Phosphorus For My Pasture

Why apply phosphorus?

Within our farming systems phosphorus applications are used to replace nutrients that have been exported off farm through crop, milk, meat or wool. If this isn't addressed, then it will have a negative impact on maintaining nutrient level and pasture production.

If phosphorus usage has declined or soils have low phosphorus levels, then you will likely see:

- Slow response to rainfall
- Weeds being more competitive in pasture
- Unwanted species becoming more invasive (e.g. onion grass, bent grass) and other native grasses
- Less legume species, leading to nitrogen deficient pastures

How much phosphorus?

The first step to determine maintenance phosphorus requirement is to establish your stocking rate based on dry sheep equivalents (DSE/ha). DSE is an industry standard unit that is used to compare feed requirements of different classes of livestock, see Table 1. Phosphorus removal rate varies from 0.4 to 1.4 kg P/DSE/ha/year based on rainfall, topography and grazing system (rotational or set stock).

Table 1. Dry sheep equivalents (DSE) for different classes of beef cattle (in part from McLaren 1997 & Ag VIC).

Stock class	Beef cattle British breeds		
	DSE at specified liveweights		
Yearling	300 kg	350 kg	
Gaining 0.25 kg/day	7	8	
Gaining 0.75 kg/day	10	11	
Mature cattle	400 kg	500 kg	600 kg
Dry cows, steers (store)	7	8	9
Gaining 0.25 kg/day	8	9	10
Bullocks (store)	8	9	10
Gaining 0.75 kg/day	12	14	16
Pregnant cow, last 3 months	9	11	13
Cow with 0-3 month calf	14	18	22
Cow with 4-6 month calf	18	22	26
Cow with 7-10 month calf	22	25	28

The average Gippsland stocking rate from the livestock monitor project was 18 DSE/ha. As a general statement our Gippsland climate (800mm + rainfall) the phosphorus removal rate is 1.0 kg P/DSE/ha/year. Therefore, running the Gippsland average of 18 DSE/ha means that maintenance should be 18 kg P/ha or equivalent to 205 kg of single super phosphate.

Table 2. The approximate amount of capital P (kg/ha) required to raise soil Olsen P (Dairy Soils & Fertiliser Manual).

Soil Type	PBI	Amount of P to raise Olsen P by 1 unit (kg/ha)
Sand	0 to 50	6
Sandy loam	51 to 100	8
Sandy clay loam	101 to 300	9
Silty clay loam	101 to 300	9
Clay loam	301 to 400	10
Clay loam	401 to 500	11
Volcanic clay	501 to 600	13
Peat	Over 600	15

Now how do I improve my Olsen P level?

Soil type is a major influence on solubility of phosphorus and how it is buffered against change. On every soil report there is an index called the Phosphorus Buffering index (PBI). This index helps us determine how much extra phosphorus is required to lift 1 Olsen P unit (Table 2). The higher the PBI reading the more phosphorus is required.

Example: A soil test shows an Olsen P of 15 and a PBI value of 220 on a silty clay loam. From table 2, to lift 1 Olsen P unit 9 kg/ha of P is required. The target is an Olsen P of 18 for this paddock. To increase 3 units a total of 27 kg/ha of P is needed as a capital application as well as the maintenance requirement. The capital application is equivalent to 305 kg/ha of single super. Remember that this capital application can be split across multiple years.

Timing of application

Timing of phosphorus application doesn't influence nutrient availability . Minimal moisture, such as a light dew, is all that is required to release phosphorus from the granule to the soil. Early phosphorus applications during summer can be more beneficial as this ensures that the phosphorus is available prior to the autumn break, ready for very start of the growing season.

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