Soil-phosphorus after drought

Jan Edwards

District Agronomist, Cowra

Karen Roberts

District Agronomist, Parkes

December 2006

Key Points

- The effect of residual phosphorus was strongest where no new phosphorus was applied in the recovery year.
- When phosphorus was applied in the recovery year, there were only small effects of residual phosphorus from the drought year.
- Some reduction of phosphorus rates is possible in the recovery year.
- Sowing time is the only opportunity to effectively apply phosphorus.
- Maintain recommended rates of phosphorus in the second year after drought.

Phosphorus carryover following drought

The amount of phosphorus in the soil profile at the start of 2007 will depend on:

- soil-phosphorus levels at the start of 2006
- the amount of fertiliser applied compared to the yield target
- the amount removed by either grain or hay (Figure 1).
- the amount of erosion over summer which can deplete soil-phosphorus levels.

Table 1: Comparison of nutrient removal in grain, straw, canola hay, cereal hay and lucerne. Source: Bowden WADA

Nutrients kg/tonne	Grain	Straw	Canola Hay	Cereal Hay (GS70)	Lucerne
P	3	0.5	3	2.1	3
N	20	5	30	16	28
K	4	10	3	12	22
S	3	0.5	3.5	1.5	3

Only 10 – 30% of fertiliser-phosphorus is taken up by the plant in the year of application. The remainder goes into the soil-phosphorus pool, some of which will be available for subsequent crops. The availability of the phosphorus depends on the same factors that are responsible for the mineralisation of nitrogen and sulphur – moisture, soil temperature and microbial activity

Where crop failure was solely due to drought (i.e. there was no other obvious cause for the poor yield) and there was enough was applied previously to meet expected requirements, there will be some carryover phosphorus available to following crops. However, some phosphorus fertiliser should still be applied.

Col Mullen worked on two sites in central western NSW during the 1972 drought and the 1973 recovery year. He concluded that of the 5 – 11 kg/ha phosphorus applied in 1972, 3 – 8 kg/ha were available the following year.

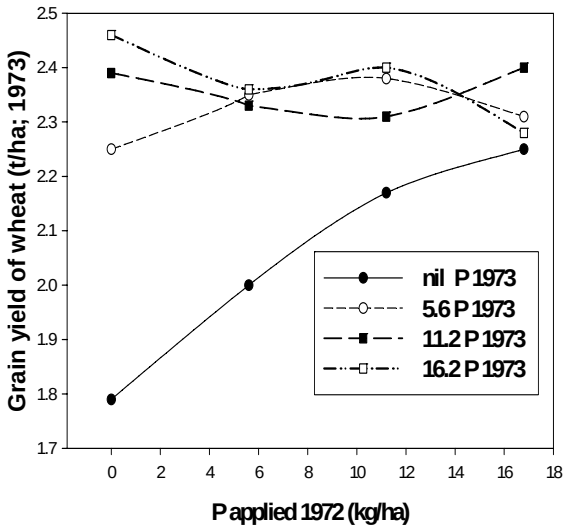

Figure 1: Grain yield of wheat (t/ha) in 1973 with varying rates of phosphorus fertiliser applied in both 1972 and 1973. The yields were averaged over two sites in central western NSW. Source: C Mullen.

In practical terms, the amount of phosphorus applied after a drought can be reduced by one-third compared. However, in paddocks with very low available phosphorus the full amount should be used.

Data from the *Western Wheat* project in 2003 (Table 2) indicates that crops sown after drought-affected crops still respond to fertiliser in the sowing year.

Table 2: The effect of phosphorus applications in the drought season of 2002 on grain yield of barley at Oaklands in 2003.

P applied	P applied 2003 (kg/ha)					
2002 (kg/ha)	0	10	15	20	30	40
0	4.5	6.4	5.7	5.4	6.1	6.3
20	5.2	5.7	5.6	5.6	5.7	5.8
40	5.5	5.8	5.9	5.9	5.8	5.8

Soil Sampling

Investing in soil testing can help decide where to invest in crop fertiliser with scarce dollars. Soil sampling in autumn will give the best indication of the likely levels of soil-phosphorus.

Phosphorus does not move very much in soil. It generally stays very close to where it is placed. After a drought, be careful not to collect undissolved fertiliser in the soil sample.

Also be aware that nutrient levels will be higher in the drill-row than the inter-row. Sampling the drill-row only may overestimate the level in the paddock. Even with precision sowing, unless you sow within 50 mm of the drill row you will miss the higher levels of phosphorus.

Fertliser rates for 2007

Assess how much you can afford and prioritise paddocks for fertiliser addition. When deciding where to apply fertiliser, consider which paddocks are:

- responsive to fertiliser. It will be a paddock-by-paddock assessment, looking at soil tests, fertiliser history and the previous crop yield.
- likely to give the highest return from the fertiliser input. For example, a paddock that is traditionally high yielding, is disease free and with few physical or chemical limitations.

It may be better to select some key paddocks to fertilise, rather than spread scarce resources thinly over all cropping paddocks.

Keep in mind the potential income from yields that will be foregone if rates are reduced.

Also remember that phosphorus must be accessed by the plant in the first six week of growth. It must therefore be applied at sowing. It is not feasible to apply phosphorus to the growing crop.

Due to differences in soils and conditions, clear recommendations on how much to reduce phosphorus rates cannot be produced. There are, however, some rules of thumb.

Maintain phosphorus rates:

- in paddocks with low phosphorus levels
- following very nutrient hungry crops like canola,
- in the first crop out of pasture
- in paddocks of likely high yield potential (high N status, low disease risk)
- after fallow paddocks.

Phosphorus levels should be matched with nitrogen supply.

Phosphorus rates can be reduced:

- to a maximum of 50% where crops have failed (<0.5 t/ha) in the previous year, provided yield potential is low for 2007 (due to low nitrogen status or high disease risk)
- by up to one third when the drought crop yielded more than 0.5 t/ha, unless soil-phosphorus levels are low
- where the paddock has had a good phosphorus history over time. There will be little response to fertiliser where soil-phosphorus levels 35 – 50 mg/kg Colwell P.
- where crops are sown early into warm soil with good moisture. If the crop has enough applied phosphorus at sowing to grow well in the first 6 weeks, it will have time to access further phosphorus over the season.