheat	Peas	0	2,051	746
		20	2,126	1,032
		60	2,622	873
		100	2,376	905
		200	2,314	730
Peas-wheat-wheat	Wheat	0	1,856	667
		20	1,841	587
		60	2,267	841
		100	2,449	730
		200	2,537	841
Continuous wheat	Wheat	0	1,267	726
		20	1,424	706
		60	1,717	714
		100	2,061	1,012
		200	2,023	889

* Also with I. Pritchard.

Soil type: Grey sand over brown clay at 10-20 cm

History: Prior to 1987 two cereal crops grown on old clover land. Stubble of 1989 crops not burnt.

Crop: Aroona wheat 45 kg/ha

Sowing Date: June 4, 1990

Vegetative Sampling Date: October 11, 1990

Basal: Superphosphate 100 kg/ha

Comments:

Urea rates topdressed by cone seeder immediately before sowing. Few weeds in wheat plots. 1989 peas average 0.3 t/ha grain.

There was a vegetative response up to 60 kg urea/ha on the first crop after peas, to 200 kg/ha on the second crop after peas and to 100 kg/ha with continuous wheat. Dry matter yields were lowest for continuous wheat at all rates of nitrogen. At lower N rates dry matter yields were higher on the first crop after peas than for the second crop, but this was reversed at higher N rates.

Grain yield responses to urea were very variable, as were comparisons between rotations.