



Consultants' Newsletter – Spring 2005

Hello and welcome to the latest consultants' newsletter from Ballance Agri-Nutrients.

The primary theme of this newsletter is precision. With the increased attention that is being placed on the fate of nutrients in farming systems, there is a growing need for farmers and all affiliated operators to have greater knowledge about the nutrient needs of the land, and a greater control on the placement of fertiliser nutrients.

There are several ways in which this can be achieved, and all have potential benefits. The method that works best for any individual farmer is likely to be that which ensures farming profitability does not decline. In addition, techniques that allow for an audit trail to be developed also offer advantages, since these make it easy for users to show compliance.

The heart of maintaining productivity while minimising nutrient inputs is a clear understanding of exactly what is required to support a crop or pasture. Fundamental research into the yield response to various nutrient regimes helps establish this understanding, and is the basis of the brassica decision support tools about to be launched by Ballance and Wrightson.

Additionally, having precise measurements of paddocks and the effective farm system helps ensure that all materials (nutrients, seed, agri-chemicals) are applied at the appropriate rate. GPS-based farm maps help add this level of accuracy to New Zealand farming systems and position farmers for rapid uptake of new and emerging technologies.

I trust that the information in this newsletter is of interest. Any questions, comments or suggestions for future research that you have can be emailed to me at the address below. In addition, if you no longer wish to receive this newsletter please let me know. If you have received a printed version of this letter and would like to receive it electronically in future, email your contact details to mbaldwin@ballance.co.nz, writing 'consultants' newsletter' in the subject line.

Kind regards

Dr Sue Page
Technical Writer
Ballance Agri-Nutrients Ltd
Mount Maunganui
spage@ballance.co.nz



Precision agriculture

The concept of precision agriculture has been around for some time, but like any emerging technology, early uptake has been relatively slow. Precision agriculture itself is defined in many ways, but the basic premise is that small-scale variations in agronomic systems are measured, their impact on production determined and if possible ameliorated.

The key to crop management using precision agriculture is the identification of the various 'sites' within a paddock and then the differential treatment of the crops depending on the site attributes. For instance, if part of the paddock receives more shade than other areas, its yield potential may be lower so less nitrogen might be applied than is spread on other, higher yielding areas. Alternatively, farmers may vary the planting density through a paddock depending on the yield potential of the soil.

The identification and location of various sites within a paddock is dependent on the use of accurate GPS measurements so that no physical landmarks are required. These coordinates can then be transferred to variable rate spreading machinery.

Precision agriculture has found favour in countries like Australia and America, where it has been applied in the cropping industry. Paddock size on arable farms in these countries can be quite large, and so it is easy to see how there may be variable yield potential within any one paddock due to, say, cooler zones, shaded areas, topography or soil type variation. Remote sensors can be used to monitor yield potential; once this is determined adjustments can be made to fertiliser applications or irrigation strategies as needed.

In New Zealand, Ballance has taken a two-pronged approach to the issue of precision agriculture. On the one hand, we have been trialling the use of the N-Sensor, a tractor-mounted sensor that essentially detects the degree of green colour in crops and from this controls the variable application of nitrogen. The measurements are made in real time and do not rely on GPS information. However, the N-Sensor can be linked to GPS systems if desired. The N-Sensor is currently being trialled on maize crops.

On the other hand, Ballance is actively involved in helping farmers to develop GPS farm maps through an association with Feilding-based company Farmworks. These maps offer high accuracy, with GPS co-ordinates valid to +/- 500 mm. The maps are constructed using a detailed series of on-farm measurements, and are not subject to the distortion that can plague aerial photos, which can still be inaccurate after ortho-correction.

An immediate benefit of having an accurate farm map is greater certainty about paddock and farm size. As farms evolve land use can change – riparian strips may be added, bush fenced off or preservation areas created. Actions such as this can change the effective farming area, yet it is easy to forget to take this land out of the equation. All areas like this can be accounted for on a GPS map, and if new areas are created they can easily be added to the digital database.

Having an accurate GPS-based farm map also offers long-term benefits. As newer precision agriculture technologies become more economic and appropriate to use in New Zealand conditions, the need for GPS information about a farm will increase. Already, fertiliser can be spread using GPS co-ordinates – for instance, Super Air has all its planes fitted with this technology. In the future, variable rate applications of fertiliser will undoubtedly become more common, especially as farmers and their advisors seek greater control over the placement of farm nutrients on the land to ensure compliance with regional and industry-wide environmental plans.



Brassica calculators aid precision

Brassicas are widely used as a supplementary feed crop, and are often sown into poor-performing paddocks as part of a regrassing programme. While this makes sense in terms of pasture management, it does mean that brassica crops are unlikely to achieve their potential yield unless some positive action is taken.

Poor-performing paddocks generally have a deficiency of one or more nutrients. This not only affects growth of the pasture, but also any other crop planted in the paddock. To overcome this, capital fertiliser can be used to redress any imbalance and starter fertiliser applied to support the growth of the brassica crop.

In collaboration with Crop & Food, Ballance and Wrightson have carried out extensive research into the nutrient requirements of brassica crops in order to better understand the role of the starter fertiliser (and any subsequent nitrogen applications) used for brassicas.

Trial sites were established throughout the country, examining the impact of nitrogen, phosphorus, potassium and sulphur in various soil types and under different climatic conditions.

The results of this work have been synthesised into two dedicated ‘brassica calculators’, decision-support tools that allow Ballance and Wrightson staff to calculate the best fertiliser option for any given crop of Pasja or kale.

One of the factors investigated as part of the research was the impact of phosphorus placement on growth. It’s known that brassicas are poor foragers of phosphorus and that its placement is critical. This is one reason why higher concentrations of fertiliser are required if it is broadcast, compared to the amount needed if fertiliser is drilled with seed.

A comparison of three application methods – broadcasting, broadcasting followed by incorporation, and drilling – showed that the highest kale yields were achieved when phosphorus was drilled with the seed (Figure 1). Interestingly, though, incorporating phosphorus fertiliser after broadcasting markedly improved kale yield when compared to broadcasting alone.

The second significant piece of information that was gleaned from this research was the importance of knowing the available nitrogen status of the soil prior to planting in brassicas. In the presence of high levels of available nitrogen, adding additional fertiliser nitrogen will have little beneficial effect on yield. The brassica calculators have this nitrogen-response functionality built into them, so fertiliser recommendations using these tools not only help the farmer achieve the best economic return on his/her investment, but they also minimise the risk of excess nitrogen being applied to crops and ending up as an environmental contaminant.

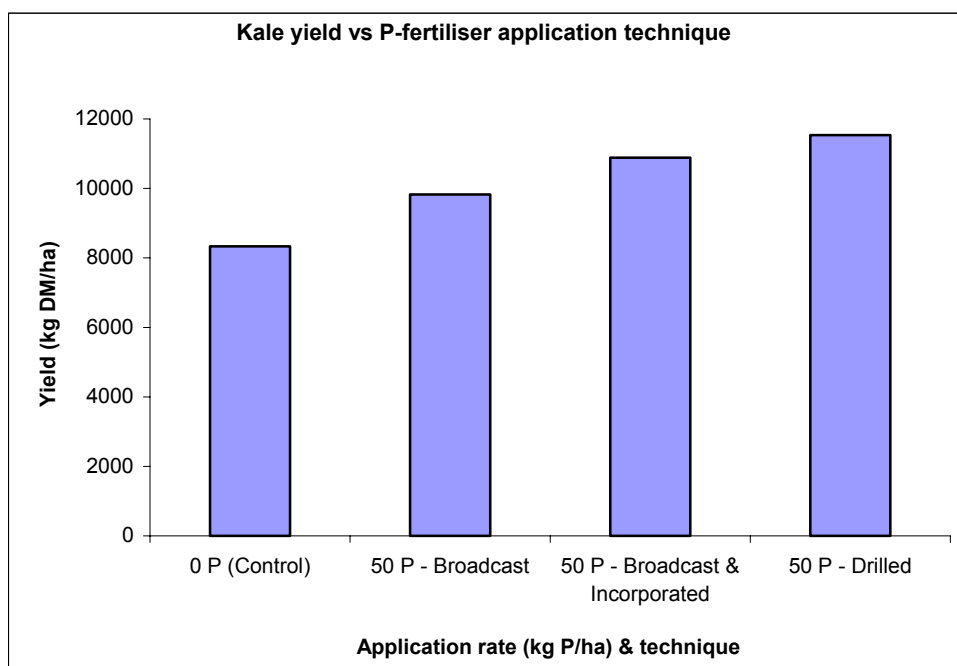


Figure 1: The effect of P application method on kale yield. Greatest yield was achieved when P was drilled with the seed; incorporating P into the soil after broadcasting improved yield compared to simply broadcasting P.

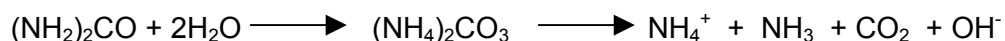


Volatilisation and urease inhibitors

The issue of nitrogen loss has been in the news throughout the winter months, primarily focusing on the impact of nitrate leaching and the efficacy of the nitrification inhibitors that can be used to reduce this leaching.

However, with summer on the way farmers in warmer, drier regions may start to become concerned about nitrogen losses caused by volatilisation – the loss of nitrogen as ammonia gas.

Volatilisation is a natural part of the nitrogen cycle. It occurs when urea – either from fertiliser nitrogen or in animal urine – reacts with water to form ammonium carbonate, which then degrades to ammonia, ammonium, carbon dioxide and hydroxyl ions.



Various factors promote volatilisation losses, notably a high soil temperature and a high soil pH. As can be seen in the reaction equation above, the degradation of ammonium carbonate generates a hydroxyl ion, which raises the pH in the immediate vicinity of the urea – or urea granule, if the urea comes from fertiliser. This in turn encourages greater losses of ammonia gas.

The initial stage in the decomposition of urea is mediated by the enzyme urease. This enzyme is highly specific for urea and does not affect other forms of nitrogen. Urease itself is produced by a wide range of micro-organisms and is naturally present in soil.

In many instances, loss of nitrogen by volatilisation is not considered a problem – losses in pastoral situations are typically only 10 percent of the nitrogen applied. However, applying urea in sub-optimal conditions will increase the risk of volatilisation.

There are a number of approaches that can be used to minimise volatilisation losses. Firstly, keep nitrogen applications to a maximum of 50 kg N/ha wherever possible. The greater the rate of nitrogen applied, the greater the rate of volatilisation losses. Secondly, avoid applying urea on hot, windy days and try to apply to pasture with a minimum cover of 1500 kg DM/ha. Heat promotes the action of urease, while wind dilutes the concentration of ammonia in the air above the ground (this ammonia would otherwise have a suppressive effect on the production of more ammonia). Ground cover reduces the effect of any wind action.

Rain following the application of urea helps minimise losses from volatilisation; in contrast, the volatilisation reaction is enhanced if urea is applied to moist soil and this is followed by a dry spell.

Choosing non-urea nitrogen fertilisers overcomes volatilisation issues, but account should be taken of the relative cost and of the need for any other nutrients supplied in alternative fertilisers (such as sulphate of ammonia or diammonium phosphate). A final option is to use a urea product that contains the urease inhibitor N-(n-butyl) thiophosphoric triamide (NBPT), marketed under the trade name of Agrotain. Such products attract a premium and their efficacy depends upon the situation in which they are applied.



Magnesium release from fertilisers

Magnesium is an essential element for both pasture growth and animal health. In plants, magnesium is found at the heart of the chlorophyll molecule so is vital if photosynthesis and growth is to occur at optimum levels. In animals, magnesium is needed for the correct functioning of many enzymes and also plays an important role in the transmission of nerve signals.

In pasture, deficiency symptoms are not seen until levels drop below 0.1-0.2% (dry matter measurement). However, for healthy stock, pasture magnesium concentration needs to be in the order of 0.25-0.30%. A soil is said to be magnesium deficient if the Quick test is less than 4.

Pasture magnesium levels vary on a seasonal basis, with levels lowest in spring, just when the animal's requirement is greatest. In addition, the uptake of magnesium by plants can be depressed by high concentrations of potassium. Liming can also reduce magnesium uptake in the animal, possibly because lime particles adhering to pasture are ingested, raising dietary calcium intake.

Where soil or pasture is magnesium deficient, farmers have several options to overcome this, including drenching animals, dusting pastures with magnesium or applying capital inputs of magnesium fertiliser to raise soil magnesium levels.

If the goal is to raise the magnesium content of a deficient soil, Ballance recommends a capital application of Calmag. The high magnesium content and relatively low cost of this product are two factors in its favour. The magnesium in Calmag is present as MgO and although not water-soluble, it is fully soluble in citric acid and dissolves in the soil within about 6 months. Two alternative products – Epsom salts and kieserite – also offer rapidly available magnesium. However, these are relatively expensive on a per-kilogram of magnesium basis, so tend only to be used in horticultural settings.

When maintenance applications of magnesium are required, Ballance recommends the use of serpentine super or Magphos. As well as magnesium, both products supply phosphorus, sulphur and calcium. Around 50% of the magnesium in serpentine super is rapidly available to plants, with a further 25% being released within 12 months. The remainder is released slowly over the following years. Dolomite is sometimes used as a source of magnesium; however, the magnesium in dolomite has only a low solubility hence is released very slowly. The more finely ground the dolomite is, the quicker it will release magnesium. In general, though, it is cheaper to apply standard lime and magnesium separately.

Product	Slow-release Mg	Intermediate-release Mg	Fast-release Mg	Mg content (%)	Common usage
Serpentine super	25%	25%	50%	5.5	Maintenance
Magphos		100%		5.0	Maintenance
Calmag		100%		50	Capital
Kieserite			100%	16	Horticulture
Epsom salts			100%	9.8	Horticulture
Dolomite	100%			40 (variable)	Liming



Product name change

Ballance has changed the name of its Sulphur Super range of products in order to reduce the possibility of confusion when blends are ordered. Orders are sometimes placed with a shortened version of the product name used, e.g. SS15 – this would be interpreted by most as Sulphur Super 15S, but could in fact be intended as 15% Potash Sulphur Super 7K. The new naming strategy reduces the potential for any confusion.

- Sulphur Super 15S becomes Sulphur Gain 15S
- Sulphur Super 20S becomes Sulphur Gain 20S
- Sulphur Super 30S becomes Sulphur Gain 30S
- Sulphur Super 50S becomes Sulphur Gain 50S

Product	N	P	K	S	Ca	\$/tonne*
Sulphur Gain 15S	-	9.2	-	15.6	21	\$184.80
Sulphur Gain 20S	-	8.5	-	20.5	20	\$189.00
Sulphur Gain 30S	-	7.3	-	29.5	18	\$191.00
Sulphur Gain 50S	-	5.5	-	47.1	14	\$218.50

*Ex-works price valid on 1 July 2005



Price lists now available

Ballance reprinted its product and services trade price list on 1 July 2005. The lists have been distributed to our merchant partners and to our technical sales representatives. Should you require a printed version of the price list, please contact your local merchant or nearest Ballance representative.

The price list is also available for download from our website (www.ballance.co.nz).