

# PLANT HEALTH—ENERGY MANAGEMENT

## DR. ARDEN ANDERSEN

taken from

### Nutrition Rules! Guidelines from Master Consultants

22 inspiring interviews  
which could change the way you farm  
and alter the way you eat!

with

**Graeme Sait**  
Founder and CEO of Nutri-Tech Solutions  
interview recorded December 1998

Dr. Arden Andersen juggles a variety of professions with consummate ease. His contrasting roles include those of medical practitioner, Air Force surgeon, agricultural consultant, lecturer and published author. His apprenticeship involved an intimate association with three of the legends of sustainable agriculture. He worked with Dr. Carey Reams for several years, he was a research assistant with Dr. Dan Skow and he was a student and field researcher with Dr. Philip Callahan. The growing interest in energy agriculture in Australia can be partially attributed to his regular visits and seminars. Originally heralding from a dairy farm, he has retained a capacity to communicate with farmers and he has influenced many conventional growers to venture forth into the brave, new world of biological agriculture. In his new profession of 'medical agronomy', Arden Andersen is perfectly positioned to become the pre-eminent specialist in the all-important soil health-human health nexus in the decades to come.

Graeme: There is a tremendous interest in sustainable agriculture in Australia at present. Is this growing interest apparent in American agriculture?

Arden: There are definitely more and more farmers looking for alternatives, looking at sustainable agriculture, biological agriculture or whatever you want to call it, but, at the same time, the government agencies are finally admitting to problems that we were talking about fifteen to twenty years ago. For example, fifteen years ago, the State Departments of Agriculture denied the possibility of herbicide-resistant weeds or insecticide-resistant insects but today they are finally admitting to these problems. Farmers are hearing these admissions and realising that they must look at other options. The better managers have often realized these problems in advance of everyone else, and I guess that is why they are better managers—they are always looking at ways to improve their business.

Graeme: Here it has become very much a farmer-driven phenomenon. There is very little direction coming from the various State Ag Departments. It is usually growers themselves deciding that it is time for a change, and I wondered if this initiative was present in your country.

Arden: There is no doubt that it is a grass-roots movement. The information is not coming from the top down—it is coming

from the bottom up. Industry is often forced to change because of grower demand. However, from my experience in Australia, I would have to say that there is a difference in intensity here. It seems like Australian farmers are more aggressively searching for answers.

Graeme: I've recently interviewed Neal Kinsey, and there's no doubt that Neal takes the middle ground. He is obviously concerned not to shake the boat. In contrast, you speak your mind. You have had more of a confrontationalist approach than anyone has in the eco-agriculture field. Have you had any problems from governments or multinationals?

Arden: I must say that I have had no problems. I really believe that the conspiracy theory issue simply relates to the way business is structured. Most of the big businesses are public companies with one expectation—maximum profit. These companies have a mandate to achieve this goal at all costs. Any threat to all-important profits will provoke a serious attempt to circumvent that threat. I just don't see any evidence that there is a conspiracy at the top that is intelligently planning stopping this. I'm not sure I want to give them that much credit. I think it's more the tail wagging the dog, so to speak. From my own personal perspective, I have to live with what I talk about. I have to speak the truth. I don't try to be a confrontationalist, but the people I deal with accept my honest opinion.

Graeme: You are closely involved with the medical establishment. Are there problems associated with talking about alternative systems in that domain?

Arden: There are far more problems in the medical field than in the agricultural field. There is a tremendous amount of fear in medicine. Disease is a

multi-billion-dollar industry, and there's a lot of fear about the gravy train drying up. Realistically this fear may be quite justified. If a cancer cure were discovered tomorrow, you would have many, many unhappy people. There would be many hundreds of thousands of jobs lost. It then becomes an economic issue of survival. It has nothing to do with conspiracy theories. It has everything to do with day-to-day paying your bills, supporting your family and meeting your mortgage. The answer is not that simple. There is an overriding motivation to maintain the status quo. There is really no difference in current sentiments from those 2000 or 5000 years ago. Remember, Copernicus was killed for suggesting that the sun is the centre of our solar system. Throughout history every true scientific discovery or rediscovery has been met with staunch opposition from the establishment. Today we do economic and political assassinations rather than physical assassinations of pioneers, but it is made very difficult for them to survive.

However, the exciting thing that is happening now relates to a 'people-push', a grass-roots drive for change, and we are not looking at a peasant uprising. Recent research shows that interest in alternative medicine is coming from well-educated, successful people. They are not people swaying with the tide. They are investigating for themselves and taking the personal responsibility. It is the same breed of farmer who is looking at alternative agriculture.

Graeme: I agree. Our company's growth has been built upon the written word. We have no salesmen cold-calling on farmers.

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When we began with our 3000-word infomercials, we were told we were wasting our time and money as farmers would never bother with this much information. Well, we proved that there is a great thirst for information about alternatives out there, and the foresight and intelligence of many of our clients confirm the American findings.

Arden: Yes, we find it is usually the well-educated, well-read, successful farmer who is looking for ways to improve things. These people are in the position they are because they have always been forward-thinkers. It is a continuation of their open-minded approach, which has created their success. But, returning to the conspiracy theory, I think it is dangerous if we get too paranoid about possible consequences rather than working at the grass-roots level and simply doing our job in helping other people. I think that what goes around comes around.

Graeme: When talking to Neal Kinsey, I asked him about the differences between the Reams and Albrecht approaches, about the similarities and differences between the two major philosophers in eco-agriculture. What is your opinion about the common ground and conflicts between the two approaches?

Arden: There are some differences, but if we go back and look at Albrecht's huge body of research, we see that the central concept relates to the premise that disease is directly related to soil health. Albrecht and Charles Northern, a couple of decades before him, highlighted this problem. Northern was a gastroenterologist who showed that digestive diseases are directly related to the food that the person ate, which was directly related to the health of the soil. He actually made the first medical/agricultural connection. Albrecht took the animal model and showed that many animal diseases were related to the trace mineral content in the soil and subsequently to the stock food. This approach is essentially identical to the Reams approach, where disease at the animal and human level is traced back to soil health, particularly nutritional balance. Achieving that essential balance is where the differences come in, but these differences are not a problem. There are many roads that lead to Rome, and the ultimate goal is still the same.

Graeme: A major difference between these approaches lies in the diagnostic tools used to determine nutritional requirements. The soil tests, for example, are very different. The Albrecht approach utilizes the Brookside-type base saturation test, while the Reams school uses the LaMotte test. How do these soil tests contrast and compare?

Arden: Well, the Albrecht system is looking for arbitrary numbers in the soil. There is a given list of percentages of various different nutrients required for soil balance. This is an excellent system which can provide valuable information, and Albrecht and Kinsey have been undeniably successful using these techniques. However, I feel that we take it a bit broader than that. The Reams test is unique in its capacity to reflect and describe actual conditions in the field. It is possible to have all the numbers right on the Albrecht test, but still suffer a range of problems. This is where our test comes into its own. The Reams

test involves the LaMotte test format, using Morgan extraction solution. The extraction solution contains weak organic acids, which closely mimic the acids plants release through their roots to dissolve nutrients and increase their availability. The Albrecht test is like a mining assay providing information about the amount of each element in the soil. The Reams test measures the biological availability of these elements.

Graeme: I can certainly see the validity of this sort of test. Nutri-Tech uses the Albrecht-based Brookside tests. We balance the soil using the numbers game, but we also include a variety of biological stimulants and microbial products in all programs to ensure this biological activity. We don't specifically test for it, but we always work to achieve this anyway.

Arden: Well, it's true that we can't have a good biological system without considering minerals. Microorganisms have to have the mineral balance in order to survive. At the same time, we often find that, just because we have achieved the percent base saturations required by the Brookside test, it does not mean that we have that system activated. So we take the next step. We measure biological availability with a Reams test, and then we make decisions about how to achieve biological availability. I have to decide—am I going to use a chemical catalyst, a biological catalyst or a combination of the two to make the nutrients available to the plant? For example, using liquid calcium with Vitamin B12 and sugar is primarily a chemical catalyst to make calcium available, but introducing a microbial or enzyme-based material is a biological catalyst. We find that in certain situations one is more appropriate than the other. Anyway, I agree that it is best to use a combination of the Albrecht and Reams tests to get the full picture.

Graeme: My other reservation about the Reams test relates to the fact that, if it is used alone, there is no cross-reference possible. Good growers monitor their test results over the years. It is possible to correlate Brookside tests with previous test data, but the Reams test is a whole new ballgame. It's like casting the grower adrift in an ocean of uncertainty. It's too much of a total change, even for the best forward-thinkers.

Arden: It is indeed a different ballpark. There is no correlation between the Reams test and any other test, because you are dealing with different extraction methods, but if you have all the ideal Brookside ratios and you don't have a good crop out there, then how do you explain that? The Reams test will explain these problems. Carey Reams spent years correlating various ratios in the test data with actual conditions in the field. The Reams test will reflect what kind of weed you will see in the field, what kind of soil compaction and tilth you will see, and what kind of brix readings you will see in the crop. It is possible to have varying brix readings, even with perfect ratios based on the Albrecht system. The Reams test will explain that variation. As I said, the combination of both tests gives the clearer picture. We need to know and adjust the nutrient bases before activating the biological system.

Graeme: We support a lot of the Reams concepts, and we have very much fused the two approaches, but there are some

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We need it in that biologically active form  
for two reasons:  
One—because of the biochemistry,  
and two—because of the biophysics  
—the energetics that we derive from that system.  
We simply can never get that energy from a pill.*

features of your approach that we have avoided. Our most important concern relates to the use of electronic scanners to monitor compatibility and energy levels of fertilizers. This equipment appears to have huge potential, but the big question mark is the human error component. What is your opinion?

Arden: That is a very good question, and I'm often asked about this. Well, I do a lot of lab stuff in medicine, and it must be said that even the clinical tests, supposedly involving no human involvement, do involve human involvement. Because, who programmed the computer, who sets and calibrates the computer that runs the test, etc? You can take blood and send it to two different laboratories and come back with two different results. The key to scanner effectiveness is the common sense of the operator, and the operator must also have a basic understanding of the basic principles of soil science. The better this understanding and common sense the operator has, the more effective they are with a scanner, and the information provided is no less reliable than that those other testing techniques.

Graeme: This scanner technology has been promoted by yourself, Dan Skow and others for ten to fifteen years. Nicola Tesla came up with the original concept a century ago. Has the concept gained more popular acceptance in recent years, or does it remain a fringe option?

Arden: In my personal realm, interest continues to increase because of my classes, etc. The technology is used extensively in England in natural health and is right up there with homeopathy and acupuncture in that country. In the States it is used predominantly in agriculture. Essentially the scanner is a problem-solver. Most problems can be solved using existing technology, but a scanner with a good operator can solve the really difficult problems. A scanner is not a substitute for good education, good planning or common sense—it is simply another tool. When used properly, it can increase your problem-solving arsenal.

Graeme: I'd like to ask your opinion about the quality of organic produce and the fertility management skills of organic vs. conventional growers. Nutri-Tech has several thousand clients with only a small percentage of organic growers, but in all honesty I would have to say that the best growers producing the best produce are not organic. The best of them are those who are increasing organic inputs to improve quality and increase sustainability. Organic produce is often inferior—the spotty, second-rate produce is obviously nutritionally deficient, and it is clear that there is a lot more to being a good grower than animal manure and idealism.

Arden: Graeme, I fully agree with you. I've found exactly the same sort of thing. It is a fact that some of the best and unfortunately some of the worst produce on the market today have an organic label on it. There are some organic growers who understand nutritional requirements, but unfortunately most of them are strictly following a philosophical procedure, and this procedure says you can't use this list of materials, you may only use this specified list, and, by doing so, you automatically have a better crop. Well, that's not true. Nutrition is the key to quality produce, and it doesn't matter whether you use approved organic materials or some of the unapproved chemical materials.

Nutrition remains the key. The chemical residue question is obviously relevant here, but even this can be a dubious guarantee. There was a study done by the US Geological Survey in 1984. It was in 'The Land' magazine in Minnesota, and they found that the rainwater falling in New York State contained pesticides and herbicides that were applied in Nebraska and the Dakotas—1500 miles from the original spray site the rain is dropping those same toxic chemicals. How can anything be truly organic? The critical requirement for low-toxic food is not necessarily rigidly enforced exclusions. The higher the nutritional values, the healthier the soil and the plant, the less the residue, regardless of the initial application of pesticide, because the biological system is able to detoxify it, and the plants do not pick it up. This fact really throws a monkey wrench in this whole procedural system. The bottom line is—why do we eat food? We eat food for the sustenance it contains. Our body doesn't care what procedure that food went through to get to us. The body needs good nutrient value to ensure it can derive sufficient energy from that food. Whatever works to achieve improved food value is valid and should be adopted. My finding is exactly the same as yours, Graeme. The growers who are already very good growers, very good managers and do a good job of fertilization are the farmers who are moving in the biological direction, and they do an excellent job of producing high-quality, biological products. This may be a bitter pill to swallow for the organic people, but it is a fact.

Graeme: Our motivation for involvement in sustainable agriculture basically relates to a desire to try to improve the food quality of produce, but the prevailing popular philosophy in human nutrition involves the correction of deficits with supplements. There is currently a huge use of these nutritional supplements in Australia and elsewhere. In your experience, is it possible to substitute good human nutrition with bottles of multi-vitamins, minerals and high-tech antioxidants? Can you counteract the junk food with these additives or are you dreaming?

Arden: I think you're dreaming. Supplements are just that. They need to be added on top of a good diet. The space program revealed the shortfalls of this idea. It was found that the astronauts couldn't survive on pills. They came back to earth with muscle loss and bone loss. We simply can't do well without natural food. We see it with patients in my clinic. We can come up with an excellent nutritional supplement program including IV nutrition, herbs, vitamins and various mineral supplements, but supplements are never as good as what nature can put in there in a foodstuff. We need it in that biologically active form for two reasons: One—because of the biochemistry, and two—because of the biophysics—the energetics that we are deriving from that system. We simply can never get that energy package from a pill. Unfortunately, because of our food chain no longer containing the nutrition that it should, we need to augment that shortfall. Supplements are not a panacea, and they should not substitute good food. There is another problem looming, which is related to supplements. Because of the increased demand and public awareness of herbs and other supplements, our native supplies of many of these supplements have run out, and so we now have commercial production using conventional agriculture. These herbs are now deficient in basic nutrition like

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the majority of our food, and consequently their value is greatly decreased. Using chemical principles to grow Ginseng or Echinacea is not a good idea. These medicines no longer work the way they are supposed to. Homeopathic physicians and herbalists have major problems, because of this increasing nutritional deficiency in the materials with which they work.

Graeme: We have had tremendous results with humates and humic acid, and I'm aware that it is possible to use too much of a good thing with these materials. What are the negatives associated with overuse?

Arden: There are two problems here. I agree that humates can provide an invaluable boost to fertility, but, if overused, they are capable of tying up valuable nutrients. Humates have the capacity of binding pesticides and toxic chemicals in the soil. It's a bit like the use of activated carbon for human health. If you were to drink a poison, the initial therapy would be to give you activated carbon, and humates perform a similar function in the soil. However, it is possible to over-apply this material and 'lock up' nutrition as a result. It's like anything that is over-applied. Calcium is very valuable, but what happens when you apply too much? A little is good, sometimes more is good, but a lot can be disastrous.

Graeme: Well, what are the appropriate applications of these materials?

Arden: Well, there is obviously a variation between requirements for different soil types. In some soils dry humates can be applied at up to a ton per acre [approx 2.5 tons per hectare]. It must be remembered these are a slow-release source of humic acids. If the release pattern is magnified with biologicals, then the maximum allowable application is reduced accordingly. Humic acids, on the other hand, are much more available. We find that we can achieve great results with up to 10 to 15 liters per hectare per season. However, if we go beyond 25 liters per hectare per season, then we start seeing decreased yields. We start seeing nutrients going out of solution. They begin to become tied up. We also start to see a decrease in our biology in the soil, because a little is good, but a lot can be disastrous. It's like using sugar or molasses in the soil. It can be a very productive additive, but it can be easily overdone.

Graeme: How much is too much molasses? We use molasses in many of our programs at around 10 liters per acre.

Arden: We also use about 10 liters of molasses per acre, but, if we start using 20 to 30 liters per acre [approx 50 to 70 liters per hectare], we are in the danger zone. 80 liters per acre, for example, can be disastrous. We start getting decreased biology and even fermentation, and the associated production of alcohols, which are not good. We start precipitating calcium when we get alcohol and we can start the process of sterilization. As far as sugars go, we are looking at 9 kg per season per acre. When we cross this threshold, we start seeing a reversal in our benefits.

Graeme: Is there any difference between white sugar and raw sugar?

Arden: As a rule it doesn't seem to make much of a difference. It makes more of a difference, in some cases, whether you are using sugar or molasses. If you have a high iron content, you should be careful of molasses because of its iron content. There are some biological products that shouldn't be mixed with molasses because of the risk of unwanted fermentation. There are others that thrive in the presence of molasses. Sucrose is the primary carbohydrate in both sugar and molasses, but the difference is that there are other minerals present in molasses.

Graeme: I guess this whole issue of use and overuse of good materials is also relevant in relation to the use of crusher dust. You are no doubt familiar with the use of this rock dust material for remineralization and paramagnetic benefits. We have growers who apply several tons per acre every year—Is this a potential problem?

Arden: There are really only two negatives about putting on large amounts of crusher dust. One relates to the possibility of unbalanced mineral content in the crusher dust. Iron can be a problem, and there is even the potential for heavy-metal contamination in some of these materials. The second negative relates simply to the cost of large applications. However, from a biological perspective, the more fertile the soil is, the higher the magnetic susceptibility. It must be made clear that this doesn't guarantee that the higher the magnetic susceptibility, the more fertile the soil, because it depends totally on what makes up that magnetic susceptibility. For example, you don't want a ferromagnetic situation; you want the influence to be paramagnetic. High iron can introduce ferromagnetism to the picture.

Graeme: That is a question I need answered. Does one exclude the other? If you have a very high paramagnetic reading on a Phil Callahan Soil Meter [PCSM] and

you find, on further analysis, that the material contains 7% iron, how do you differentiate paramagnetism from ferromagnetism and analyze likely benefits?

Arden: Yes, the differentiation is difficult, and of course you don't want iron toxicity in the soil. Paramagnetism is lower on the scale as far as magnetic susceptibility goes. It's a range—you start at zero—below zero is diamagnetic and above zero is initially paramagnetic—and then, once you get over a threshold, you are now ferromagnetic. It's simply a degree of magnetic susceptibility—paramagnetic being the lower degree, and it is this low-level paramagnetic energy which is so closely related to soil fertility.

Graeme: Is there a one-on-one relationship—the more crusher dust you apply, the higher you will lift your soil paramagnetism?

Arden: Yes, there is a direct relationship here. The more you put on, the higher your overall score is going to be. There is an obvious dilution effect related to whether you spread it on top or work it into the whole six inches of aerobic zone. If you can influence that zone, the benefits will be greatest. If we can increase soil CGS (units of measurement on the Callahan meter) by 100, we get direct benefits—both with microbes and crop production, particularly root growth.

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"How come these beneficial organisms are not active in the soil now?"  
The reason is because the environment isn't conducive for them.  
When you take these microbial products and add them to soil—it's like taking a human and placing them on the moon without a spacesuit.*

Graeme: Is there a relationship between overall mineral balance and that paramagnetic effect?

Arden: Whatever soil you have—if you increase the magnetic susceptibility, you get better efficiency of whatever you have there. There are benefits for poorly balanced soils, but obviously, if you couple magnetic susceptibility improvements with nutritional balance in the soil, you maximize the best of both worlds.

Graeme: Paramagnetism can be a difficult concept to grasp for growers. Could you provide a simple explanation of this phenomenon?

Arden: Well, when you increase paramagnetism, you are essentially setting up an antenna to receive magnetic energy. It is energy that grows living things. Magnetic susceptibility is basically the ability of a substance to collect electromagnetic energy, particularly radio waves in the atmosphere. Radio waves are very important for driving plant growth and microbial growth. When you increase a soil's magnetic susceptibility, you increase its capacity to harness these radio waves.

Graeme: Thanks. That should help clarify the concept. One of the major differences between your approach and the Albrecht approach, as represented by Neal Kinsey, relates to the size and cost of treatment programs required to correct problems. At a recent Kinsey seminar, it was hard not to miss the despair of some of the broadacre growers present, as Neal talked about 700 kg of ammonium sulfate per hectare and expensive trace element applications required to reach minimum levels. Your approach doesn't involve the numbers game to this extent, and you seem confident that you can lift production in any soil cost-effectively, regardless of its condition. What are your comments regarding these contrasts?

Arden: We believe that it is possible to increase the efficiency of whatever you have. I agree with Neil regarding the importance of having sufficient calcium in the soil to ensure a good foliar response, but if the calcium correction is not feasible, then we look at other options like the concept of providing a localized supply. We might dribble pelletized lime down beside the seed with a little carbon attached to set up a local, available calcium source. We might hit it a little later with a calcium foliar, and we now are starting to achieve that all-important calcium base. This base alone will give you a higher magnetic susceptibility, and you will benefit accordingly. I've seen many soils completely out of balance, which have significantly increased yield simply by adding some paramagnetic rock down beside the seed.

Graeme: There is another conflict here between the two approaches. Neal Kinsey is adamant that broadcasting is the most effective fertilizing' approach as opposed to banding beside the seed. He believes that broadcasting encourages better root growth and ensures a better ultimate response.

Arden: Well, he's absolutely correct, long-term, but the bottom line with many of the farmers we work with is that if you set that demand upon them, we don't get anything done. If we can at least get a foot in the door with inexpensive banding, then

farmers see the results, and they begin to see the potential for improvement. Maybe they will be able to afford to broadcast after these improvements. We simply have to work with whatever parameter we are given. It is undeniably better to broadcast, but what happens when we can't afford the luxury?

Graeme: The Reams approach has a strong emphasis on the importance of phosphate, particularly in relation to its importance in plant sugar production. Carey Reams was a strong advocate of the use of soft rock phosphate to build phosphate levels to increase brix levels. Has this emphasis changed at all during the past few decades?

Arden: The fact is that, if we have problems with insecticides, diseases and weeds, then we have an imbalance in that soil, regardless of what the conventional soil test figures might be telling us. Carey Reams showed that insect and disease problems are related to the brix level of plants. He also showed that weeds are evidence of nutritional imbalance—often involving calcium and phosphate deficits or potassium excesses. Soft rock phosphate, because of its colloidal nature, is a very available source of both calcium and phosphate. When we look at the importance of phosphate in plant sugar production, we must go back to basic photosynthesis, the Krebs cycle and the citric acid cycle, which is in all living microorganisms. Phosphate is a key component of that, particularly in the form of ADP and ATP. If you don't have an adequate amount of Phosphate available, you will not have sugar production, and consequently you won't have

sugar combustion for energy and plant growth. Yes, phosphate remains a primary emphasis in this system, and soft rock phosphate is undeniably the best source of this element. However, it must be remembered that it is the microorganisms which

*Farmers have an incredibly important role to play as food producers. I often hear farmers tell me they don't eat what they commercially produce. They keep a separate plot, which doesn't get all the poisons, that they feed their families. To me this idea embodies an unforgivable lack of respect for your fellow man.*

determine phosphate availability.

Graeme: We use a variety of microbial inocula as part of a balanced program, but there is a tendency for unscrupulous operators to oversell these materials.

Arden: I agree with you, Graeme. You have to provide nutritional balance for a biological system to operate. The question that should be asked is: "How come these beneficial organisms are not active in the soil now?" The reason is because the environment is not conducive for them. When you take these microbial products and add them to the soil—it's like taking a human being and placing them on the moon without a spacesuit. The reason we are not there now is because the environment is not suitable and the soil is no different. We have to provide good nutrition in the soil for microbes to function well. Simply adding a microbial product guarantees us nothing. It is possible to build a good biological system without a microbial inoculation, simply by the use of fish, seaweed, humic acid, composts and sugar. However, inoculants tend to speed up the process. They can give a jump-start.

Graeme: The likelihood of good biological response is conditional on pre-existing organic humus levels in the soil. We design all programs with a view to building these humus levels. Can you offer any new insights into this carbon-building process?

Arden: Yes, I think there is one aspect that is often overlooked

here. It should always be remembered that the quality of your nutrition determines the quality of the fodder that you have to reincorporate into the soil and turn into organic carbon. In many of our conventional soil systems the crop residues comprise an extremely high lignin fiber and very low carbohydrate or free sugar. Lignin takes a lot of energy to break down, and the humus production is limited by this problem.

Graeme: Yes, it's much the same with compost production. Your compost will only be as good as the ingredients it contains. The home gardener's lawn clipping compost is a prime example. If they were to add rock phosphate, humic acid, animal manure and molasses to the clippings, their end compost would be far more productive.

Arden: Yes you tend to reap what you sow. The microbes work more effectively with good nutrition, and you end up with a case of the whole being greater than the sum of the parts.

Graeme: I'd like to take the opportunity to ask a series of questions that may be of help with some of the problem soils we deal with regularly. Firstly, high-calcium soils—soils with 80%+ base saturation of calcium and the associated lockups. Is the foliar option the only way to ensure adequate trace element availability for the crop?

Arden: Foliars are an effective way to get the system to go, but I often like to try to get things in the soil, in can, to get it balanced. I might look at humic acids, carbohydrates like sugar and maybe Vitamin B12 to get things available. That's when the Reams test comes into play. We may appear to have a calcium overload, but how much is available? I've seen sour grass weeds growing in calcite soils, which tells me that we still have, functionally speaking, a calcium deficiency in that soil. I need to do something to get the calcium working in that system. I may use liquid calcium as a catalyst on the soil for rapid activation. I may use ammonium sulfate. This material often works very effectively when we have a high base saturation in order to get some calcium available and to generate some microbial activity. There are many factors determining a plan of action. What is the CEC? Do we have 80% calcium in a sand or clay soil? Are we in an arid or tropical environment? The reason I ask this is because, if we don't have water control in a high-calcium soil, then dehydration is going to be an issue. If you try to do too much at once in this situation, it may produce too much crop for what my late season water supply can handle. So, now I have too much water demand and dehydrate my whole crop, my biological system falls in the sink and nothing works for me. Each situation must be evaluated independently.

Graeme: What is your opinion of the use of natural hormones to manipulate plant growth?

Arden: Yes. I did a research project on gibberellic acid and growth hormones in general at the University of Arizona. I find that, if I understand the energetics of nutrition, I can get the same out of nutrition as I can from hormones. A good example, a colleague of mine, Jep Gates, works in the cotton industry,

where they use a hormone called Pix, in order to slow down the growth of cotton and to get it to set bolls. We can get the exact same thing happening with the use of nutrition. In plant growth there is the Yin (female) or acid energy, and there is also the Yang (male) or alkaline energy. Do you want to set fruit or do you want to get growth? If we want fruit and we have established a good calcium base, either locally or regionally, then I can apply an acid-based foliar and I can set fruit with that. There is a common problem with orchards and grapes, where we have one good year followed by a poor year. This is a nutritional problem.

Graeme: The season can play a big role. We work with a lot of tropical fruit in North Queensland, and this past season there has virtually been no winter. Some growers have had mixed results in manipulating fruiting response in these conditions. Can you offer any advice?

Arden: In an extreme situation like this it means that you need a little more power. A single foliar is simply not powerful enough to get that system to switch. It is also important that, if you use hormones, you run the risk of causing an energy switch without the nutrition to support it. A good base saturation of calcium is the critical factor here. If you have this prerequisite, then you do both a foliar application and a ground application.

*You must always take environmental factors into consideration when using a refractometer.  
For a start, the 12-brix reading must come from the weakest part of the plant.  
You also have to consider the dehydration issue.  
Dehydrated plants concentrate sugar in the leaf, and you will always get a higher reading.  
Always correlate brix readings with field observation.  
If I have a brix reading of 20 and pest problems, then that is obviously an aberrant brix reading.  
When we have factored in all conditions, a true 12 does not have insect problems.*

You come in with something like superphosphate on the ground, which creates a powerful acidic reaction. I might even use ammonium sulfate or a combination of these. Then I come back with a foliar spray of vinegar, phosphoric acid, some household ammonia, seaweed, fish, maybe a little sugar and maybe a deficient trace element. Amongst these basic ingredients, vinegar should be apple-cider vinegar, the carbon (sugar) is in there to

buffer it, so I don't bum the leaves. I may include humic acid, if I can get it to mix (we always do a jar test first). Seaweed in general works better on the leaf and fish better in the soil.

I had a 100-acre walnut plantation in California, which had produced so badly that the farmer was going to rip them out. It was a species that became notoriously unproductive after fifteen years—these were eighteen-year-old trees. I said, "Well, just give us a year, and we will see what we can do." We had to hit that with three heavy foliars in order to kick it over to fruiting. He had been yielding only a quarter of a ton per acre. The first year he had between 1/2 and 3/4 of a ton, the second year he got over a ton, and the third year he had 2 tons—so much for the waxing and waning of years. And not only did he eventually increase yield by 800%, but he got a premium, because the nuts were of superior quality. We had already prepared the nutritional base, but we still had to hit with a foliar once a week for three weeks in order to get the system to switch.

Graeme: What is the reason for your use of household ammonia in your foliar recipes? Why not use ammonium sulfate or any other ammonia source?

Arden: You have to be very careful with ammonia when you are putting it out on the crop. If you put too much out there on

the crop, and your brix reading isn't high enough, Phil Callahan has shown that ammonia is the most effective radiation pump to call in the insects. You just need a little ammonia, so you are just kind of teasing it out there. We always prefer to use ammonium sulfate in the soil to encourage microbes and to get the calcium working, and we use a very diluted ammonia in the foliar recipes. This usually seems to work best. Remember that you also need to include a carbon with ammonia, so you don't lose it. We use sugar rather than molasses, and it also buffers against leaf burn.

Graeme: Is that one of the reasons that seaweed works so well in broadacre foliars, where four liters of product in forty liters of water is a dangerous dilution rate, but if you add seaweed, you don't get burning? Is it the complex sugars in the seaweed providing this buffer?

Arden: I think so, yes. Plus you are providing hormones and other broad-spectrum nutrition, so that the plant is better equipped to handle the stress.

Graeme: I'd like to ask you for your evaluation of the reliability of monitoring brix levels and associated plant health using refractometers. How solid is the high brix / pest resistance connection? Does a good brix of 12+ automatically confer pest resistance?

Arden: You must always take environmental factors into consideration when using a refractometer. For a start, the 12-brix reading must come from the weakest part of the plant. You also have to consider the dehydration issue. Dehydrated plants have concentrated sugar in the leaf, and you will always get a higher reading. You must always correlate brix readings with field observation. If I have a brix reading of 20 and I have pest problems, then that is obviously an aberrant brix reading. When we have factored in all conditions, a true 12 does not have insect problems. Let's take sweet com as an example. You may take a reading of the ear and you may have 24 brix, yet the com borers are running rampant. What you will find with that sweet com is that, if you take a reading of the stem or the main roots, you will have a brix reading of 4 or 5. What's happening is that nature is moving all of the carbohydrates into the ear in an attempt to reproduce the species, so it's a fictitious level in the cob. The other influence at work here can be genetic manipulation and breeding, where free sugars are forced into the fruit without the plant having the opportunity to utilize these sugars to keep the whole plant healthy. So, again you look at the weakest point of the plant—you don't measure the fruit. Another source of false brix is what we call vascular plugging, where there is no sugar transport out of the leaves. It just sits there, but it's not healthy. It's just like constipation in humans. You could say you're full, but you haven't had a bowel movement in a week. If we take these things into consideration, then the refractometer is a very valuable tool to monitor plant health. Remember though that all tests should be used within a context as to what you are going to do about it. You may need to correct a deficit or you may need to catalyze availability with a biological, but you make that decision based on a variety of observations, and refractometer readings are one of those. Even conventional analysis should be considered within a context like this. It is common, for example, using conventional leaf analysis, that you will be told that your nitrate is low. However, your crop may be doing fine—it's putting on

*The fact is, if we have problems, with insecticides, diseases and weeds, then we have an imbalance in that soil, regardless of what the conventional soil test figures might tell us.*

fruit, the fruit is growing and you don't have an insect problem. One sure way to get insect problems in this system is to add nitrate nitrogen when it is not needed, because then you lower your brix reading, you get more water in the plant and the insects move in. No test data should be used in isolation. If the field evidence contradicts the test results, then more evaluation is needed before taking action. For all deficiencies you must always evaluate whether it is a quantitative or qualitative deficiency.

Graeme: I was wondering about your experience with weeds. Weeds are often called a signpost to nutritional deficiencies. Do you have concrete evidence of this nutritional link?

Arden: Absolutely and without question. Three to five years into a program weed problems begin to significantly diminish. Sour grass weeds are indicative of a functional or qualitative calcium problem. It may be quantitative, too, but it is a functional calcium problem. Broad-leaf weeds are a functional phosphate and potash issue, and succulent weeds (the viney things on the ground) are a carbohydrate issue. Another interesting thing is that, when balance improves and brix readings go up, then the brix in the weeds goes down. The insects go from eating the crop to eating the weeds. Again, if you're not out in the field looking at these things, you won't see them.

Graeme: Are you familiar with a balancing philosophy popularized by a New Zealand consultant, Peter Lester, which has an emphasis on the importance of manganese? His clients put on high manganese applications, and many claim results.

Arden: Yes, I am familiar with this approach, Graeme, but I suspect that they are misreading their results. It goes back to energy. Anytime we

are using a metal we must remember that a metal is a very strong conductor. You can apply metals when you may not necessarily need them, and they are a tremendous conductor. You can instigate large amounts of energy release in the system. You think—"I put manganese on and I got this great response"—but it need not necessarily be the case. The strong metal conductor gave energy release, which in turn gave the crop response.

Graeme: Energy release and nutrient release are obviously two sides of the same coin, but there are some questions I'd like to ask about the phenomenon of nutrient release in general. We have had good results releasing tied up nutrients by biologically activating the system, but the hardest element to release has been potash. Even though there can be huge amounts of this element locked up in heavy soils, we rarely see good nutrient release gains reflected in subsequent soil tests. Can you throw any light on this problem?

Arden: You must remember that the crop will consume a lot of potash, compared to phosphate, where some is consumed, but a lot of it is cycled. Crops use large amounts of potash and calcium. You may be successfully releasing potash, but it is being used to produce the crop. With the Reams test we find that potash availability is directly related to our calcium availability. This is a functional and qualitative issue. It has nothing to do with conventional soil test numbers—it has to do with bioavailability. When we make calcium biologically available, then it seems to be easier to get our potash functionally available.

Graeme: While we are talking potash, what are your feelings about the use of muriate of potash vs. sulfate of potash?

Arden: The only time we would consider muriate is if the soil needed chlorine. Chlorine is actually required at about 10 ppm, but you will appreciate the fact that very few soils today have a chlorine shortage. In conjunction with Dan Skow, Phil Wheeler and several other organizations, we are farming several million acres with this eco-agriculture, biological approach, and we are doing this successfully without using muriate of potash. Muriate is destructive to beneficial organisms, and it also affects active carbons (basically all salts tend to do this). It is really a poor energy producer. Many conventional programs have inadvertently replaced calcium with potash, and quality suffers as a result. Muriate is a strong salt that increases conductivity, and it can produce growth, but it is not sustainable. It sterilizes the soil, and sulfate of potash is a far better material in this regard. We really have to get our calcium base moving, and then remove muriate of potash from the program immediately, or, in some situations, we may need to take it a little more slowly.

Graeme: I would like to know your opinion regarding the relative benefits of conventional vs. organic systems. Do you prefer either, or would you rather have a combination of both? In my opinion, a functional hybrid works better.

Arden: I think you're absolutely right. Our concept of biological farming is the best of both worlds. The conventional system has learned to manage business on the farm very well. They are very efficient managers. The organic system acknowledges the need for biological balance with non-toxic inputs. Unfortunately they may not be doing a very good job achieving this balance, but at least they understand the imperative. We combine these two systems. We use good commercial fertilizers—if used correctly in a biological system, they do the job very well, and the ultimate goal of course is producing nutritionally rich food. However you achieve this goal is valid. Biological farming should be both economically and ecologically sustainable—we have to have both. Farming may be a great way of life, but only if you are profitable enough to pay your bills.

Graeme: There seems to be a genuine spiritual component to your work. Carey Reams was a profoundly religious man. Dan Skow appears to be of a similar ilk, and one of the chapters in your book is titled "*The Divine Blueprint.*" How important are your personal beliefs in your work?

Arden: Well, I think it's a legitimate question. I think it has to do with the question "*What are you doing your work for?*" As a physician, my concern is the link between human health and soil health. Farmers have an incredibly important role to play as food producers. I have often heard farmers tell me that they don't eat what they commercially produce. They keep a separate plot, which doesn't get all the poisons, and that is what they feed their families. To me this idea embodies an unforgivable lack of respect for your fellow man. The ludicrous thing is that even this selfish attempt to protect your own family from poison is often pointless, because your children will eventually marry outside of the family and that polluted food you produced and sold may well have fed your future daughter or son-in-law. As a farmer, anything I do affects my neighbors and future generations. I see, as "a physician, that the food that people eat determines their health. The integrity of the farmer determines the integrity of that food chain. Those farmers who acknowledge that

connection seem to find the answers to their problems. They are motivated by a compassion for their fellow man and a compassion for the soil, because they want their children and grandchildren to have the opportunity to farm. These are the big success stories in eco-agriculture. They are the ones producing the best quality food. It doesn't matter what religion you subscribe to. The basis of all religions is that you take your fellow man into account and you treat your fellow man how you would like to be treated yourself. We are not an island unto ourselves. Whatever we do affects our fellow human beings, and, if we understand that, our decision making process is different. We should still make profit—we were meant to be profitable—and it is a lot more rewarding, however, achieving profitability sustainably.

Graeme: Finally, I'd like to ask you about your reasons for becoming a Doctor of Medicine after years as a leading agricultural consultant. Why did you decide to move in this particular direction?

Arden: Well, for many years I had been interested in going to medical school. Carey Reams encouraged the idea, and Phil Callahan also encouraged me to do that. Most of the earlier researchers I really respected, like Charles Northern, for example, had combined agriculture and medicine. They made that direct connection between soil health and human health. I also noticed how many farmers were ill from pesticide use whether it be more and more birth defects, lung diseases like asthma, environmental sensitivities, chronic fatigue, etc, etc, and they had nowhere to go. There was no one really pushing the connection between their farming practices and their health. So I decided to take the plunge and go to medical school. Now, when I speak about soil health,

I can make the connection between what you, the fanner, is applying to your soil and what you, the patient, comes to me with symptom-wise. I can now offer a wider understanding of the importance of biological farming. Not only do you need to be profitable, but you also need to be healthy to enjoy that profit. Many of my patients are fanners, and I relate very closely to these people. The laws of nature apply to all living things. The human body and the soil are closely linked. The digestive system is the closest parallel. My increasing understanding of each system adds to my ability to make these analogies to fanners. I now feel better equipped to help make a real difference through my medical practice and through my teaching of the principles of biological agriculture.

Graeme: Thanks for time. I really enjoyed talking with you.

Arden: I really enjoyed Australia, I look forward to returning.

*taken from*

## Nutrition Rules!

### Guidelines from the Master Consultants

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**Soil Therapy Pty Ltd**

PO Box 338, Eumundi Qld 4562, Australia

[www.nutri-tech.com.au](http://www.nutri-tech.com.au)