

# tips & tools

## NATURAL RESOURCE MANAGEMENT

LPI611

# Making the most of phosphorus fertiliser applied to soils

Phosphorus (P) is the key nutrient determining pasture productivity, and has been shown to give the greatest stocking rate response in grazing systems.

## Tactics

### Soil fertility targets

The optimal P level for grazing enterprises varies with the soil type, pasture composition, stocking rate and type of enterprise.

For sheep or beef enterprises stocked close to the maximum carrying capacity and fertilised annually, the target Olsen P test should be about 13–15mg P/kg soil. For the Colwell P test, the optimum level will be influenced by the soil buffering capacity. For lighter soils this will be about 20–30mg P/kg and above for heavier textured soils.

### Soil nutrient status

The application rate will depend on the soil type. Use soil tests to determine the level of soil nutrients and then compare the results to the soil fertility targets.

Take soil samples for testing when P fluctuations have been shown to be smallest – ideally during spring when plant growth and soil moisture is at its optimum. Take at least 30 individual cores to the correct depth (usually 10cm) from a uniform sampling location or transect which is representative of the paddock or soil type. Avoid sampling areas of obvious high fertility.

Soil nutrient status can also be determined using fertiliser test strips or examining plants for visual deficiency symptoms.

### Pasture responsiveness

The species present will determine the likely response to increased soil fertility. Introduced pasture species show dramatic responses to additional phosphorus, while native pastures with low legume contents generally have less response and will require lower fertiliser input.

## Key benefits

- Applying phosphorus and increasing stocking rate to utilise the extra pasture grown can achieve higher returns per hectare.
- Managing risk from erosion and run-off can maximise the benefits of applying phosphorus.

## How much P?

To lift soil P levels toward your target, use a 'capital' dressing. Depending on soil type and rainfall, 6–13kg P/ha above maintenance applications will increase the Olsen P by one unit or to raise Colwell P by 2–3 units.

Apply maintenance fertiliser dressings regularly (every 1–2 years) to cover the inevitable 'effective losses' of P from the grazing system. The old standard maintenance target rate was 'one bag of super' to the acre or 125kg super per hectare (11kg P/ha).

It is useful to link P requirement with stocking rate or annual rainfall (potential stocking rate). Other 'rules of thumb' are to apply 1kg P/dse (dry sheep equivalent) or 1kg P/25mm annual rainfall. The Phosphorus Buffering Index also assists with decision making.

## When to apply P

Apply P prior to the autumn break and when sowing any new pasture or crop. Alternatively, apply P fertiliser a few months before the break to allow P to dissolve and enter the soil before it is washed away by rainfall. Avoid applying fertiliser to bare soil, or when heavy rain is likely within a week of application.

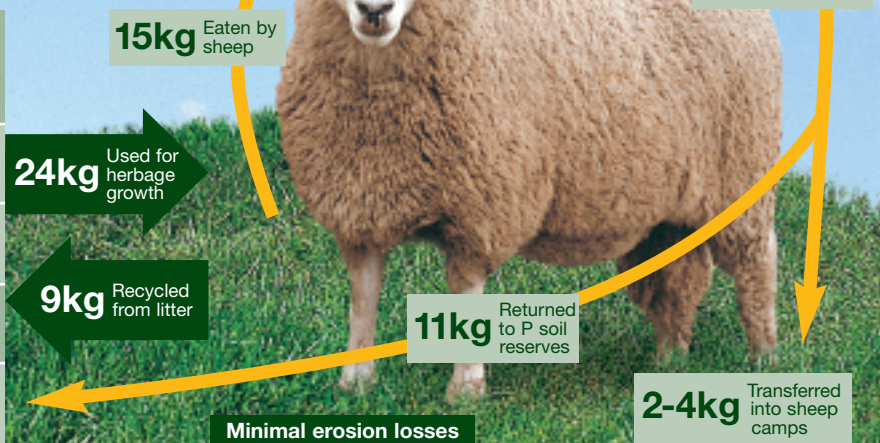
## Nutrient facts

P has a role in many essential plant cellular processes. The digestibility and quantity of pasture growth is improved with P, both directly and through its effect on legume growth.

## The 'P' cycle explained

Where the phosphate in fertiliser ends up after an annual application of 110kg superphosphate/ha (10kg phosphate/ha) and grazed at 15 sheep/ha by a self-replacing flock of Merino sheep (with a 20% annual replacement policy). The numbers represent amounts of phosphorus (kgP/ha) moving along each path.

<b>10kg</b> P/ha applied	<b>Annual application of superphosphate</b>
<b>1kg</b>	Use immediately for pasture growth ....days or months
<b>4kg</b>	Use for pasture growth and released over 3-4 years
<b>5kg</b>	Fixed in the soil long term
<b>TOTAL SOIL 'P' RESERVES</b> Size: 200-400kg P/ha	



A pasture producing 10 tonnes DM/ha/yr would use about 25kg P/ha in herbage growth. Only 1–2kg P comes from the current year's fertiliser application (if 10kg P/ha is applied). The rest must come from the residual value of previous fertiliser applications (3–4kg) and recycled P from dead plant material and animal dung/urine. Excreted P (not required for animal growth) is recycled by macro and microorganisms, along with any uneaten plant litter, and slowly released back to the soil (over about six months).

Rotational grazing generally improves nutrient cycling as rest periods build up litter and humus (from roots and above-ground herbage), resulting in more microorganism activity and less localised camping activity. Continuous grazing (set stocking) can lead to areas of overgrazing and undergrazing in the same paddock.

Up to 30% of recycled nutrients may be accumulated on only 5% of the paddock because of the camping behaviour of sheep and cattle. Grazing large mobs at high stocking density for short periods helps spread dung and urine evenly across paddocks. This can help reduce the need for P fertiliser, possibly saving the equivalent of about 2kg P/ha (18kg super/ha).

Intensive prime lamb enterprises lose around 4kg P/ha/yr from stock sales.

## P losses from the soil

### Leaching

Once it enters the soil, P usually remains within a few

centimetres of where it was applied. Losses by fixation and leaching depend on soil type and rainfall, and are generally greater as rainfall increases.

### Run-off

P that is removed, either washed straight from fertiliser or eroded with soil, can contribute to algal blooms in streams and dams. Frequently waterlogged soils lose P when it dissolves in excess water and moves from the soil. Well-fertilised pastures are generally well protected from P lost from erosion due to better groundcover.

## Management tips

Fertiliser applications are capital investments. The primary reason for applying P to pastures is to get higher returns per hectare. To achieve this, more livestock needs to be run, requiring widespread on-farm practice change and additional management skills if the benefits are to be fully realised.

High P fertility generally leads to a nitrogen build up as the clover content of the pasture improves.

Skipping P fertilising for a year may have an effect on animal production if the stocking rate is high and supplementary feeding is required.

## Acknowledgments

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## Further information

For further assistance contact your local pasture or livestock advisor, or go to [www.mla.com.au/publications](http://www.mla.com.au/publications) to search for other MLA publications on grazing and pasture management.



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