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Healthy Soil — Healthy Plants — Healthy Livestock

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Biological Agriculture

In today's marketing environment where quality is increasingly becoming the driver we need to get a lot smarter at how we grow our fruit. How would you like to reduce fertiliser usage, increase production, and improve fruit quality. Sounds like a dream?

It won't happen straight away, but it will happen, through applying the principals of biological agriculture. And it need not take long. We have been playing with this for a number of years, have made plenty of mistakes through lack of knowledge but have learnt a lot in the process. Most of the mistakes need not have happened. The knowledge and support is now out there.

Seminars presented in New Zealand by Dr Arden Andersen and others over the last three years have greatly improved our knowledge and understanding of how the whole soil, microbe, plant thing is supposed to work.

And the stuff they're talking about isn't new or radical. Just good common sense grounded in sound basic science. Mostly it's old knowledge that has been lost under the current "chemical farming" regime and the reapplication of this knowledge has the ability to greatly improve our fruit quality and our financial bottom line.

But first we have to get back to basics. Relearn some stuff our grandfathers instinctively knew. Re-establish our soil nutrient balances and biology.

The NPK experiment has failed, depleting our soils of vital micronutrients and killing our microbial workforce. Oh, it worked for a while, but it gradually became the "moreon" philosophy. Every year, to get the same result, we have to put more on. Need to think about that for a bit. Why do we now need more fertiliser for the same result?

I could throw in some basic chemistry and biology here but there are plenty of experts out there who could do it far better than me. I just know the moreon thing is happening and I have a pretty good idea why.

Even Justus von Liebig who first expounded the NPK theory in the mid 1800s admitted his mistake some 20 years later and tried to retract. Unsuccessfully, more's the pity.

I know what you're thinking. But you're wrong. This article is not about organics. Nor is it an anti chemical tirade. In fact the fastest way to restore soil nutrient balances is to use some more chemical. Intelligently, responsibly, selectively, and buffered to reduce any toxic effects.



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Intelligently – use soil tests (Albrecht and Reams) and work towards establishing balances.

Responsibly – not chucking the stuff on willy nilly but responding to an identified need and supplying no more than is needed. Eurepgap demands no less!

Selectively – use the best chemicals, the ones that have the least negative impact on soil biology.

Buffered - with carbon products (compost, humates, carbohydrates, etc) to further reduce harmful effects and provide a home and food for soil microbes

The basics of growing start in the soil. We've all paid lip service to that. You know - healthy soil, healthy plant, healthy people. But it's true! Healthy mineralised biologically active soil produces nutrient dense high quality health promoting food for people. And people are becoming increasingly prepared to pay for that quality.

The initial thrust of biological farming is to correct soil nutrient balances while developing a vigorous microbial workforce.

Why is balance so important? Some more science here that is far more complex than the bit I avoided earlier. Basically all matter is electrical energy – neutrons and protons revolving around a nucleus. Minerals react against each other to create electrical energy, the basics of matter is then manifested in plant functions, growth, etc. This energy can be measured in ERGS (energy released per gram of soil) with a conductivity meter.

Only when all minerals are present in their correct quantities and ratios can they react with each other to release the correct energy flows, those that can support proper plant function

Calcium is extremely important in this process as it is the base against which all other minerals react to produce these energy flows. Even conventional soil science recognises that, with calcium making up about 70 percent of base saturation.

A final bit of science. ERGS is a measure of the amount of energy being produced while pH measures the resistance, or flow of that energy. If the pH is too low there is insufficient resistance and energy is moving too fast to be properly complexed and so is wasted. If the pH is too high there may be insufficient energy flow to support proper plant function.

But don't get hung up on pH. If your readings are above five and below nine you probably don't have a problem. As soil nutrient balances are restored the pH will automatically come into the right range all by itself.

So what is the role of the microbes in all this? The microbes bring together mineral energies securing them into the biological system and as the link between soil and plant systems make those energies available to the plant.



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Without an abundant vigorously functioning microbiology it is not possible to provide enough energy to the plant to produce the high quality food we want to grow.

So it's a two pronged attack – well three really. We have to provide a full range of minerals to the soil, make sure the microbes are there and feed the little critters so that they can do their job.

Let's start with the mineral bit. Soil Test.

For many years we have used an Albrecht style soil test with its concentration on major cations, anions, pH, CEC, and base saturations. Some of us have carried this a little further and tested for a range of trace elements. What an eye opener!

I now consider it essential that the test includes micronutrients such as Boron, Iron, Manganese, Copper, Zinc, Molybdenum, and Cobalt. The test is still a useful tool but it has a problem. The harsh extraction methods used are very good at revealing the total quantity of a given mineral in the soil but fail miserably to tell us how much of that mineral is **available** to the plants. The test shows what is in the “capital account” but it is the “working account” that pays the bills.

Even with its problem the Albrecht test should be performed at least every two years to monitor the “capital account” and provide the initial data on which our winter base dressings are formulated. So long as all nutrients are tested for we can start our move towards balance.

By contrast, the Reams test with its very mild extraction process shows what is available to the plant (the working account). Comparing the two tests from the same sample is usually a huge eye opener.

I saw an Albrecht test recently that showed 8000 Kg of calcium per hectare with a Ca base saturation of 73 percent and a CEC of 24.4. Looked a little high so no calcium in the fertiliser recommendation. But on checking with a Reams test only 500 kg per hectare of calcium was found to be available to the plants (proper function requires 2000 kg minimum). They were starving for the lack of calcium! A calcium foliar catalyst – say calcium nitrate at 5 kg per hectare – would have had a remarkable effect!

I would suggest that a Reams test should be performed several times a year to allow us to manage the “working account”. By Reams testing say at green tip, pre flowering, and during fruit fill, we may be alerted to some minerals that are not present in their correct ratios and are therefore adversely affecting plant performance.

Knowledge is power. We can now do something about it and not just shrug our shoulders at the end of the season and say it looked good till the wheels fell off.

Microbes are the soil plant link providing enzymes, vitamins, and mineral energies from the soil to the plant. The relationship is symbiotic.



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The primary function of a plant is to produce sugar in the leaves through the action of photosynthesis. The sugar is then distributed to every cell in the plant as fuel, and building blocks to create proteins, fats, etc.

About half of the sugar produced is used as fuel (ATP). One molecule of sugar makes thirty molecules of ATP and **every cell** uses about one billion ATP molecules every one to two minutes. About one third of the sugar produced is exuded through the roots into the rhizosphere – a film surrounding the roots – where it is used as food by the microbes living there.

Twenty seven percent of a plant's mass is contained in the rhizosphere and there are 2000 times more microbes living within the rhizosphere than outside it. So the sugar provided by the plant gives the microbes the energy to give back all the stuff the plant needs – as long as it was in the soil to begin with. Neat system!

Plant sugar production can be monitored very easily by testing leaf sap with a refractometer and this should be done regularly. The aim is to reach a brix reading of 12 - higher is even better. (Most “conventionally” fertilised kiwifruit plants will have a brix reading between one and five – check it!)

Once these higher sugar levels are achieved, insect and disease attacks are minimised as healthy plants vibrate to the correct frequencies and do not attract pests.

Insects and diseases are nature's sanitation engineers and home in on signals broadcast by sick plants. Their mission is to seek out, destroy, and recycle those plants.

Foliar Feeding

The amounts of nutrient used in foliar sprays are minute and extremely effective - up to 20 times more effective than applying fertiliser to the soil but are top ups or amendments rather than full fertiliser programmes.

The “moreon” principle doesn't work here. Putting more on is often detrimental and always wasteful.

When applying foliar sprays, a brix reading should first be taken, a test area sprayed, then retested for brix an hour later. If the brix has not lifted by at least two points try a different formulation, or a different rate. It could be you need even less than you were planning to apply!

It is vital early in the season to have calcium and phosphorous mobile in the plant, and small amounts of these as foliar sprays can be the catalysts to encourage the microbes to mine these minerals from the soil reserves.

Sap brix readings should be taken regularly throughout the season right through to harvest with small amounts of foliar nutrients applied at regular intervals to maintain energy flows. Let the refractometer be your guide.



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As I said earlier the initial thrust of the biological farming system is to correct soil nutrient balances while developing a vigorous microbial workforce. The use of fish emulsions, kelp, molasses or sugar, compost teas, and microbial brews are all useful tools to help increase the microbial biomass. And when it all comes together with microbes and minerals working together as nature intended and the plants producing sugar in abundance we will truly produce the best Kiwifruit in the world.

There are some excellent books available for those who wish to learn more.

I would recommend:

Non Toxic Farming Handbook by Dr Philip Wheeler

Science In Agriculture by Dr Arden Andersen

And best of all:

Biological Ionization as applied to Farming and Soil Management

By Dr A F Beddoe