Are you a Hanrahan or an Alan Bond when it comes to P management?

By Mark Conyers[1], Bruce Ramsey[2] and John Francis[3]

In 2006 the NSW DPI and Incitec-Pivot conducted phosphorus rate trials (0, 10, 20 and 30 kg P per hectare) at four southern grain region locations (Culcairn, Temora, Yarrawonga and Balranald). We measured dry matter production during the season as well as grain yield, and P uptake in crop dry matter and grain. This provided data for an evaluation of the effectiveness of P application in a dry year.

A simple marginal cost analysis (Table 1) showed that even in the drought year of 2006, the lower P rate of 10 kg P per hectare paid its way (that is, was cost neutral or profitable) at three of the four sites.

At the Temora site no rate of P was profitable. But if we consider the fallback option of cutting the wheat for hay, our dry matter data at flowering (Table 2) shows that P application was profitable at all four sites.

This data has led us to conclude that application of P is a low risk strategy for generating profit – even in a 'bad' year like 2006.

We also had P response data at closely located sites (Morven near Culcairn) for 2004, 2005 and 2006. This enabled us to compare the profitability of P applications across seasons. The sites used had initial Colwell P of 35–45 ppm (satisfactory) and had basal N of 40 to 60 kg per hectare.

THE MAIN POINTS

- Soil test for P in cropping paddocks to see where each paddock is likely to be – deficient, marginal, adequate/maintenance level, luxury amounts. We consider 'luxury' to be greater than 60 ppm Colwell P on soils with P_{BI} <100. It is above this point where P application rates can be reduced.
- What is your ability to withstand the financial implications of another dry year? It is counterproductive to cut input costs that have an adverse impact on production. Production drives profit more than input costs.
- Work through the 2 by 2 risk analysis model while thinking through your individual circumstances (soil test P, financial position, attitude to risk).

Despite the satisfactory soil test for P, and the good grain yields without P fertiliser (consistent with the soil P test), the sites profitably responded to P at up to 40 kg per hectare (Table 3) in the better seasons.

This contrasts with the drought year where the maximum profit from grain was at 10 kg P per hectare.

P application decision support

Unfortunately we never know in advance what the season will bring. Table 4 offers a means to assist with thinking through the issue of risk for grain production.

An equivalent table is available for the fallback position of hay from wheat crops.

Table 4 offers a simple 2 by 2 classification of seasonal circumstance and fertiliser management decision. The division of the circumstance in which a farmer finds himself is expressed simply: "average" year or "drought" year.

The second division is based on the farmer's action: low P (10 kg/ha) and average P (20 kg/ha) application.

We explored the economic consequences of the four combinations of action and circumstance.

The spreadsheet model shows that a decision to decrease the phosphorus rate from 20 to10 kg per hectare results in an opportunity cost of income foregone ($123 per hectare) in an average season and a cost benefit ($17 per hectare) in a drought.

Because the chance of a drought is low relative to the chance of an average sea-

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TABLE 1: Grain response and $/ha return to phosphorus applications in 2006

P rate (kg/ha)	Temora grain kg/ha	Culcairn grain kg/ha	Yarrawonga grain kg/ha	Balranald grain kg/ha
0	171	211	150	431
10	166	403	338	558
20	129	450	404	604
30	79	493	403	639

Cost of fertiliser used: $4.35/kg of P
Price of grain: $350/t
maximum

P cost	return	net	return	net	return	net	return	net
0.00	60	**60**	74	74	53	53	151	151
43.50	58	15	141	**98**	118	**75**	195	**152**
87.00	45	–42	158	71	141	54	211	124
130.50	28	–103	173	42	141	11	224	93

TABLE 2: Dry matter (hay) response and $/ha returns to phosphorus application in 2006

P rate (kg/ha)	Temora hay kg/ha	Culcairn hay kg/ha	Yarrawonga hay kg/ha	Balranald hay kg/ha
0	1297	1164	627	867
10	1800	1768	1289	1114
20	1939	1880	1497	1199
30	1990	2149	1711	1383

Cost of fertiliser used: $4.35/kg of P
Price of hay: $220/t
maximum

P cost	return	net	return	net	return	net	return	net
0.00	285	285	256	256	138	138	191	191
43.50	396	**353**	389	**345**	284	240	245	**202**
87.00	427	340	414	327	329	242	264	177
130.50	438	307	473	342	376	**246**	304	174

son, the cost of conservative behaviour (a low P rate) is greater than the benefit. That is, we should err toward the decision to earn income rather than toward saving costs.

So what are the relative chances of a good or bad year in 2008? What is your attitude to risk? Are you a Hanrahan or an Alan Bond, an Eeyore or a Tigger?

This is a personal characteristic with no right or wrong answer. The aim of this data and the economic/risk analysis is to provide our industry with a framework to assist us think through each individual's circumstances – soil test P, cash availability and attitude to risk.

We would appreciate feed back both now and as 2008 progresses. If droughts are going to increase in frequency and severity, we need to be ready with a template for considering risk associated with P fertiliser application.

[1]EH Graham Centre, [2]Incitec Pivot Ltd, [3]Holmes Sackett.
For more information contact Mark Conyers
Ph: 02 6938 1830 E: mark.conyers@dpi.nsw.gov.au ■

A trial site on Lance Howley's farm south of Balranald NSW, showing responses to various fluid P sources.

TABLE 3: Marginal returns ($/ha) for grain response to phosphorus application at Morven over 2004 to 2006*

P rate (kg/ha)	2004 grain kg/ha		2005 grain kg/ha		2006 grain kg/ha	
0	4830		5770		211	
10					403	
20	6010		6360		450	
40	7080		6630			
Cost of fertiliser used: $4.35/kg of P						
Price of grain: $350/t				maximum		
	2004		2005		2006	
P cost	return	net	return	net	return	net
0.00	1691	1691	2020	2020	74	74
43.50					141	**98**
87.00	2104	2017	2226	2139	158	71
174.00	2478	**2304**	2321	**2147**		

*The 2004 & 2005 data are the property of Incitec Pivot Ltd.

TABLE 4: Decision support tool for risk associated with phosphorus application after a drought*

P response 10–20kgP/ha (Average years)	**13%**	
P response 10–20kgP/ha (Drought years)	**8%**	
MAP price ($/t)	**$1,100**	
Phosphorus price ($/kg)	$4.35	
	Season	
20 kg P/ha – Phosphorus rate	**Average**	**Drought**
Grain yield (t/ha)	**4.00**	**0.80**
Grain price ($/t)	**$320**	**$420**
Phosphorus expenses ($/ha)	$87	$87
Marginal income ($/ha)	$1,193	$249
	Season	
10 kg P/ha – Phosphorus rate	**Average**	**Drought**
Grain yield (t/ha)	3.48	0.74
Grain price ($/t)	**$320**	**$420**
Phosphorus expenses ($/ha)	$43	$43
Marginal income($/ha)	$1,070	$266
Area (ha)	**1**	
	Average	**Drought**
Marginal income	**Cost/benefit**	**Cost/benefit**
20 kg P/ha – Phosphorus rate	$123	–$17
10 kg P/ha – Phosphorus rate	–$123	$17
Chance of an average season	**50%**	
Decision	20 kg P/ha – Phosphorus rate	

* The Decision Support Tool is the property of Holmes Sackett.