agKnowledge
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CONTEMPTIBLE ADVERTISING

Have you seen the recent advertisements for Summit Quinphos's nitrogen (N) product Sustain? They are eye catching, literally; **"itrogen"**. The recent Dairy Exporter (September 2009) advertisement claims; ".....on average 50% of the nitrogen from ordinary urea you apply is lost after application".

I find these advertisements contemptible as in, "disobedient to lawful authority" (see The Pocket Oxford Dictionary). The authority I'm invoking here is a) science and b) common law – is it fair and reasonable?

Why such anger?

There are now 3 reports in the public domain which have concluded that Sustain is no better, or worse, than urea, when applied at normal rates on pasture:

1) A set of 10 trials reported by Ballance AgriNutrients Ltd (FLRC Conference 20 Feb 2008).
2) A set of 3 trials conducted by Crop and Food (Proceedings Grasslands Association Conference 2008).
3) A trial conducted by Dairy NZ (Exporter August 2009).

This is how it looks to me: Summit-Quinphos Ltd challenged with this body of scientific evidence, of which they must be aware, decide, to hell with the science and our customers, the best form of defense is attack – a new marketing effort is initiated – the **"itrogen"** ads. That, in my opinion is contemptible. Have they not read the judgments: MAF v Bell Booth in respect to the product Maxicrop, or more recently, Commerce Commission v Probitas. Is there now no moral or ethical duty in the fertiliser industry? And never mind the hypocrisy – "our clients are important to us"?

There was a time when such blatant disregard of science was confined to the fringes of this important industry, but, regretfully, it is now becoming main-stream. And the two big co-operatives, Ravensdown and Ballance, once staunch defenders of sound robust, science, are not without blemish.

Summit Quinphos is a wholly owned subsidiary of Ballance. One assumes that every extorted Sustain dollar ends up on Ballance's balance sheet. And they are a cooperative – robbing Charlie to pay Paul? And of course Ravensdown continues to promote EcoN to boost pasture production despite being informed that this is not what the science says.

My Advice:

If you are concerned about this type of nonsense in your industry:

1) Complain to your co-operative.
2) Phone the Commerce Commission – that is what they are there for.

BRIX (AND BATS?)

A correspondent has asked – what about the Brix test for pasture quality? What does it measure and should I be using it?

An analogy is useful. Soils contain Mg and the total Mg in the soil can readily be measured. But this Mg is in three forms – there is the Mg which is part of the minerals in the soil, there is the exchangeable Mg and then the Mg in the soil solution. I'm a soil fertility scientist, concerned about plant growth, and thus I am not very interested in the mineral Mg – it is not plant available. I am not much interested in soil solution Mg either, because it is such a tiny component. My primary interest is the amount of exchangeable Mg – this is the pool that the plant can 'see' – and the soils ability to provide plant Mg is directly related to the amount of exchangeable Mg.

But measuring all the exchangeable Mg in soil is laborious. This is not a problem in a research lab but it is a major limitation in an advisory lab trying to process thousands of samples a year. The solution (and this was devised by Ruakura scientists in the 1950s) was to develop a "quick test".

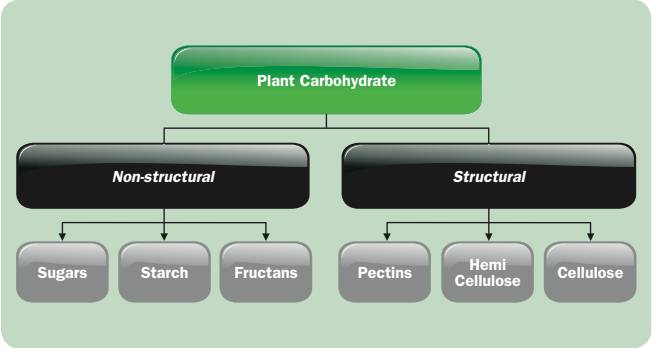
Rather than extracting all of the exchangeable Mg, the Quick Test (QT) (which takes 5 minutes not 5 hours) measures only a portion of the total exchangeable Mg. This works fine because it is known that QT Mg is directly related to the total amount of exchangeable Mg. The Quick test in other words is a surrogate for exchangeable Mg.

Likewise, plant nutrition scientists, who are interested in the nutritional value (feed quality) of pastures, have developed numerous tests which measure the amounts of the various components in pasture: dry matter, crude protein, plant carbohydrates, digestibility and metabolisable energy. After many years of research they have been able to relate animal growth and production to these various components. Go back 30 years and animal nutrition scientists would have told you that dry matter intake was the most important determinant to animal production. As with all science, we refine our understanding and knowledge over time and today DairyNZ scientists will probably tell you the metabolisable energy (ME) is where the money is – ME intake drives animal production.

Today you can send a pasture sample to the laboratory and get all these components measured. But nevertheless they are expensive and take time and so there is always the thought – there must be a better way – a simpler, cheaper more readily available method to measure pasture quality. This brings us to the Brix test.

The Brix test is to 'plant carbohydrate' what the soil QT Mg is to total soil Mg. It measures a part of the total carbohydrate in the plant – the readily soluble sugars, and just as there are different components of soil Mg, so too for plant carbohydrates (Figure 1). There are the structural carbohydrates that make up the cell wall etc and give the plant structure, and there are non-structural carbohydrates – these are the simple carbohydrates which are more soluble and slosh around in the cell sap.

The Brix test measures just a portion of the non-structural carbohydrates in the plant – it measures the sugars in the cell sap.



The question arises – how useful is this measurement? Well if you are a grape grower it is very important because the amount of soluble sugar accumulating in the developing grape (note – in the fruiting body of the plant not the leaves) has a big impact on the taste of the final product – the wine. It is used for this reason to test the sugar levels in other fruits as a measure of crop maturity.

So where does that leave Brix, pastures and the pastoral farmer? Put differently, does the amount of soluble sugar in a pasture tell us anything about the feed value of pasture to a ruminant animal? The answer is NO. No in the same sense that measuring the amount of Mg in the soil solution does not tell me anything about the ability of the soil to provide plant available Mg.

To elaborate, with thanks to Dr John Roche of Dairy NZ: Ruminants can utilize all the various forms of plant carbohydrate, from the readily digested simple sugars through to the complex celluloses, and, altering the mix of structural and non-structural carbohydrates does not greatly affect on animal production. Thus, the Brix test, which measures only one small pool of carbohydrates – the soluble sugars, is of little use as a predictor of pasture quality and hence animal production.

PASTURE IS KING!

Economic pressures are bearing down on all pastoral farming at present. I know this first hand because it affects my business too – no longer do I have the magic hand of public service to protect me! With Churchillian courage therefore it is a good time to remind ourselves of what is important: How to make a profit when incomes are low? Of course I do not have all the answers. All I can do is reinforce the message which others have been espousing, but from a soil fertility perspective.

The Good Question

Prof Colin Holmes (Massey University) has been active in his retirement saying that it is all about pasture management and pasture utilization and reminding us of how wonderfully efficient our system is – the animal does the harvesting for free! Dr John Roche (Dairy NZ) comes at it from a nutrition perspective – pasture is the cheapest feed and the higher the proportion of pasture in the diet the lower the cost of production (see Figure 1). Both Holmes and Roche are begging the question: why are we so hell bent on mimicking our Northern Hemisphere competitors with feed pads, herd homes and supplementary feeding and now irrigation?

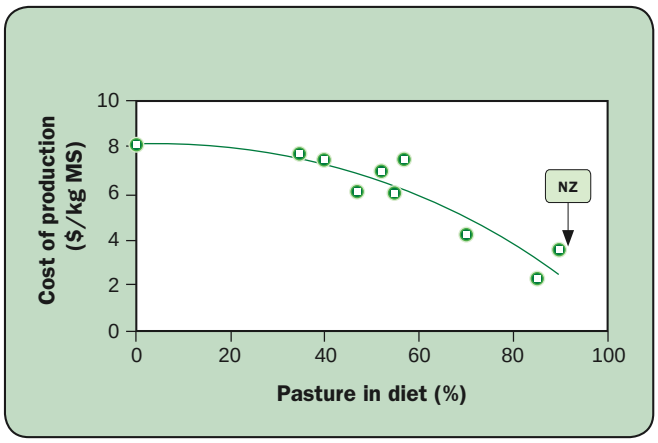


Figure 1: Effect of the proportion of pasture in the diet and the cost of production (from an international study by Dr J Roche, Dairy NZ, used with permission)

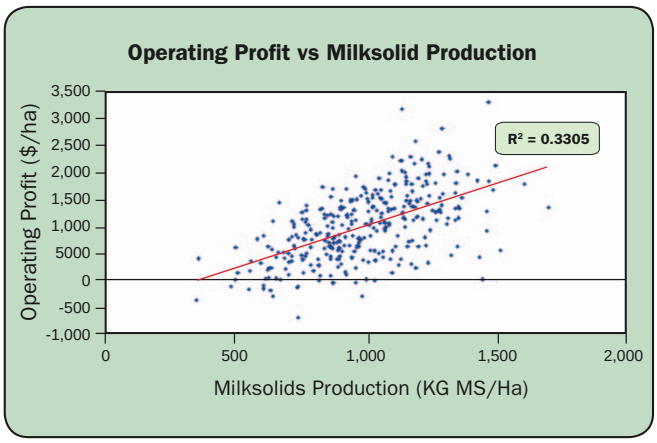


Figure 2: Relationship between milk solids production and operating profit (data from DairyNZ Economic Survey 2006-07)

Competitive advantage

The underlying reason for our traditionally lower costs of production is our climate. It means that we can have a forage legume (clover) growing all year. Not only does it harvest free N from the air, it is also a better food source than grasses. The climate also allows us to have animals outside all year round. They harvest their own tucker and, importantly, they complete the N cycle, returning clover N from the atmosphere back to the soil, as excreta N. This N is about 5 times cheaper than bag N. Our costs of production are therefore lower in terms of a) operating an animal b) harvesting the pasture and c) getting N into the soil-pasture-animal system.

Based on marginal costs (excluding the cost of land and money) it costs us about 2-3 cents to grow a kg of clover/ryegrass DM. In the Northern Hemisphere their costs are about 10-12 cents per kg DM. The difference is the competitive advantage that NZ Pastoral Ltd enjoys and is the historical reason why we can compete on the world stage despite our distance to market.

So what have we been doing with our competitive advantage, especially in the dairy sector? Fertiliser N, supplements, feed pads, herd homes, irrigation – they all add costs but do they increase profits. In many cases it appears not – production is not a good predictor of profitability – at 1,000 kg MS/ha, profitability ranges from minus $200/ha to plus $2,000/ha (see Figure 2).

So is intensification – making production the goal – the way to go? The recent data from Dairy NZ's Red Trial explores this point further. This trial compares the production and the financial outcome of 5 different farm systems, going from an all grass no fertiliser N up to the system importing 50% of the feed requirements. Figure 3 below shows how the operating profit is affected by the degree of intensification at 4 levels of payout.

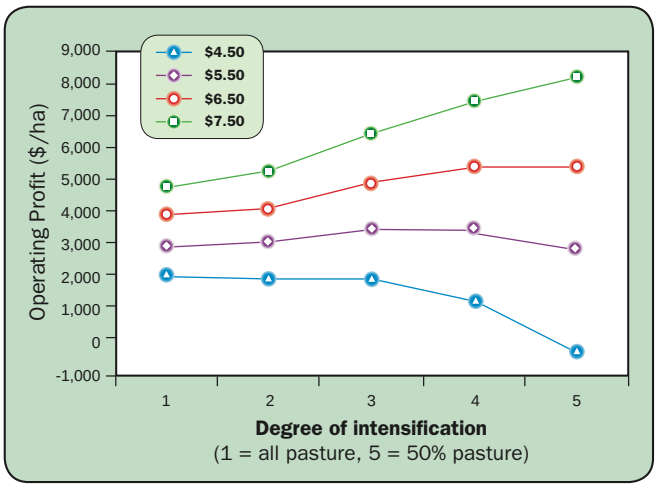


Figure 3: Effect of increasing intensification on operating profit ($/ha) at four levels of payout ($/kg MS) (1 = all grass; 2 = + 200kg N/ha; 3 = + 12% supplements; 4 = + 25% supplements; 5 = +50% supplements) (From Chris Glassey Dairy NZ used with permission)

Three points are worth emphasizing from this data:

1) Increasing intensification has very little beneficial effect on operating profits unless the payout is > $5.50.
2) Very intensive dairying (i.e. level 4 & 5) is risky in times of low payout.
3) Low intensity farming is always profitable if the payout is > $4.50.

Clover is Queen

The one clear message from all of this is that if your focus is on profitability then pasture is **KING**. And if pasture is **KING** then the **QUEEN** must be clover. Repeating myself, clover provides 'free' N and more product per unit DM consumed. It is the power behind the throne but it comes at a cost. In our rush to increase production we seem to have lost sight of the importance of clover in our pastures.

Clover has a higher requirement for all nutrients (except of course N) relative to grasses and it needs 16 nutrients (see Fertiliser Review 16). Remember also that it can only grow as fast as that allowed by the most limiting nutrient – ongoing applications of say P fertiliser will be in vain if the clover is limited by S or K or Mo deficiency.

This is a problem I see every day; soils which are "out of balance", one or several of those 16 nutrients is missing. The clover growth is restricted and its absence is blamed on the drought, the clover flea or any other likely excuse. But no clover means no clover N going back into the soil to feed the grasses, and hence the pastures look N deficient. The "solution' in most cases is to apply fertiliser N thus replacing a cheap source of N with an expensive source of N. Costs go up but production does not necessarily increase. It is in this context I call those blue and green urea silos – drug delivery units.

Knowing the soil fertility of your farm is as fundamental as having good foundations to a building. Get it wrong and you end up spending too much or too little on fertiliser. Get it wrong and in time your pastures will 'fall over.'

But how do you determine whether the soil fertility on your farm is optimal for maximum clover growth? There are three actions required:

1. Pasture visual assessment – pasture vigor, where is the clover growing, any symptoms of nutrient stress?
2. Soil tests – avoiding camping areas, dung and urine patches.
3. Clover-only tests – to check nutrients like Mo and B for which there are no soils tests.

All three actions are required to get a firm handle on the current soil fertility. And professional skill and competence is essential. It is very easy to get inflated soil test results, and many has been the time when I have seen inflated soil test results which do not reflect the pastures – the tests are high but the pastures terrible! Ground proofing the soil test results by careful inspection of the pastures is essential. The same applies to taking clover-only samples – you need to know what you are doing.

My Advice:

Seek professional advice from people you have the necessary skills and experience. Don't know anyone? Give me a call 07 834 0316.

PRICE WATCH

Fertiliser prices appear to be on the way down. This is true for N, P and S but unfortunately K prices remain stubbornly high. The table below lists current prices for the key nutrients on a $/kg nutrient basis.

Nutrient	Product	Company Ballance	Company Ravensdown
		$/kg nutrient	
P	Superphosphate	3.89	3.79
	DAP	3.15	2.91
	Triple	5.10	5.12
	RPR		4.09
N	Urea	1.35	1.35
	DAP	0.64	0.36
	Sulphate of ammonia	2.67	2.65
K	Muriate of potash	2.29	2.29
	Potassium sulphate	3.06	3.05
S	Elemental sulphur	0.36	0.36
	Sulphate of ammonia	1.54	1.47
	Potassium sulphate	2.28	2.14

Notes 1) For fertiliser containing more than one nutrient the value of the companion nutrient is taken into account as follows: S = $0.36/kg; N = $1.35/kg P= $3.79.

The key points are:

1) DAP is the cheapest form of N & P assuming that the other nutrient (ie P or N is required).
2) Super is the cheapest form of P where S is also required.
3) Muriate of potash is the cheapest form of K.
4) Elemental S is the cheapest form of S (but refer to Fertiliser Review 22 regarding particles size issues).

HOW TO READ YOUR SOIL TEST REPORTS

An example of a soil test report from Hill Laboratory is shown on the right. It is for a cropping soil but that is of little importance to the discussion below. I have deliberately chosen an example from this laboratory because of the big three labs: Hills, NZ Labs and ARL, Hills have led the way in New Zealand in terms of introducing un-calibrated soil tests and creating confusion into the soil testing market.

Eight numbers in the report have been highlighted with a red circle: Soil pH, Olsen P, Sulphate and Organic S and, in MAF Units, soil K, Ca, Mg and Na. These later four test are sometimes referred to as Quick Tests (see earlier article). These are the only numbers on this piece of paper with any agronomic value. By that I mean they have been calibrated against pasture production. It is only when soil tests are calibrated that they can be interpreted in a meaningful way.

There are three other numbers which are useful (highlighted with blue squares), not because they are related to pasture growth but because they tell us something about the soil group we are dealing with. These are the ASC (Anion Storage Capacity), the CEC (Cation Exchange Capacity) and the volume weight. We know, for example, that this soil is a peat because of the combination of high CEC, low volume weight and medium ASC. A further number – the Available N – is highlighted because it may be informative when advising on fertiliser N requirements for crops.

ANALYSIS RESULTS

Hill Laboratories

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Hill Laboratories

Client:
Address:

Client Phone

Laboratory No.:
Registered:
Reported:
Order No.:
Submitted By:
Client Ref:

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Sample Name: Hay Barn (Peat)
Sample Type: SOIL Maize (S6)

Analysis		Level Found	Optimum Range	Below Optimum / Optimum / Above Optimum
pH		6.3	5.6 - 6.4	
Resin P	(mg/kg)	61	40 - 75	
ASC/Phosphate Retention	(%)	37	30 - 60	
Potassium	(me/100g)	0.27	0.50 - 0.80	
Calcium	(me/100g)	81.2	5.0 - 12.0	
Magnesium	(me/100g)	2.79	0.80 - 3.00	
Sodium	(me/100g)	0.21	0.00 - 0.50	
Potassium	(%BS)	0.3	2.0 - 5.0	
Calcium	(%BS)	84	50 - 75	
Magnesium	(%BS)	2.9	5.0 - 15.0	
Sodium	(%BS)	0.2	1.0 - 2.0	
CEC	(me/100g)	97	12 - 25	
Base Saturation	(%)	88	50 - 85	
Volume Weight	(g/mL)	0.41	0.60 - 1.00	
Olsen P	(mg/L)	15		
Sulphate-S	(mg/kg)	4	10 - 20	
Organic Sulphur	(mg/kg)	27	12 - 20	
Available N (15cm Depth)	(kg/ha)	167	100 - 150	
Iron	(mg/kg)	1050		
Manganese	(mg/kg)	23	50 - 400	
Zinc	(mg/kg)	14.5	2.0 - 10.0	
Copper	(mg/kg)	5.7	1.0 - 5.0	
Cobalt	(mg/kg)	0.4	2.0 - 4.0	
MAF Units		K 2	Ca 42	Mg 26	Na 4
Anaerobically Mineralisable N		269 ug/g		

The above nutrient graph compares the levels found with reference interpretation levels. NOTE: It is important that the correct sample type be assigned, and that the recommended sampling procedure has been followed. R J Hill Laboratories Limited does not accept any responsibility for the resulting use of this information.

All the other numbers and information on this report, including the optimal ranges and the bar graphs on the right, are largely a waste of paper for the following reasons.

1. The Resin P test has only been calibrated on four sites. It measures RPR residues but if you do not know the particle size and the origin of the RPR residue it is impossible to interpret.
2. The figures for K, Ca, Mg and Na expressed in me/100gm, are in fact a repeat of the MAF Units shown down below. It was precisely because farmers would not relate to the scientifically correct unit, me/100gm, that the scientists at Ruakura developed a more meaningful scale (ie the Quick test units or MAF Units) for farmers. Repeating these numbers and their arcane units is confusing.

3. The next set of numbers is the base saturation (%BS) ratios for K, Ca, Mg and Na. These ratios if taken seriously can result in misleading fertiliser advice (See Fertiliser Review 4 and 10). The same applies to the Base Saturation figure given latter.
4. The reports also gives results for the amounts of the trace elements Fe, Mn, Cu and Co. These are also meaningless in terms of pasture growth and animal health, with the possible exception of the Co. The problem is that the levels of these trace elements in soil do not necessarily relate to what the pasture is 'seeing'. If you are at all concerned about these micro-nutrients measure their concentrations in mixed pasture (for animal health) or clover-only (for clover nutrition) samples.
5. The stated optimal ranges are either wrong or so broad as to be meaningless. For example there is no such thing as an optimal range for ASC, CEC or volume weight. The optimal range for the pH of pastoral soils is 5.8-6.0 not 5.6-6.4. The optimal range for sulphate S and organic S is 10-12 not 10-20.

I have raised these matters with Dr Hill on several occasions and he responds by saying that his clients demand these 'other' tests. This is, in my opinion, facile. Being responsive to your client needs surely does not extend to selling them soil tests which have little or no value. Surely all soil testing laboratories must has a responsibility to science?

WHY FARMERS SHOULD LEAVE SOIL TESTING TO THE EXPERTS!

Soil testing is an art. Choosing the correct place for the transects in the landscape, and avoiding high soil fertility areas such as gateways, troughs, camping areas and excreta patches is a learnt skill. We have come across a number of otherwise intelligent, good farmers who have been soil testing their farms themselves and got it wrong, dreadfully wrong! The results below are but one example – in this case the soil K and P levels were greatly elevated.

	Olsen P	Potassium	Sulphate	Magnesium
Farmer tested (average of 4 transects)	48	13	Not tested	38
AgKnowledge tested (average of 4 transects)	30	3	10	27
Optimum	**35-40**	**7-10**	**10-12**	**8-10**

Note: These are averages over the farm excluding the effluent block.

Why so different?

Typically a soil sample comprises 15 to 20 cores. One or two cores from a nutrient rich excreta patch will greatly elevate the soil test levels and urine patches in particular are a problem because they often cannot be seen and they are very rich in K. Also animals transfer nutrients across the landscape typically towards gates ways, troughs and camps at the top and bottom of slopes. That is why choosing the correct placement for transects within the landscape to avoid these nutrient rich areas is so important.

The consequences are serious

The consequences of getting the soil fertility wrong can be profound. In this example the farmer, believing his soil test results were correct, has not been applying fertiliser P and K. Consequently the soil P and K levels declined and with it pasture production. The pastures looked terrible, something like in the picture below. This feed shortage was however masked by feeding supplements. It was a financial double whammy!!

How do you know if your soil tests are wrong?

The best guide is to look carefully at your pastures. If they look patchy, similar to the picture below, then be suspicious. But this introduces another art – how to 'read' pastures and very few professionals have this skill.

Optimise farm profitability

Make your fertiliser dollar go further

Decrease your farm's environmental footprint