Alternative fertiliser considerations

Key points

When choosing an alternative nitrogen source, consult with both your agronomist and veterinarian to assess the best fit for your soils and pastures whilst accounting for any animal health considerations.

If using poultry litter, be aware of and manage botulism risks.

Ensure appropriate grazing withholding periods:

- 21 days for effluent and fertiliser applications
- Six to eight weeks when effluent sludge is applied.

When urea is not readily available, alternative nitrogen sources may be considered.

Before using a product for the first time, assess whether it is suited to your farming system by considering:

- Nitrogen content, form of nitrogen, and how readily available the nitrogen source is for plants.
- Nutrient profile relative to soil test results.
  Will it help address deficiencies?
  Will it cause a nutrient imbalance?
- Any potential animal health risks.

Common nitrogen fertiliser alternatives

A wide range of nitrogen (N) fertilisers are available for Australian dairy pastures, differing in nitrogen content, chemical form, and cost per kilogram of N. Some also supply nutrients such as phosphorus (P) and sulphur (S), which may be beneficial depending on soil deficiencies. Urea still remains the most commonly used fertiliser.

Ammonium sulphate (sulphate of ammonia)

Ammonium sulphate supplies both nitrogen and sulphur (~24% S), making it useful where sulphur is limiting, particularly in winter. However, it has a stronger acidifying effect on soils. Elevated sulphur intake can also increase the risk of polioencephalomalacia (PEM or 'star-gazing'), a serious neurological condition in cattle as the sulfur converts to sulphide in the rumen.

Di-ammonium phosphate (DAP)

Where phosphorus is required, DAP can be a cost-effective option. However, it contains less nitrogen and may need to be blended with other fertilisers.

Nitrate-based fertilisers

Nitrate-based fertilisers such as urea ammonium nitrate and calcium ammonium nitrate may be less effective in wet conditions due to higher leaching risk.

Organic fertilisers (e.g. manures, compost or poultry litter)

Organic fertilisers can supply multiple nutrients but are often limited by low and variable nitrogen content, slower release, and higher handling and transport costs. They also bringing with them significant animal health considerations.

Foliar nitrogen

Foliar nitrogen applications may not meet total pasture nitrogen requirements due to low uptake efficiency and may pose a risk of leaf burn. However, they can be useful for small, targeted applications during key growth periods.

Nutrient analysis of commonly used N fertilisers

Table 1 Relative nutrient content of different fertilisers. Nutrient content in effluent, poultry litter and compost is variable. It is recommended that a nutrient analysis is completed.

Nitrogen source	Form	Nitrogen, N %	Phosphorous, P %	Potassium, K %	Sulphur, S %
Urea	Granular	46	0	0	0
Liquid N	Liquid	30-32	0	0	0
Calcium nitrate	Granular or Liquid	15	0	0	0
Ammonium nitrate	Granular	34	0	0	0
Mono-ammonium phosphate (MAP)	Granular	11	22		1-2
Di-ammonium phosphate (DAP)	Granular	18	20		1-3
Ammonium sulphate	Granular	21	0	0	24
Dairy effluent	Liquid	0.01	0.003	0.02	0.002
Poultry litter	Solids	3.0	2.1	1.3	0.7
Compost	Solids	1 - 2	0.2 - 1.3	0.5 – 2.5	0

Applying nitrogen fertilisers can increase the risk of animal health issues such as nitrate toxicity, ammonia-induced bloat, and reduced production from excess dietary nitrogen. These risks can be managed by:

- Limiting applications to ≤60 kg N/ha, particularly on species prone to nitrate accumulation (e.g. ryegrass, kikuyu, capeweed)
- Withholding grazing for at least 14 days (up to 21 days when pastures are high in crude protein or under stress, as nitrate levels are highest during this period).

Effective feeding and grazing management is also important. Avoid sudden dietary changes and do not allow hungry stock unrestricted access to heavily fertilised pastures. Providing roughage (e.g. hay) can buffer nitrogen intake. When pasture crude protein exceeds animal requirements (>16–18%), supplementing with high-energy feeds (e.g. grain) can improve nitrogen utilisation.

Ensure fertiliser products are fenced off to prevent stock access.

Dairy effluent

Dairy effluent can act as both a fertiliser and soil conditioner, improving soil structure and recycling nutrients. However, nutrient loading (particularly potassium) must be carefully managed. High potassium increases the risk of metabolic disorders such as grass tetany and milk fever by reducing magnesium uptake.

Application rates should minimise both animal health and environmental risks:

- Potassium: ≤60 kg/ha per application or 120 kg/ha annually
- Nitrogen: ≤60 kg/ha per application. Over-application increases the risk of nitrate poisoning, mineral imbalances, and nutrient losses, reducing overall efficiency.

Effluent also poses disease risks particularly for young stock. Calves and young heifers (<12 months) are susceptible to Bovine Johne's Disease (BJD), while Salmonella can affect all stock. Effluent should not be applied to paddocks grazed by young stock. For older animals, paddocks should be withheld from grazing for at least 21 days. Where sludge is applied, longer withholding periods may be required.

Poultry litter

Poultry litter (chicken manure) can be a cost-effective fertiliser supplying nitrogen, phosphorus, and organic matter. However, nutrient content is variable, so testing and appropriate application rates are essential.

A key risk is botulism, particularly where litter is not adequately composted and may contain decaying carcasses or feathers. The toxin causes progressive paralysis and is often fatal. Signs are usually seen within two to six days after eating contaminated material with treatment rarely successful.

Key risk management practices include:

- Sourcing litter from reputable suppliers (permits may be required).
- Preventing stock access to stored litter and treated paddocks (ensure paddocks aren't grazed for at least 21 days after application).
- Vaccination, which provides protection for up to 12 months (consult your veterinarian).

For additional information on utilising poultry litter refer to **Best practice guidelines for using poultry litter on pastures**.

Regulatory considerations, including the Australian ruminant feed ban, must also be followed. Australia has a ban on feeding Restricted Animal Material (RAM) to ruminants, including meat and bone meal derived from vertebrates including fish and birds. This helps prevent the establishment of bovine spongiform encephalopathy (BSE).

While highly pathogenic H5N1 Avian Influenza is not present in Australia, other strains have infected Australian chicken populations. Litter should not be sourced from farms affected by disease outbreaks.

Compost

Compost is produced through the controlled aerobic decomposition of organic materials and can improve soil structure while supplying nutrients.

The process involves two key stages:

- **Pasteurisation**, which reduces pathogens and weed seeds
- **Maturation**, where the compost stabilises and becomes safer for use

Pasteurisation reduces, but does not eliminate, all risks. Some pathogens (e.g. botulism, Q fever, Johne's disease) may persist. Immature compost, although legally saleable if pasteurised, may remain biologically active and negatively affect plants and soil.

Selecting high-quality compost requires ensuring it is fit for purpose and meets relevant standards. When spreading compost observe a withholding period of at least 21 days.

Other materials (e.g. industrial by-products or food waste) may be proposed as nitrogen sources. These should be carefully assessed for potential animal health risks and any impacts on milk or meat withholding periods due to contaminants such as chemicals or heavy metals.

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