

P₂O₅

PHOSPHATE AND POTASH REMOVAL BY CROPS

K₂O



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The need to improve precision of fertiliser practice.

Financial and environmental pressures are increasingly requiring farmers to follow the best possible policies of soil management and crop nutrition.

The strategy for nitrogen manuring needs to be considered on an annual basis to provide the optimum input to achieve crop response whilst leaving minimum residues in the soil.

Phosphate and potash policies in contrast should be based on long-term strategies which maintain soil fertility within an optimum range depending upon the crops grown and the soil type. Maintenance of soil nutrient levels is important because residual fertility in the soil provides more effective nutrition of the plant than reliance on fresh fertiliser only.

Balance sheet manuring

Once nutrient levels in a soil are within the optimum range, fertiliser and manure applications should be calculated to replace the nutrients removed in the rotation and thus maintain the soil fertility. Soil P and K levels should be maintained at index 2-3 for P and index 2 for K. Above these levels a complete replacement policy is usually not appropriate and soil reserves can be allowed to decline. On some clay soils, release of potash from reserves must also be allowed for.

High soil P levels can increase the amount of P reaching surface water, for example by soil erosion. To reduce the risk of P pollution avoid raising soil P levels above those necessary for crop production.

It is therefore important to estimate nutrient offtake as accurately as possible.

Calculation of nutrient offtake

Nutrient offtake is a function of crop yield and nutrient concentration in the harvested crop.

Measurements of crop yield are becoming increasingly sophisticated and precise for arable crops. More accurate systems to record grass and forage crop yields are still required.

The actual concentration of nutrients in harvested crop products varies considerably in practice. Analysis of individual crops is not a practical option and therefore reliance has to be placed on standard figures for P and K content as a basis for calculating removal. Local experience may be applied to adjust such guide figures for specific circumstances. Several factors can affect P and K concentration including:-

- ❑ soil P, K and Mg level
- ❑ nitrogen rate applied
- ❑ timing of harvest relative to crop maturity
- ❑ weather - especially in the last 4 weeks pre harvest
- ❑ phosphate and potash manuring of the crop
- ❑ other husbandry practices such as haulm destruction

Agreed UK guidelines

The following guide figures have been agreed by:-

ADAS

Department for Environment Food and Rural Affairs (DEFRA)

Department of Agriculture and Rural Development Northern Ireland (DARDNI)

Fertiliser Advisers Certification and Training Scheme (FACTS)

Natural Resource Management (NRM)

Potash Development Association (PDA)

Scottish Agricultural College (SAC)

Expression of guideline figures

The figures in the table are expressed on a fresh crop basis assuming normal dry matter levels for easier use.

Some figures are based on limited data e.g. oats, and may be subject to review.

For cereals where straw is removed, a single figure is provided on a per tonne of grain yield basis which assumes that straw yield is 65% of grain yield.*

Example: 10 t/ha (4 t/acre) winter wheat crop, where straw is baled, removes

metric 86 kg P_2O_5 /ha (10 x 8.6) 118 kg K_2O /ha (10 x 11.8)

imperial 68 units P_2O_5 /acre (4 x 17) 92 units K_2O /acre (4 x 23)

For oilseed rape which tends to suffer higher losses of haulm in the field, a straw yield of 50% of seed yield is assumed.

Example: 5 t/ha (2 t/acre) oilseed rape crop where straw is carted off, removes

metric 75.5 kg P_2O_5 /ha (5 x 15.1) 87.5 kg K_2O /ha (5 x 17.5)

imperial 60 units P_2O_5 /acre (2 x 30) 68 units K_2O /acre (2 x 34)

* Recent information has shown that fungicides can increase straw yield and straw : grain ratios above this figure. Where this occurs, standard allowances for offtakes for cereals, as shown, may need to be reviewed.

Acknowledgement

The help of Chris Dawson Associates in compiling and reviewing the sources of data is warmly acknowledged.

Guidelines for calculation of PHOSPHATE and POTASH removal by crops

	METRIC		IMPERIAL	
	kg/t of fresh material		units/t of fresh material	
	P ₂ O ₅	K ₂ O	P ₂ O ₅	K ₂ O
Cereals - grain only	7.8	5.6	15.6	11.2
- grain & straw				
winter wheat/ barley	8.6*	11.8*	17.2*	23.6*
spring wheat/ barley	8.8*	13.7*	17.6*	27.4*
winter/spring oats	8.8*	17.3*	17.6*	34.6*
Oilseed Rape - seed only	14.0	11.0	28.0	22.0
- seed & straw	15.1*	17.5*	30.2*	35.0*
Peas - dried	8.8	10.0	17.6	20.0
- vining	1.7	3.2	3.4	6.4
Field Beans - seed only	11.0	12.0	22.0	24.0
Potatoes - tubers	1.0	5.8	2.0	11.6
Sugar Beet - roots only	0.8	1.7	1.6	3.4
- roots & tops	1.9	7.5	3.8	15.0
Grass - fresh grass @ 15-20% DM	1.4	4.8	2.8	9.6
- silage @ 25% DM	1.7	6.0	3.4	12.0
- silage @ 30% DM	2.1	7.2	4.2	14.4
- hay @ 86% DM	5.9	18.0	11.8	36.0
Kale	1.2	5.0	2.4	10.0
Maize - silage @ 30% DM	1.4	4.4	2.8	8.8
Swedes - roots only	0.7	2.4	1.4	4.8
Broad Beans	1.6	3.6	3.2	7.2
French Beans	1.0	2.4	2.0	4.8
Beetroot	1.0	4.5	2.0	9.0
Cabbage	0.9	3.6	1.8	7.2
Carrots	0.7	3.0	1.4	6.0
Cauliflower	1.4	4.8	2.8	9.6
Onions - bulb	0.7	1.8	1.4	3.6
Sprouts - buttons	2.6	6.3	5.2	12.6
- stems	2.1	7.2	4.2	14.2
Bulbs	2.4	6.3	4.8	12.6

* offtake value is per tonne of grain or seed but includes nutrients in straw. (See examples on page 3)