Nitrate based fertilisers versus urea for ryegrass pastures during cool conditions.

During the winter of 2017, Farmcraft (Kalbar Qld) agronomist Donald McMurrich established a replicated trial to assess the productivity benefits of different forms on nitrogen fertiliser for annual ryegrass.

The reason for trialling these different forms of nitrogen originated from Donald's experience with irrigated wheat in northern NSW many years ago. He had observed that when the ground was cold, nitrate nitrogen (at that time Nitram) when applied to winter cereals as a topdressing application at the beginning of stem extension (early spring) led to a greater visual crop response compared with urea. Growth and leaf colour were improved by using nitrate nitrogen as opposed to urea.

The difference in plant response to urea and nitrate nitrogen during cold soil conditions can be explained by the poor conversion of NH_4 (ammonium) the major component in urea to NH_3 (nitrate) by soil microbes. Optimum conversion occurs at soil temperatures above 20°C, with conversion reduced significantly below 15°C. Nitrate nitrogen however is in a form that is readily available to the plant and not affected by soil temperature.

Unfortunately, Nitram is no longer available. There are however fertilisers that still contain nitrate nitrogen. Pivot's Cal-Gran, Calcium Ammonium Nitrate, was one with the most promise.

In 2017, Farmcraft established a trial to look at the potential benefits of Cal-Gran versus Urea application to annual ryegrass over winter. The project was also funded by Subtropical Dairy from the South-east Queensland Regional Group and received supported from Incitec Pivot.

The trial was conducted at Paul Roderick's farm at Harrisville in south-east Queensland. There were four treatments: no fertiliser, one level of urea (100 kg per ha per application) and two levels of Cal-Gran (150 kg and 200 kg per ha per application). In terms of nitrogen application (kg) per hectare, this equated to 0 (control), 46 (urea), 36 (Cal-Gran 150 kg) and 48 (Cal-Gran 200 kg). It should also be noted that Cal-Gran also contains sulphur (10.8%) and calcium (4.4%).

The treatments were replicated three times in a random block design. Pre- and post-grazing fresh pasture mass was measured, while a sample was tested for nutritional content. Due to the abnormally warm winter, it was late July until soil temperatures were lower than 15°C.

The figures below show the yield and quality of the different treatments.

In terms of yield, Cal-Gran 150 was higher than the other treatments, however this was not significantly different. One cut (out of three) was however statistically significant.

In terms of quality, Cal-Gran 150 had a higher energy content than the other treatments. This was statistically significant.

The Bottom Line.

- The data from this experiment would suggest that improved yields and quality of ryegrass could be achieved with replacing urea with Cal-Gran, however this may not be consistent.
- It is unclear why the higher level of Cal-Gran did not perform as well as the lower level.
- Cal-Gran also contains sulphur and calcium. It can not be ruled out that the responses observed here may be attributed to these nutrients.
- Another similar experiment is currently underway with the Subtropical Dairy Mid North Coast Regional Group at Dorrigo. Northern Horizons will publish the outcomes from this project later in the year.