NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Establishing pastures - Readers' Note

This document is part of a larger publication. The remaining parts and full version of the publication can be found at:

http://www.dpi.nsw.gov.au/agriculture/livestock/dairy-cattle/feed/publications/establishing-pastures

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Fertilisers for sowing pastures

It is important to ensure that sufficient nutrients are available to the young pasture in the early stages of growth. Seedlings need nitrogen, phosphorus, sulphur and molybdenum to be available nearby.

When sowing into a prepared seedbed, the fertiliser is often sown with the seed. When heavier rates of fertiliser are required, they can be prespread or applied soon after the pasture has effectively established.

High rates of nitrogen or potassium fertiliser placed in contact with or very close to the seed can restrict germination and reduce establishment.

Nitrogen

Small amounts of nitrogen at sowing (10–20 kgN/ha) can be beneficial for establishing pasture seedlings, especially on lighter-textured soils. The nitrogen stimulates early growth of pasture seedlings and helps their rapid establishment. Additional nitrogen can be topdressed soon after establishment to continue the rapid growth of grass-based pastures.

Previous nitrogen fixation by legume-based pastures will add to the nitrogen supply available in the soil for pasture establishment and growth. As shown in the table at the bottom of this page, different legumes vary in their capacity to fix nitrogen. A high proportion of this fixed nitrogen is avail-able for cycling and and can stimulate the establishment and growth of the pasture.

Nitrogen fixed by various pasture legumes

	N fixed (kg/ha/y)	
	Typical	Range
Lucerne	217	56–504
White clover	115	70–200
Red clover	128	85–189
Cowpeas	100	64–129
Vetch	90	90–154
Peas	80	33–156
Soybeans	112	65–180

Phosphorus

Phosphorus is taken up rapidly in the early stages of seedling growth. It should therefore be applied near the establishing seedling. Phosphorus fertilisers can be drilled in contact with seed. The rhizobia in legume inoculum can be killed when mixed with acidic phosphorus fertilisers, but lime-pelletting inoclated seed protects them from damage.

Phosphorus is more readily available to establishing pastures when placed in a drill row than when broadcast. Follow-up topdressings are effective when applied in subsequent autumns and springs.

Soil tests help in deciding the best rate of phosphorus to apply. Take samples as close as possible to the planned sowing date.

Potassium

Potassium is not usually applied in the drill row at sowing as it can reduce germination if placed in close contact with the seed. Potassium-deficient soils are best treated with a separate application before or after sowing with muriate of potash (potassium chloride). The rate will vary from 62 to 125 kg/ha, depending on the deficiency and the soil type.

Molybdenum

Molybdenum (Mo) deficiency in young legume seedlings inhibits rhizobia and reduces nitrogen fixation, leading to

Recommended rates of phosphorus for sowing pastures. *(These rates must be reduced by up to 20% in direct-drilled pastures as fixation of phosphorus is reduced.)*

Soil P status	Colwell P soil test (mg/kg)	Phosphorus rate (kg/ha)	Single super equivalent (kg/ha)
Low	≤ 15	30–40	341–454
Medium	16–30	20–30	227–341
High	31–45	10–20	114–227
Adequate	> 45	10	114

nitrogen deficiency.

Molybdenum can be applied in prepared mixes with superphosphate and other fertilisers. Super Mo 0.02 at 250kg/ha and Super Mo 0.04 at 125 kg/ha both supply 50g/ha of Mo (the required rate).

Treating legume seed to apply 100g of molybdenum trioxide per hectare is an effective method of applying Mo that guarantees sowing the seed in contact with the Mo. A foliar spray of sodium molybdate at 420g/ha will overcome molybdenum deficiency. **Do not use sodium molybdate to coat seeds** as it kills rhizobia.

Sulphur

Certain soils, for example those derived from basalt, are low in sulphur (S). Apply sulphur fertiliser at sowing to meet deficiencies. Sulphur is more likely to be needed for direct-drilling than when conventional cultivation has been used to prepare a seedbed. Apply at least 10kg/ha of sulphur at sowing.

Sulphate S, such as in gypsum, is more quickly available than elemental yellow sulphur, which has to be changed to sulphate by microorganisms before it becomes available. This change takes longer.

Fertiliser placement

Place the fertiliser under the seed, where the roots of the seedlings can use it. Fertiliser burn of seedlings can be caused by direct osmotic effects (because of high concentrations of dissolved salts in the soil solution) and specific ion effects (for example, ammonium from urea or DAP). Different fertilisers have different effects on soil pH in the immediate vicinity of the granule when they dissolve. Some products form an acidic solution, and might induce aluminium or manganese toxicity in seedlings on soils that are already strongly acidic.

Fertiliser burn is most likely to occur with nitrogen, then potassium, then phosphorus fertilisers. To avoid fertiliser burn, don't exceed 20kg/ha of N or 10kg/ha of K when seed is in direct contact with the fertiliser. Potassium is usually not used near the seed when establishing pastures. The salt effects of nitrogen and potassium fertilisers are additive.

Rhizobia and fertiliser

Rhizobia bacteria can be killed when the seed is mixed directly with fertiliser. They are suceptible to phosphate fertiliser, nitrogen, sulphur as sulphate of ammonia, and potassium.

Lime-pelleting legume seed will improve rhizobium survival, the nodulation of the seed and the growth of young seedlings. Lime-pellet and inoculate legume seed not more than 24 hours before sowing.

Commercial fertilisers

A wide range of fertilisers is available from the various fertiliser companies for establishing pastures. Fertilisers and rates

Nutrient application rates for a range of products

Product	Application rate (kg/ha)	Nutrient supplied (kg/ha)			
		N	P	S	Ca
Superphosphate	125–250		11–22	14–28	25–50
Trifos	50–100		10–21	0.5–1	8–15
Goldphos	100		18	10	
Pasture Starter	75–125	58	10–17	6–11	7–12
Starter Fos	50–100	510	11–22	12	
Starter 15	75	10	10	8	
DAP	50	9	10	1	

125 kg/ha≈ 1 bag per acre; 250 kg/ha≈ 2 bags per acre; 1 bag = 50 kg

are chosen on the basis of the nutrients required to successfully establish the pasture, and on the cost to buy the fertiliser, deliver it to the farm and apply it.

The table below shows several fertilisers available from the major fertiliser suppliers Incitec, Pivot, Hi-Fert and W. Paton.

Fertilisers from various manufacturers and their analysis for NPK (3 numbers) or NPKS (4 numbers)

Incitec	W. Paton	Hifert	Pivot	Comments
Single Superphosphate 0:9:0:11	**Superphosphate** 0:9:0:11	**Superphosphate** 0:9:0:11	**Superphosphate** 0:9:0:11	Phosphate fertiliser
Double Super 0:16:0	**Double Super** 0:16:0		**Double Super** 0:16:0	Phosphate fertiliser where S is not important
Greenleaf Trifos 0:20:0	**ABO Triple Super** 0:19:0	**Triple Superphosphate** 0:20:0		Phosphate fertiliser where S is not important
		Goldphos 0:18:0:10 0:16:0:20		Phosphate + sulphur fertiliser
Starter 15 15:13:0	**Starter 15** 15:13:0	**Hifert** 15:13:0	**Pivot 15** 15:13:0	Sowing with seed
Starter NP 18:20:0	**DAP** 18:20:0	**DAP** 18:20:0 **DAP Sulphur** 16:18:0:12	**DAP** 18:20:0	Sowing with seed
Greenleaf Pasture 13 0:6:12:8 **Greenleaf Pasture 16** 0:5:16:7 **Greenleaf Pasture 25** 0:4:25:5		**Phosphorus-Potash** 0:6:35 0:10:26 0:12:20 0:13:18 0:14:15 0:16:10	**Super Potash** '1+1': 0:4:25:5 '2+1': 0:6:17:7 '3+1': 0:7:13:8 '4+1': 0:7:10:9 '5+1': 0:7:8:9	Topdressing lucerne pasture
Greenleaf Greentop K 32:0:10:3		27:0:21 23:0:25 33:0:11	20:0:16 27:0:21	Topdressing ryegrass, clover, kikuyu on K-deficient soils

Which fertilisers are the best buys?

A fertiliser can be valued by estimating the quantities of N, P, K and S and then valuing the components at current market prices. For example, calculate the value of each in terms of the nitrogen it contains. Another way is to value all of the components and then estimate the value of the most important one.

The following table shows typical examples. The two most popular NP fertilisers are DAP and Starter 15.

Brand	Analysis (NPKS)	Cost ($/t)	Value ($*)	Comments
DAP	18:20:0:0	500	674	High P and N fertiliser. On high P soils, use 187 kg/ha. The big problem is DAP's lack of sulphate sulphur, an important nutrient on some soils.
Starter 15	15:13:0:11	459	479	More suited to high P soils that respond to sulphur.
Starter 18	18:7:0:17	430	369	Suited to high P soils that respond to sulphur. Not price-competitive.
DAP Sulphur	16:18:0:12	500	610	Similar to DAP with the bonus of sulphur.
Grower 12	11:8:14	440	428	Recommended rate is 250 kg/ha. On low K soils, broadcasting muriate of potash (potassium chloride) at 62 kg/ha and sowing with DAP might be a better option.

* Value as if each were a nitrogen fertiliser. Valuing in terms of, say, phosphorus content might give a different result.