

### Some lessons from the field

#### **1** LESSON NUMBER ONE (BELIEVE YOUR EYES!)

**A Taumaranui farmer recently purchased a new block of land.** It was rundown and he sought my advice to develop a fertiliser/nutrient management plan to get the property ‘up to speed’. After visiting this new block, he urged me to take a look at the flats on his home farm – something was wrong with them, he said.

Sure enough the pastures looked dreadful. They were very patchy – a mosaic of green healthy patches, full of clover and green vigorous ryegrass among a sea of yellow-brownish ‘pasture’, full of flat-weeds, with little clover and very poor grass vigor.

We dug a few holes to compare the soils under the good and bad patches. The difference was stark. The topsoil under the healthy pasture was moist with plenty of signs of biological activity (crumbly soil with plenty of earthworms and no accumulation of dead organic matter). In contrast the soils in the bad areas were ‘root-bound’ - dead organic material was accumulating and they looked and felt ‘dead’ – exactly what the pastures were reflecting.

The farmer then told me the story. These flats - alluvial pumice material brought down by the Wanganui River - are important to his operation. This is where he fattened his beef animals and made his supplements. The pastures, he had noticed, had been deteriorating over a number of years and he had tried many things to overcome the problem, all to no avail. More super had no effect and resowing after a crop had no benefit. He did note that the pastures gave great responses to fertiliser N but he was reluctant to have to ‘depend’ on this as a solution.

He had correctly noticed that the soils looked ‘dead’ and he reasoned that the soil biology had ‘turned off’. So, in the absence of other advice, he purchased and applied one of these soil tonic brews; it contained humates as

was claimed to ‘detox’ the soil and stimulate biological activity. Needless to say this cost him money. It also resulted in failure.

He then showed me a soil test taken from these flats. The levels of all other nutrient were fine, but the soil K level (the Quick Test K reading) was about 3, well below the optimal level of 7-10 for pumice soils. The soil was grossly K deficient and this was consistent with the visual evidence in front of us.

I explained: clovers have a higher requirement for all nutrients, and especially K, than grasses; no soil K, no clover; no clover, no soil N (from clover N fixation); no soil N, no ryegrass and no soil biology; no biology, accumulation of dead organic matter. The exception was under the urine patches, which are rich in urinary K. This also explains why he saw large responses to fertiliser N.

#### **2** LESSON NUMBER TWO (BELIEVE YOUR EYES!)

**This next story has similarities to Lesson Number One.** It concerns a dairy farmer south of Hamilton on a volcanic ash soil. The farmer was achieving reasonable production but at the cost of large amounts of fertiliser N and supplementary feed. And he knew something was wrong with his pastures and getting worse.

At the time of my visit (spring 2006) the pastures showed all the classic symptoms of soil K deficiency (see the description above or Fertiliser Review No 16). The farmer himself had observed the patchy nature of the pasture and that clover was only growing in the old urine patches. He investigated this further. He took a soil test from the urine patches and one from the poor areas in between. From memory the soil K level under the urine patches, as expected, was very high (> 20). Elsewhere it was very low (< 4). He got so close to solving his problem but, understandably did not make

the connection – the missing nutrient across all his farm, which was limiting pasture production was K. This was the reason he was becoming locked into a high fertiliser N regime and importing increasing amounts of supplements.

Such cases intrigue me. K deficiency is the easiest to diagnose, especially in grazed legume based pastures and yet it was missed in both cases. Why? It is in this environment that the quack merchants thrive preying on the vulnerability of well meaning farmers.

My Advice: Mr Farmer, if you think your pastures are not doing what normal pasture do then believe your eyes and instincts – get some sound advice.



## **BEWARE: ANOTHER DOOMSDAY PROPHECY**

One of the well proven techniques to get a following (and hence an income) is to become a doomsday prophet. Evangelical Religions have got this down to an art form. Soil Science also is strewn with such people – consider our own Mr Peter Lester (Quantum Laboratories, Waipawa), Mr Trevor Danks (soil consultant, Northland) and in the more general sense the Organic Movement, for example.

Their message is similar: There is a conspiracy perpetrated by the establishment (any large industry together with science), they do not care about you, your farm, or the planet, only their profits; they are forcing you to use dangerous products and technologies, and as a result, you (we) are destroying our soils and the environment and human health is suffering. “Prepare ye the way of ..... (enter prophets name)”.

Such prophets are more believable if they come from out of town. Welcome Dr Arden Andersen. He was here in New Zealand last year and is running another series of 3 day seminars in early 2007 (Balancing Soils for Profit, \$600 per person). Dr Anderson is from America and according to his promotional material has a BSc (agricultural education), a PhD (biophysics specializing in plant/insect attraction phenomena) and a medical degree. The nature of the medical degree is unclear to me. Apparently he holds a qualification in Osteopathic Medicine and is a flight surgeon (ie paramedic) in the US air force. He has written several books.

His website (ArdenAndersen.com) declares “There is an absolute link between agriculture and human health. His latest book (“Real Medicine, Real Health”) claims

to “give the reader and patient a look at sound options available to treat everything from autism and chronic fatigue to heart disease and cancer.” As my colleague Dr John Roche would say, “If it sounds too good to be true it probably is!”

The first chapter of his book sets up the conspiracy – it is a tirade against science and, in particular, the suppression of ‘alternative’ science by the establishment (read ‘alternative’ science to mean the type of ‘science’ he supports).

Obviously I cannot comment on the statements and claims he makes in regard to human health and medicine – that is not my expertise. But I can comment on those matters related to soil science, soil fertility and plant nutrition.

I agree with Dr Andersen’s thesis to the extent that there can sometimes be a direct link between agriculture, and in particular soil fertility, and human health. I will extend this to include animal health. But it is only a direct link in specific cases.

### **Here are some New Zealand examples:**

- Our New Zealand soils are low in Se and because of this our human diet (ie. in bread, meat etc) is also relatively low in Se. Also we must supplement animals with Se, on most soils, to optimize their health and production (white muscle disease).
- Our pumice soils were deficient in Co – these soils were unfit for animal production (bush sickness) until Co deficiency was defined and corrected.
- Our New Zealand diet is low in iodine (I) (thyroid problems) and hence the need to add I to our salt and to the diet of production animals in our care.
- Many of our sedimentary soils were deficient in Mo. They would not support clover growth and hence the input of biological N into our soils.

My point is this. There are some strong linkages between soil fertility and animal and human health. And many, if not most of these problems have all been identified, studied, understood and solved by the application of science, to the great benefit of all New Zealanders. Andersen seems to be asserting that science is the problem – that science has got it all wrong!

He cites the work of William Albrecht from the University of Missouri, USA, as an example of science that has been suppressed. He goes on to say that when Albrecht’s

work “is fully acknowledged and applied to modern agriculture, the majority of the agricultural poisons now peddled by the industry, which subsequently fund the majority of university agricultural research, would not be needed”. Too good to be true?

Albrecht’s claim to fame is that he proposed the Base Saturation Ratio theory of soil nutrition: it states that there is an ideal ratio of Ca, Mg, K and Na in soils and that if this is achieved, the soil and hence the plant will have optimum nutrition (see Fertiliser Review No 4 for a more detailed account). Many soil testing laboratories in New Zealand pump out these meaningless figures to farmers.

There has been much research on this topic over the last 50 years and it is now clear to many reviewers of this literature that there is no such thing as an ideal BSR. Furthermore, it has been shown that if this theory is used as the basis for making fertiliser recommendations it result in excess application of some nutrients, that are not required, and inadequate application of other nutrients, that are required (see examples in Fertiliser Review No 4 and 17).

This is science in practice: a theory is advanced; experiments are conducted, evidence accumulates and the theory is shown to be inadequate. It is therefore, correctly, set aside. That is a very different proposition from Dr Andersen’s assertion that Albrecht’s work has been, and is being, suppressed by the establishment.

But my biggest concern is when Dr Andersen comes out with big global, headline grabbing assertions like: “Western farming systems have raped the soils, depleted the minerals and compromised our food resources.” This is fear-mongering at its worst.

### Consider the following:

- Before the introduction of ‘western farming practices’ many of our New Zealand soils were depleted in minerals (see examples above).
- A recent national survey showed that, with some exceptions, the quality of New Zealand soils is very good (see Fertiliser Review No 14).
- The recent, Total Diet Survey, in New Zealand (see article in this issue) concluded that, “..... consumers need have no concerns about the safety of New Zealand food.”
- The world now feeds more people than ever before, and its people – at least in the western world – are

healthier than ever before, as indicated by longevity statistics.

So what is Dr Andersen on about? I do not know. Perhaps to use the words he uses to damn the agricultural industries: “Business is business is business.” I do think however that New Zealand farmers and growers deserved better than to have their fears and vulnerability exploited by pseudo-science.



## MORE GOOD NEWS (FOOD QUALITY)

As a counter to some of the doomsday nonsense perpetuated in the popular press and via product advertising, the Fertiliser Review has been featuring some good-news stories about soil bugs and soil quality generally (see Fertiliser Review No 13 and 14). Following this theme, here is some more good news – this time about the products from our soils – the food we eat.

The New Zealand Food Safety Authority regularly tests the foods that we typically eat (120 different types in the latest survey tested on an ‘as consumed basis’) for levels of agricultural compound residues (i.e. pesticides, 221 different compounds were screened), contaminant elements (e.g. arsenic, cadmium, lead and mercury) and nutrient elements (iodine, iron, selenium and sodium). Their most recent survey was published February 2006 (see [www.nzfsa.govt.nz/publications](http://www.nzfsa.govt.nz/publications)), but I figured, given Dr Andersen’s comments (see earlier article), and the increasing volume of literature from the ‘organic’ movement that a brief summary would be useful.

### The key results, quoting directly from their report, were:

- Of the 200,000 individual tests carried out as part of the study only 997 showed any detectable residues, AND all well below their Acceptable Daily Intake limits (my emphasis added).
- New Zealanders enjoy among the lowest lead exposures in the world. Dietary exposure to lead has reduced overall – a likely result of the introduction to New Zealand of lead-free petrol in 1996.
- Most kiwis enjoy low exposures to all contaminant elements
- The average Kiwi diet is high in salt (one assumes Na) and low in iodine
- Women aged 25 and over are consuming only half of the Recommended Daily intake of iron.

Their conclusion reads in part, "The survey provides proof that consumers need have no concerns about the safety and suitability of New Zealand food." This is hardly the evidence to support those who advance the opinion the western agriculture is the path to destruction and will ruin our soils, our animals, and ultimately ourselves.

Of the specific problems highlighted above, only a few relate to the management of soil fertility. One of the pathways by which cadmium gets into the food chain is as a contaminant in fertilisers. There are now strict limits imposed on the fertiliser industry in this respect. The problems of high dietary salt and low iodine are most cost effectively managed through food selection and supplementation rather than changing fertiliser practices. Similarly, with low iron. Our soils have plenty of iron in them but it is not plant available. Adding iron to soils is ineffective because it is readily converted to insoluble (ie not plant available) forms at normal soil pH levels. Theoretically we could unlock this soil iron by allowing our soils to become acid – but this is hardly a solution!

So, if our conventionally produced foods are okay where that does leave the claim made by the organic movement that organic food is better.

Better than what you might ask?

There have been 2 recent reviews of the considerable international scientific literature on this question - one by staff from the Department of Food Science, Otago University, New Zealand and the other from the Federal Institute for Health Protection of Consumers and Veterinary Medicine in Berlin, Germany. Both reviews concluded that there was no evidence to support the general claim that 'organic' food was better than conventionally produced food. (Note that all food is organic in the strict sense of the word, hence the parenthesis, 'organic' to indicate food produced using systems decreed by the Organic Movement to be 'organic').

Given these bold conclusions it is surprising to see the intense reaction from the organic movement to statements made by David Miliband, the British Secretary of State for Environment, Food and Rural Affairs, who recently suggested that organic food was not better than conventional food. He described organic produce as 'a lifestyle choice' and insisted that food grown with the use of pesticides and other chemicals should not be regarded as second-best." (see [www.organicdirect.co.nz/news](http://www.organicdirect.co.nz/news)).

Good on him, I say. He has exposed, in a glorious

manner, one of the greatest myths perpetrated by the organic movement: that organic food is better for us.

To make things worse for the organic movement, Dr Kirchman, from the Swedish University of Agricultural Sciences has recently reviewed a set of international trials, and concluded that organic systems are not more environmentally friendly or more sustainable than conventional systems (see *Better Crops* 89 (2005, No 1)). I agree with him given my own research on this subject (see *Fertiliser Review* No 4). To use his blunt summary: "When critical scientific analysis is applied to organic farming the dogma of superiority fails." My old Professor, TW Walker, would enjoy that!



## COMMERCE ONE, SCIENCE ZERO.

I have been concerned for many years about what I call the "commercialization of science". It erodes the independence and impartiality of science and scientists and it limits freedom of expression and debate. These are all vital values on which good quality science depends.

To make my position clear, I can do no better than quote my own words from *Science Friction* (2001). "It is important that commerce has access to, and uses, the tools of science. But commerce must never control the process that is science and specifically this includes the process of peer review, publication and open dialogue. Without this freedom scientific standards will be eroded and science will lose its integrity and with it the confidence of the public."

This ugly possibility emerged after the South Island Dairy Event (SIDE) Conference last year in Invercargill. At the conference Dr Roche and I presented a workshop, "Fact or Fiction: Who do you believe?" We ended the session by giving farmers a set of five questions that they could put to the salesman to test the truth or otherwise of their claims. I added that the attendees could practice this new skill immediately, at the conference, by visiting one of the sponsor's sites – that of Mainland Minerals – a company which sells proprietary fertiliser brews. I had ample reason at the time to fore-warn farmers about this company (see *Fertiliser Review* No 17).

The company complained to the conference organizers who in turn, and without discussing the matter with me, sent me a "Dear John" letter, dated August 1 2006: "I write to advise that you will not be invited to present again at SIDE." A big red card! Sent off, not just for the match, matches or season, but for life! Incidentally my coauthor bless him, was not cited?

My letter in response was lengthy, but two points are worthy quoting:

1. I note that the purpose of SIDE is to provide, “....a forum to evaluate and apply knowledge, skills and technology to their businesses.” Surely my actions at the SIDE conference were consistent with this purpose? And
2. Surely if SIDE has the interests of its farmer stakeholders at heart, then it is not I who should be banned, but those who perpetuate ‘muck and mystery’ in the industry.

I have had no response from SIDE in respect to my letter.

Later in the year, I attended the New Zealand Soil Science Society biennial conference at Rotorua. I was mortified to learn that a company called Agrissentials Ltd was a sponsor. This company, you may recall (see Fertiliser Review No 15) sells ground basalt rock and calls it a fertiliser. It has no such merit. The company director, Mr John Morris, actually spoke at the conference – I assume this was part of the sponsorship package.

I must say that the conference organizers were more than surprised and embarrassed when I appraised them of the situation at the AGM. But the damage was done. Because of the way he was introduced at the conference, and because of the political correctness that pervades such conferences in this commercially sensitive age, Mr Morris avoided any rigorous questioning and not doubt is using this fact as evidence that New Zealand scientists approve of his product and its claimed benefits. Credibility by association is a persuasive argument at least to the vulnerable.

There is a beautiful ending to this story. We were all able to pick up our own free DVD called “A Can or Worms”, produced by Agrissentials Ltd and featuring Professor David Bellamy. He repeats the doomsday message (repent now for western agriculture has destroyed our soils and environment) which is then morphed into a wondrous story about how ground rock will save us all!

I have more than a passing interest in Dr Bellamy’s scientific abilities. He appeared with me on the Fair Go program about Maxicrop way back in 1985. He was involved, at that time, with the parent company, and claimed on the program that the product worked. Eight hundred and fifty field trials later, he was proven wrong, a fact supported by the highest court in the land. One

the current DVD he claims that there are 25 essential plant nutrients. Wrong again David – 16 is the correct number (see Fertiliser Review no 16). What is that old saying – to err is human to forgive .....?



## STOP THE DRAIN DIGGER?

There can be no doubt that one of the major challenges facing pastoral farming, and in particular dairying, is nitrate leaching into the groundwater. We know that the primary source of this nitrate is from the animal urine patch. When a cow urinates it dumps about 1000 kg N/ha on the soil - the soil-pasture system at this spot is overloaded and the excess N is readily washed out at the next leaching event. The more animals per unit area the bigger the problem. Many scientists are working on various ways to solve the problem.

The solution is to develop landscape and management practices which will allow farmers to maintain their productivity and at the same time intercept the nitrate before it gets into the waterways. And one obvious solution is to rediscover wetlands.

Most, but not all, farm landscapes have with in them what we used to call swamps or bogs – areas where drainage water from the surrounding catchment seeps to the surface in a steady flow of water. Generations of farmers have spent time and money draining these areas. I myself can remember assisting my father and brothers in such activities.

Providing these seepage areas are wet all year and appropriately planted, and providing the flow of water is slow enough, the water, particularly at the margins, will be anaerobic (i.e. without oxygen). Under these circumstances there are bugs (bacteria) which convert the nitrate (from the surrounding landscape) into nitrogen gas, which is then voided into the atmosphere – it does not proceed to the waterways downstream. This process in effect reverses what the bacteria on the clover roots do. Cute huh!

The result is that a farmer who stops draining the swamp and recreates these wetlands on his farm will be able to maintain his stocking rate and at the same time reduce his environmental foot print.

How big is this effect? I’m not sure at present. Some tell me the effect is minimal but other data I have seen suggest very real and practical benefits. I will keep you posted but in the meantime be a little selective when you get the digger in.



## ARE YOUR PARADIGMS SHIFTING?

The Parliamentary Commissioner for the Environment, Dr Morgan Williams, urged us to shift our agricultural paradigm. It is a fashionable word to use these days and it simply means to change the framework in which one thinks. Some examples may help to clarify:

The earth is not the centre of our solar system – this was a big paradigm shift especially for the church

The earth is not flat – another paradigm shift that even today some people resist.

Thinking of dairy shed effluent and wetlands as resources (see earlier article) not problems is a more practical example.

Shifting ones paradigms then is changing the framework in which we ‘see’ things. I think that was what the Commissioner was asking of us: Can we see New Zealand’s agricultural system, not just with the mindset of production but in the wider content of the physical and social environment. It is important that we do and that is why I so much like the FESLM framework (see Fertiliser Review No 14). It requires, in a non-threatening way, to consider all these things when setting farming goals.

I was reminded of this when listening to a number of papers presented at the New Zealand Soil Science Conference in Rotorua (November 2006).

One paper explored the possibility of putting ‘socks’ filled with a material which absorbs phosphate into stream to strip out the phosphate running off the land. Another paper looked at a similar idea; putting a phosphate absorbing material into tile drains to stop the phosphate before it gets to the waterway.

I like this type of thinking. Instead of carping on about the problem (dirty farming) lets find some novel solutions to the problems that confront us.

Imagine what the pastoral world may look like in 20 years time. Where there are tile drains (as in much of Southland) we will trap the drainage P and N and recycle it. And why not extend this idea to much of the Waikato basin which is flat and is an environmental a hot spot. Our streams at there headwaters, will have nutrient-trapping ‘socks’ in them. We will not apply dairy shed effluent to the soils. We will capture its energy content as methane gas to ‘drive’ the milking plant, capture the

nutrient in a dry form to easily return to the soil and the ‘waste’ water will be recycled.

In addition the landscape will change we will rediscover wetland and riparian planting not just as a means of reducing P and N losses to the waterways but also as a means to encourage biodiversity.

And all the above based on currently known technology. What about the future?



## DICALCIC SUPER

Both Ballance and Ravensdown now list dicalcic super (lime and super mixes) on their price lists. I have no problem with the products per se, or the claims being made for them, (see Fertiliser Review No 12). The issue is: is there is a cheaper way of delivering super and lime onto you farm. A cost comparison of the products is set out below:

Product	Source	\$/tonne	\$/kg P <sup>1</sup>
Dicalcic super	Hautuma		
	Ravensdown	169.42	3.11
	Ballance	140.00	
Superphosphate	Ravensdown		
	Ballance		

Notes 1) assuming lime at \$18/tonne and sulphate S at \$0.35/kg



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