



leaflet 7

The Potash Development Association

Watch your P's & K's for cereals



Cost saving pressures

There is tremendous pressure on cereal farmers to reduce costs. Around a third of total cereal variable costs goes on fertiliser and many farmers are reacting by reducing P and K usage. For the UK as a whole, less potash has been applied to cereal crops than has been removed in each of the last 8-9 years. Such trends are clearly depleting soil reserves and run the risk of reduced yields and grain quality. In these cases **crop value losses will far outweigh the cost savings**. 40% of the winter cereal crops nationally are estimated to have received no P or K at all in 2002/03, despite only 25% of soils being at a fertility level that requires no potash. These trends represent a ticking time bomb for cereal farmers now on inadequate soil reserves.

Don't be fooled by appearances

It is tempting to believe that crops are performing well if there are no signs of deficiency. Yield losses often occur with no visual symptoms - potash deficiency is described as 'hidden hunger' for this reason. It is also difficult to judge visually if crops have achieved their full potential within the limits of the climate and conditions of the particular year, or whether lack of inputs has limited yield. Nutrient symptoms may appear but be difficult to diagnose because of many possible causes, or appear too late to remedy and avoid crop loss. Crop appearance cannot therefore be relied upon to identify P and K shortage - soil analysis must be used to determine the need for fertiliser and the opportunities for cost saving.



Why potash is important

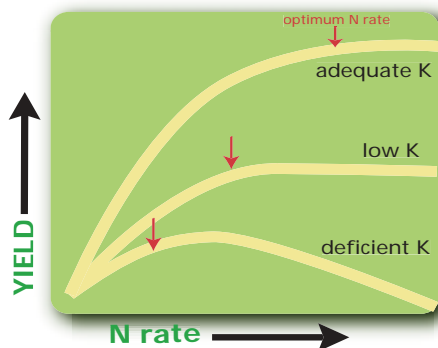
Potash affects both yield and quality of grain as well as other aspects of plant vigour and health. Cereal crops need at least as much, if not more, potash than any other nutrient including nitrogen. Potash is needed in such large amounts because it regulates water and nutrient movement in the plant. The practical implications of shortage are:

- Lower yield
- Less efficient N response
- Reduced 1000 grain and specific weights
- Fewer grains per ear
- Weaker straw
- Increased susceptibility to drought
- Poorer quality
- Increased risk of N loss
- Reduced grain ripening period
- Poorer grain sample
- Increased risk of lodging
- Increased disease susceptibility

N:K partnership

Cereals require a balance of nitrogen and potash to obtain full yield response to applied nitrogen. If there is a shortage of potash, nitrogen is not taken up or used efficiently and some may be lost with risk to the environment. Careful optimisation of nitrogen is a waste of time if potash supplies are not adequate.

Effect of potash on nitrogen response



Why maintain soil reserves ?

Adequate reserves of potash must be maintained in the soil because :

- Cereals take up more than 250 kg/ha of potash which is far more than is provided by the fertiliser.
- The rate of uptake during tillering and stem extension can be as high as 10 kg/ha/day which cannot be supplied if soil reserves are low.
- Potash reserves in the soil are more efficiently available to the plant than newly applied fertiliser.
- Yields from impoverished soils will often not match those from fertile soils however much fresh potash fertiliser is applied.
- Potash is not leached from most soils so there is no risk of loss by maintaining reserves.
- Crops on soils with satisfactory reserves also perform much better under adverse growing conditions and achieve better yields in the more difficult years.

Soil analysis

Knowledge of the fertility level in the soil is essential to determine fertiliser policy. Deciding fertiliser rates without soil analysis is likely to result in poor and costly decisions. The cost of standard analysis for pH, P, K and Mg is normally under £10 per sample. Sampling is needed every 4-5 years, so assuming a field size of 10 ha this represents a cost of only about 20p/ha/year. The value of this knowledge far exceeds these modest costs.

Soil P Index	mg/l	Yield response to added nutrient	Soil K Index	mg/l
0	0-9	Large response likely	0	0-60
1	10-15	Response likely	1	61-120
2	16-25	No response	2-	121-180
		No response	2+	181-240
3	26-45	No response, good reserves	3	241-400
4	46-70	Unnecessarily high reserves	4	401-600

Principles of potash use

"Let the soil feed the crop, use fertiliser to feed the soil"

Soil K reserves should be maintained at a level which will provide an adequate supply to the crop; fertiliser should be used to replace what is removed in the harvested crop in order to maintain these reserves.

Low reserves Index 0 & 1

Extra fertiliser in addition to that removed should be used to restore fertility

Target soil K level Index 2-

Potash fertiliser rate should equal the amount removed

Above target reserves Index 2+ & 3

Fertiliser usage should be less than removal

Unnecessarily high reserves Index 4

Fertiliser should be omitted.

Soil analysis is a guide rather than an exact measurement, and there is no precise or fixed point at which yield and quality are reduced. Target fertility levels are set to minimise the risk of reduced returns and as soil reserves fall below these targets, the risk of penalties increases. The losses from such penalties are likely to be much greater than the cost of nutrient saved. The restoration of low fertility is also a long and expensive process. To run such risks is not good management.

Current economics of potash use

A general guide to the economic return of potash use is as follows :-

K index **0** **£10** return for every **£1** spent on potash

K index **1** Up to **£5** return for every **£1** spent on potash

K index **2-** Replace potash removed or index will fall to 1

K index **2+** Cost saving opportunities for reducing potash

PK balance

Fertiliser use should be related to P and K removal and this is substantially altered if straw is removed. Phosphate is considerably more expensive per kg than potash and if P and K use is not properly matched to requirements, expenditure can be higher than necessary.

Typical phosphate and potash removal in cereals

	Phosphate kg/t of grain	Potash kg/t of grain	Ratio P ₂ O ₅ : K ₂ O
Grain only - All cereals	7.8	5.6	1.4 : 1
Grain + Straw			
Winter wheat/barley	8.6	11.8	1 : 1.4
Spring wheat/barley	8.8	13.7	1 : 1.6
Oats	8.8	17.3	1 : 2.0

Recommendations

kg/ha P₂O₅ and K₂O

Low fertility soils

P or K index 0	Add 50 kg/ha to the replacement quantity
P or K index 1	Add 25 kg/ha to the replacement quantity

Target fertility soils

P index 2 K index 2-	Use replacement quantities Multiply yield (t/ha) x removal figures (see above) = replacement
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Above target fertility soils

K index 2+	Deduct 15-25 kg/ha from the replacement quantity
K index 3	Nil K where straw incorporated. Deduct 60-70 kg/ha from the replacement quantity where straw removed
P index 3	Deduct 40-55 kg/ha from the replacement quantity

High fertility soils

P or K index 4	No P or K fertiliser application required
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What value straw ?

The financial contribution from the sale of straw is increasingly important in supplementing low cereal returns. This raises the question as to what it is worth to the farm on which it is grown. It is clearly important that baling and removal of straw does not delay or interfere with necessary post harvest operations but the main costs to be considered are the P and K exported. The figures below provide general guidelines. In practice there could be large variations according to individual circumstances.

	Typical total nutrient value of straw	
	£/t straw	£/ha*
Winter wheat/barley	£2.50	£13
Spring wheat/barley	£3.30	£15
Oats	£4.50	£20

* Assuming typical straw yields from grain yields of 8t/ha for winter wheat/barley crops
7t/ha for spring wheat/barley crops
7t/ha for oat crops

Conclusion

Economic pressures must not divert cereal growers from following long-established principles of good nutrient management. The reduction in basal nutrient use which has occurred over recent years is not sustainable and farmers should review the specific phosphate and potash needs of their soils and crops before planting.

More information

More detail on this subject is provided in PDA leaflet 11 "Potash for Cereals"

Cover photograph courtesy of Amazone Ltd.

FOR MORE INFORMATION ON POTASH CONTACT:-

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The Potash Development Association is an independent technical organisation formed to support the efficient use of potash fertiliser in the UK

