Trial 38

Wheat Responses to the Application of Nitrogen and Phosphorus
Sponsored by Pivot Agriculture

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Aim: To demonstrate the benefits of applying phosphorus and nitrogen to wheat in cereal-legume rotations on sodic soils in the southern Mallee.

Results:

Table 1. Soil Analysis - April '96

Phosphorus '94/95	P Colwell	Nitrogen '94	Nitrate	kg N/ha
Nil P	9.3 ppm	0 kg N/ha	16 ppm	134
5 kg P/ha	10.3 ppm	25 kg N/ha	15 ppm	126
10 kg P/ha	11.5 ppm	50 kg N/ha	17 ppm	143
20 kg P/ha	13.5 ppm	100 kg N/ha	16 ppm	134
40 kg P/ha	20.5 ppm			
60 kg P/ha	37.7 ppm	**Ave. N available at sowing:** 134 kg N/ha		

(P taken 0-10cms, Nitrate/Ammonium taken 0-60cms)

Table 2. Harvest data

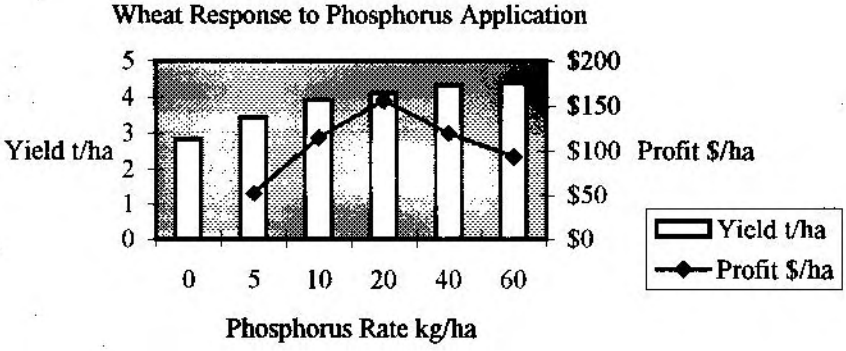
Treatment Number	Phosphorus Rate kg/ha	Nitrogen Rate kg/ha	Grain Yield t/ha	Grain Protein %	WUE kg/mm	Fertiliser Profit from control 0P, 0N $/ha
1	0	0	2.74	11.4	13.7	$0.00
2	0	25	2.63	12.0	13.2	($40.50)
3	0	50	3.04	12.0	15.2	($3.00)
4	0	100	2.90	12.0	14.5	($72.00)
5	5	0	3.52	12.5	17.6	$109.00
6	5	25	3.27	10.8	16.4	$44.90
7	5	50	3.54	11.4	17.7	$61.80
8	5	100	3.38	12.5	16.9	($8.20)
9	10	0	3.78	10.8	18.9	$134.90
10	10	25	3.91	10.8	19.6	$130.00
11	10	50	4.07	12.0	20.4	$133.50
12	10	100	3.89	12.5	19.5	$59.90
13	20	0	3.93	10.3	19.7	$137.40
14	20	25	4.23	11.4	21.2	$161.30
15	20	50	4.32	12.5	21.6	$155.00
16	20	100	3.93	12.5	19.7	$48.00
17	40	0	3.98	10.8	19.9	$110.30
18	40	25	4.34	10.3	21.7	$137.20
19	40	50	4.49	11.4	22.5	$139.90
20	40	100	4.45	12.5	22.3	$90.60
21	60	0	4.04	10.8	20.2	$83.10
22	60	25	4.44	12.0	22.2	$123.00
23	60	50	4.41	10.8	22.1	$89.50
24	60	100	4.63	12.0	23.2	$79.50

Notes: Nutrient costs - phosphorus $1.80kg, nitrogen $0.96kg
Wheat valued at $145t for 10% protein plus $5t for each 1% protein

Interpretation:
The harvest results clearly show the gains to be made from the balanced application of phosphorus and nitrogen to wheat crops grown in the southern Mallee.

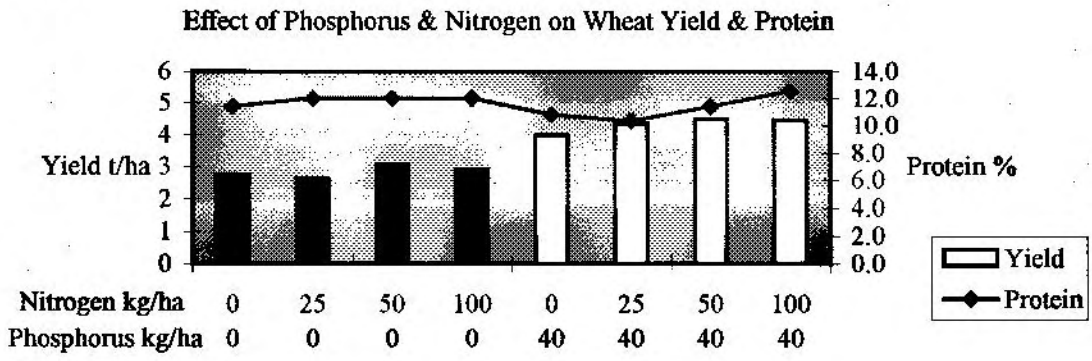
Phosphorus
As the application rate of phosphorus increased so too did wheat yields with an extra 1.5 t/ha produced at 60 kg P/ha compared to no P fertiliser. The most profitable rate of phosphorus at the site was 20 kg/ha (Figure 1.). These results have been achieved even after 3 applications of the same rate of phosphorus in successive years ('94/'95/'96). The soil test values in table 1 reflect the build up that can be achieved with a well planned phosphorus strategy.

Figure 1.



Nitrogen
Nitrogen results at the site varied from no response up to 0.6 t/ha. At low phosphorus rates, yield potential was clearly limited by phosphorus not nitrogen. The application of nitrogen fertiliser had little effect on yield until sufficient phosphorus had been applied to raise the potential past 4.0 t/ha. Soil tests prior to sowing indicated there was sufficient nitrogen in the profile to grow this size crop without the addition of nitrogen fertiliser. At high rates of phosphorus and increased yield potential, nitrogen responses started to appear (Table 2). Grain protein decreased with the application of phosphorus due to dilution through higher yield, however this trend was reversed when nitrogen fertiliser was applied in addition to phosphorus (Figure 2). The most profitable nutrient combination in the trial last year was 20 kg P/ha plus 25 kg N/ha (eg Pivot 15 at 155kg/ha).

Figure 2.



Take Home Message:
Carefully assess soil fertility prior to sowing cereals and canola to ensure dollars are spent on the most profitable nutrient combination for each paddock. Applying an excess of one nutrient will not overcome a deficiency in another. Plan on balanced nutrition of crops to optimise farm profits.