How to grow (or buy) healthy food

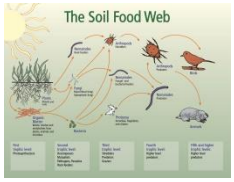
Colin Austin 28 June 2015

Preface

I felt I needed to share my experiences in learning how to grow healthy food. But I did not want to write a dull boring instruction manual so decided to write this as a personal story of how I tried to find solutions to Xiulan's diabetes (my Chinese wife - pronounced shoelan). I describe the basic principles of healthy food in the following chapters.

I write about how critical diet is to health and describe the basics of healthy food - how we have food to provide us with **energy** and food to **regenerate** our bodies.

I then go on to write about my battle to understand the total bag of worms that is the diet industry and how I learned that our modern diet has an excess of energy food but is lacking basic nutrients which is needed to regenerate our bodies and how important it is to get critical minerals such as selenium, magnesium, chromium etc. into our diet. Overfed and undernourished.



Almost finally I write about how to grow plants which contain these critical nutrients - how adding these minerals to the soil is essential but not enough. An active soil biology must be developed to release these minerals so they are available to the plant which embed them in phytonutrients (plant base chemicals) which are essential to health.

Naturally I am encouraging people to grow their own healthy food - but this is not enough. It requires an act of superhuman dedication to grow the full range of health plants on a continuous basis.

So I also describe a free web site www.healthyfoodassociation.com I have set up to bring people who are concerned about their health together with growers who are willing to put the time and effort into growing genuinely healthy food.

Chapter 1 Diet and health – a personal experience

Coming up

A personal experience of why diet is so important for our health.

Xiulan's story

Sometimes a story really needs to be told. This is the story of how Xiulan came to Australia, contracted diabetes leading to problems with her eye sight which in turn led to her falling down a flight of steps and breaking multiple bones in her foot and how - after the operation - her foot started to turn black with the fear of amputation.

It's a story of studying massive amount of information on diet and health, how critical a healthy soil is to people's health and how to grow plants with a high nutritional content.

It is a story about the chronic misinformation about diet and diabetes, how the global food companies put profit before people's health, how multinational corporation seem to have the power to manipulate populations and the Governments who should be there to protect us from exploitation and deception.

Don't worry - it has a happy ending - Xiulan is fit and healthy - her eyesight is good and her foot is now daily better - she is out in the garden showing fit young men how to dig holes with a mattock.

But it is not just a story for entertainment - at the minimum it shows how to improve health by literally 'growing' healthy soil full of minerals and an active soil biology - which is the key to healthy food - and perhaps it may even create an alternative food supply system so other people can avoid fighting the battles that we have been through.

Xiulan's journey

Xiulan (it means show flower and comes from a specific type of orchid) was a respected surgeon in her professional life. She was trained in western medicine but has a good knowledge of traditional Chinese medicine.

I had surgery on my knee which was a disaster which left me virtually crippled. I was reluctant to have more surgery so went to China to look for alternative medicine where I met Xiulan.

She introduced me to a Chinese knee specialist who basically confirmed what I suspected - that there was no alternative but a complete knee replacement.

I accepted the inevitable and decided to come back to Australia and have the operation performed by one of Melbourne's leading knee surgeons. Thanks to Australian Rules Football - Melbourne is knee capital of the world.

Xiulan volunteered to come back to Australia to look after me following the operation. If you could have seen how this slight Chinese lady pushed me around in a wheel chair you would appreciate how well she cared for me. (That's not really Xiulan)

So always quick to spot a good thing when I see one I asked her to marry me.

When she first came to Australia she was fit, healthy and slim. After three years in Australia she was diagnosed with diabetes.

Overload

At that time I had no experience of diabetes and at first I thought this was just a problem for Xiulan and me. But I began to read and the statistics are dramatic.

Thirty years ago some 1% of the population was diabetic. This has now risen to some 11% and even more dramatically some 50% of the population is now either pre-diabetic or overweight. The biggest increase is in the young.

This is an issue of massive global proportions - even the bean counters recognise that this is the largest drain on our health services. The diabetes services are overwhelmed - there is simply not enough specialist staff available.

Diabetes is associated with poor diet so naturally we went to see a diabetes diet specialist. It was like a sausage factory with a standard formula for everyone.

I now know that people react very differently so diets have to be individually tuned to their physiology and psychology.

Diet it is not just about the physical aspects of food - when it comes to eating the emotional and psychological factors matter. China is an ancient country with a history extending back over 4,000 years. For much of that time famines has been a feature of life. But the worst famine occurred when Xiulan was eleven years old - in her formative years. Some 60 million people died of starvation - three times the population of Australia and more than were killed in the war.

The babies and young were the first to die, parents would never eat their own children but it is reported that people would exchange dead corpses to eat. This is shocking to us but nothing to the psychological impact of people at that time, they are emotional scarred. The Chinese are obsessed by food - a common greeting translates to 'have you had rice' (have you eaten).

Go to China and they always give you more food than you can possibly eat. When I was a kid I was told to clean my plate - that was my culture. In China to clean the plate is an insult to the host for not providing enough food.

A regimented and restrictive simply diet does not fit in with this cultural clash.

Traditional Chinese food is healthy - rice (in the South) or wheat (in the North) with a lot of vegetables. But that would be a very boring diet so the Chinese have developed a cuisine in which some animal fat and a wide range of herbs and spices are used to add flavour.

Believe me it is very tasty. I once experimented with a vegan diet and after several months I was just bored with the plain food. I experimented by adding Chinese sausage and herbs to the vegetables and it completely transformed them into a tasty dish.

The standard diabetic diet we were recommended precludes certain food such as fats and dairy. It may be fine in theory and is certainly not meant to be a high carbohydrate diet but in practice that is exactly what happens. Carbohydrates are the worst food for diabetics stimulating the release of insulin which is extremely dangerous.

Xiulan would try and conform to the instructions and became extremely hungry but just could not eat any of the prescribed food. She would complain 'I am hungry but there is nothing to eat'.

Eventually she would become so hungry that she just gorged out on quick acting carbohydrates (junk food).

Apparently they call this Yoyo eating.

The result was violent swing in blood sugar levels which is extremely dangerous and leads to violent moods swings of anger and depression.

Not good.

She began to have vision problems - fell down and broke several bones in her foot. It did not recover properly and started to turn black so amputation became a real possibility.

I blamed diet and so started extensive research into the diet, health and diabetes - and what a bag or worms I found. Not just quacks promoting their pet cure with no evidence but highly qualified medical doctors and researches having diametrically opposed views

But then there was the multinational food processors who seemed to have uncontrolled power and the inability of the bureaucracy to adapt to the health challenges.

I want to write about my adventures into the wonderful or not so wonderful world of diet in the following chapters. But just for now I want to tell you that I learned there are really two types of food.

We need food to provide the **energy** so we can be physically active - **energy food**. But we also need food to regenerate our body parts - **regeneration food**.

Energy food is chemically simple, cheap and plentiful and generally we eat too much of it.

By contrast regeneration food is intrinsically complex. Science has identified the minerals needed and a broad spectrum of vitamins. But new vitamins are still being discovered and plants produce a whole range of phytonutrients which may have been identified but we are still not sure the exact role they play in regenerating our bodies but these plant based phytonutrients are clearly important to our health.

We know that factory farmed fruit and vegetables based around chemical fertilisers, insecticides and herbicides may be cheap but simply do not provide the minerals and phytonutrients essential for health.

We need to add minerals and trace elements to the soil and use micro-biology in the soil which converts these to intermediate soluble chemicals which can be absorbed by plants which then produce the complex phytonutrients which are crucial for regenerating our bodies.

I want to write about how to grow plants with these phytonutrients which are essential for health.

While I want to tell people what I have learned about growing healthy food I just do not think that it is practical for everyone to grow all the healthy (or regeneration) food they need. So I am setting up a system where people who appreciate the need for regeneration food can get in contact with growers who take the trouble to grow food with these health benefits.

Coming up in the next Chapter

I work my way through the confusing and contradictory advice provided by diet and health specialist to try and unravel the apparent contradictions.

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Chapter 2 Statistics and the diet controversy

The story so far

In the first chapter on 'WHY' I made the point that you have a choice - either be fit, healthy and feel younger for the rest of your life of your life or - risk going blind, having your legs or arms chopped off from diabetes, ending up in a wheel chair dribbling out of the corner of your mouth following a stroke or at least - mercifully short - dropping dead from a heart attack.

I talked about some of the experiences Xiulan and I had had in facing her diabetes brought on by poor diet and how we received dietary advice which aggravated rather than helped her control her blood sugars.

What's to come

Now I know it sound dead boring but I want to talk about the science of statistics. Don't turn of yet! The reality is our knowledge of diet and health is largely based on the statistical analysis of large trials involving thousands of people. If they all led to the same conclusion we would not have to worry about the statistical analysis - we could simply say that is what the experts say and we could get on with growing healthy food - which is really what this series is all about.

However they do **NOT** come to the same conclusion - the world of diet is full of strongly opposed views. It also misses a dramatic conclusion - the minerals and nutrients in the soil in which our plants grow have a major impact on the hormones which control our bodies - making us either healthy or fat and prone to decease.

But WHAT should we eat?

Before I start I want to clarify some points. Because of our health issues we have put a great deal of effort into researching diet, Xiulan is a doctor and my expertise is in science and innovation so I feel we have the expertise to acquire significant knowledge on diet.

However our prime motivation is to develop a diet for **our** health and situation. We are very happy to share our findings and if they are helpful to you that is great - but we are not offering dietary advice. Also we had our own targets; we accept the reality that our DNA can only reproduce a finite number of times so our life span has an upper limit so our focus is being fit, active and healthy while we are alive rather than aiming to live for ever.

Also food is not just about health, food and sharing meals with friends is (or should be) a source of pleasure. We want to enjoy our food.

Also we like to travel and often it is just impossible to get the sort of food we would prefer to eat, so at times we accept the reality of having to eat food which is not as healthy as we would like.

These decisions are personal - we are not trying to tell other people how they should eat.

Why do we eat?

We first asked ourselves what may sound a silly question “why do we eat?”

We eat for two very different reasons 1) to get **energy** and 2) to **regenerate** our bodies - (and because we simply like to eat it - should be a very pleasurable and social experience).

Modern food has an excess of energy but is lacking in key nutrients (overfed and undernourished). For us the most important factor was to regenerate our bodies.

Obviously we have to watch our energy levels but having a diet which regenerates our body parts so we can remain fit and active is crucial for us.

But it is not so easy - there are so many options and much contradictory information, just a few are the low and high fats diets, Atkins, Biggest Loser, DASH, gluten-free, Jenny Craig, Mayo Clinic, Mediterranean, Nutrisystem, paleo, South Beach, TLC, Weight Watchers and so on.

Where to start?

Ask Mr. Google (or search YouTube) using key words such as diet and health, diet and diabetes, metabolic syndrome, hormones and hunger.

You will find dedicated and competent doctors arguing their viewpoint - Drs Michael Gregor, Tel Oren, Caldwell Esslstyne, Robert Lustig, Hoanna McMiller, Colin Campbell, Wortman, Douglas Lisle, Sarah Hallberg, Joel Fuhrman, Gary Taubes, Nina Teicholz would be just a few.

But their recommendations are in dramatic conflict, particular on fat, meat, eggs and dairy.

By chance it happened that in my search I watched a YouTube video by Dr Jay Wortman followed immediately by Dr Dean Ornish.

When I watched Dr Wortman presentations it was obvious he really had a good understanding of the issues and presented much valuable information based on sound experimental trials and I was totally convinced that this guy had the formula.

We need to incorporate more fat into our diet.

Next I watched Dr. Dean Ornish and again he was clearly on top of his job, presented the results of many well conducted trials and came to absolutely the opposite conclusion.

We need to eliminate fat from our diet.

How can two highly competent doctors armed with data from well conducted trials - with virtually total agreement on the basic principles of how the body works come up with diametrically opposite views?

This is what these chapters are all about - sorting out the meaning from the available mass of information and contradictions.

Sorting out the meaning

As I studied the information it became clear that we have been using models which are unrealistically simple. One oversimplification is thinking that people are all the same and one diet will fit all.

Both doctors are correct.

If a patient arteries are clogging up and death is imminent then an extreme fat free diet may keep him alive - but this may only be necessary for a small proportion of the population.

The bulk of the population is suffering from health problems stemming from being overweight It is common to have a diet which is too rapidly digested giving sugar spikes causing the body to overreact (by pumping insulin into the blood) this in turn leads to excessive drops in sugar and a craving to eat again.

Fat slows these cycles and may benefit many people.

Mechanical use of statistics - **without human judgements -** can result in oversimplification of complex issues.

Another over oversimplification is the misuse of thermodynamics saying we get fat because we eat too many calories. The body has a complex control system which can send fat to tums and bums or to poop and pee. The solution is to manage our control system by what we eat rather than simply restricting calorie intake.

Eat right not less.

Many years ago I studied both statistics and thermodynamics at University, they were difficult and far from being as entertaining as a James Bond Movie - and not much has changed. However to sort the meaning out really needs an appreciation of these disciplines so there is no way I can avoid talking about them.

I have tried to make them more interesting than my old lecturers did by telling horror stories and jokes but the key message is simple - **Eat Right Not Less**.

Take 1 doctor add - 1 engineer - stir well and let them fight it out

How can I make sense of this and what qualification do I have to conduct this analysis? I am not even a doctor - I am an engineer - but my wife Xiulan is a doctor and she takes her wifely responsibility of telling her husband that he has **got it wrong** very seriously.

She takes the message from Tammy Wynette song ‘Stand by your man’ to heart and won’t give up until I stop **getting it wrong**.

So how could an engineer make any contribution to the debate on diet?

I am always surprised by the positive image engineers seem to have - true we do build aeroplanes, computers and dish washers that seem to work.

But while we may appear competent to the outside worlds the truth is that mostly we have no idea what we are doing - but somehow manage to disguise our incompetence to the rest of the world and struggle through.

Why have we so little idea about what we are doing? Simple - if we want to keep our jobs or keep our company solvent then we have to make products that actually work - and on time and on budget.

There is too much to know and too little time to learn it. The greatest skill of an engineer is managing ignorance.

We often say we are in the applied science business - we study science then go out and apply the findings. A scientist can study something and may be if he is lucky come up with some world shattering breakthrough but generally they make small advances with some issues still unresolved.

They can then quite happily admit that further research is needed and go off and apply for another grant. (Actually it is more likely to be a she scientist but since I found out the Government wants to change the kids rhyme from Baa Baa Black Sheep to Baa Baa Rainbow Sheep I have decided to give being politically correct away.)

Engineers have to somehow deliver product so we have to take what information is available from our scientist colleagues and apply it as best we can. Scientist can study in their particular area of speciality but we engineers have to study so many disciplines, if we are designing a car we have to know how engines, gearboxes, transmission work, the dynamics of road holding, how to form metals and plastics etc.

It is simply impossible to know everything that we really should know - so how do we struggle through?

It is by the process of extracting a simple mechanism or principles or general rules from the vast amount of data. Scientists conduct tests and measure things collecting vast amounts of information. With the improvements in instrumentation and recording technology this data is generally correct.

The weak link is going from good data obtained by reductionist science to a general principle which can be widely used.

This seems to be at the heart of the problem with dietary understanding, good data which fails to lead to sound general principles - from going to the specific to the general.

Trying to unravel the data

I love the internet; it opens up global information to me sitting on my veranda watching kangaroos. This is where I get most of my information from on diet (plus of course my friends in Bundaberg library). But there are two great traps.

In the internet world people often use the term ‘pancake knowledge’ - there is so much information that it is impossible to know anything in depth - so we end up knowing a little about all sorts of things.

To understand the basic principles you need depth of thinking.

The second is **google bias**. I like red wine and chocolate; I could google *‘health **benefits** of red wine and chocola*te’ and would get a whole bunch of scholarly articles praising the benefits of red wine and chocolate. I could feel very smug and go and gorge myself.

But if I want to be honest I need to google *‘health **hazards** of red wine and chocolate’* - then I can see the counter arguments (which I may just decide to deliberately ignore - I am human too). The web tends to reinforce existing prejudice or paradigms.

Which is bigger 5 or 0.15?

Smokers are 5 times more likely to get lung cancer than non-smokers. This is a result of statistical studies and 5 times is so big no one is going to question it - simple stop smoking. Clear as a bell!

But look at the data on diet and health. We don’t see big numbers like 5 but really very small numbers like 0.15 or 15%. When we see numbers like this we tend to get suspicious and question whether it is really true or is there something else going on.

I have done this and it has led me to some dramatic changes on the way I think about diet and health. But to do this I have to talk a bit about statistics, which I know most people find just plain boring - but I actually want you to read this stuff - so I am going to try and lighten it up with a horror story and a joke.

A horror story

Imagine there is this deep gorge you want to cross. Hundreds of meters below in the bottom of the gorge are white water rapids flowing over rocks.

Swimming in the water are flesh eating piranhas fish and crocodiles, this gorge is also home to the world’s largest snake which can swallow people whole. There are also the giant carnivorous birds which peck your eyes out first before attacking your stomach, and then of course there are the killer hornets which can sting you to death.

Even if you manage to escape all these there are the mites that live in the slime covering the rocks. These penetrate your skin - get into the blood stream and eat your organs from the inside leaving just the skin.

The only good news is that you are almost certainly going to be killed by the fall onto the rocks so won’t have to suffer knowing what is happening to your body.

Why do I bother to write about food? It is much more fun writing horror stories - move over Sigourney Weaver and Aliens.

Anyway you say to me *"Colin you are an engineer can you build us a bridge over the gorge"*. Being a decent sort of fellow I build a bridge out of local vines and say "go for it"*.*

You look at the swinging vines and ask the obvious question *"Is it absolutely safe".*

Here I start to lecture you about probability. In this world there is nothing that is absolutely safe - it is all a question of probability. There could be a one in a hundred million chance that the bridge will collapse or a one in a hundred or one in ten.

So naturally you want to know what the probability of failure is so you ask me for my assessment.

"Well' I say *"there is a 15% probability that you will reach the other side. The bridge is 20 metres wide so after taking three steps the odds are that the bridge will collapse".*

You may not be too impressed by this so being a nice guy I put some really strong steel beams over and explain that this is still not guaranteed - all I have done is to improve the probabilities.

So why tell this silly story - just to make the point that there is a lot we do not know for sure about diet and health and the correlations are really very low. Compare diet data with the data for smokers when you are 5 times more likely to get lung cancer. This is a serious correlation which we can virtually take as a fact.

In comparison our knowledge of diet and health is much shakier - there is simply a lot we do not know - but we still need to take decisions.

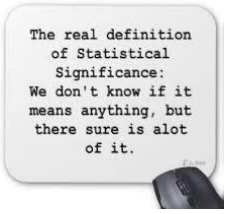
Not safety factors – ignorance factors

I was trained as an engineer and the job of an engineer is to make something work in a state of ignorance.

The first lecture at University is about safety factors - these are not safety factors at all but ignorance factors - how to make sure things don't fall to bits even when you don't have all the facts.

The A, B, C of statistics

Engineers don't really like statistics, but we are such an ignorant bunch that we have to use them. Give us a nice simple formula like **stress = load/area** and we are like kids at the beach. But give us statistics and we become grim faces and suspicious - give us a mechanism - we cry in unison.



Statistics uses the term *'significant'* which like many technical terms has a specific meaning which is different to general usage.

Nowadays all statistics are managed by software, a highly sophisticated but mechanical process which looks at all the data, calculates out what is the natural variability and if some factor seems a bit unusual e.g. unlikely to happen by chance - it is classified by software as significant.

To impress us - it even gives us a number to measure how significant it is.

This is very different to what we - as thinking humans - may say is significant - the importance of this I will soon show.

Let's take a couple of examples of correlation between A and B. The security of results is measured by sample size and the length of time the results have been measured.

The correlation between **obesity** and **mobile phone** use is very high, far higher than most of the publicised correlation data for diet and health. We can collect data for hundreds of millions of people going back over thirty years - good data.

Our first thought is to find the cause and effect.

One possibility is that people get fat because they use mobile phones. This seems feasible as time spent on mobile phones involve little activity so it is quite reasonable that people who use mobile phones would get fat.

Another possibility is that people who are fat find it difficult to be active so use their mobile phones a lot.

Which one is right? Well neither A or B but factor C which was never fed into the computer.

Over the last thirty years there has been a dramatic change in technology so mobile phones have become more sophisticated as has the food processing industry (making products like high fructose corn syrup) which now dominates our food supply.

But no one told the computer about this so it was not analysed.

My favourite A, B, C is that bright red cars get more speeding tickets than dark blue cars (true). Now believe me - I am an engineer - painting a car red does not make it go faster.

Factor C is that bright red cars tend to be bought by adolescent males whose brain is saturated by sex hormones, so they buy bright red cars to attract the chicks and also drive faster.

These examples are just a bit of fun but let us look at one that is for real.

One of the most important studies on diet and health was the China study which came to the uncontested conclusion that a diet high in vegetables leads to better health. Now this was a well conducted proper scientific study and I am not suggesting that the results are in doubt - but there is one interesting anomaly that the computer analysis completely missed.

It has a profound effect on how we think about diet, a theme I will pick up in the next chapter.

Coming up in the next Chapter

The next chapter will lead to a dramatic conclusion - the minerals and nutrients in the soil in which our plants grow has a major impact on the hormones which control our bodies - making as fat and prone to decease or alternatively fit and healthy.

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Chapter 3 Statistics and the diet controversy

The story so far

So far I have been a bit dramatic on how diet affects our health and then trying to unravel the opposing views on dietary recommendations which maybe led me to be a bit tedious on the statistics on which much of our health advice is based.

I have just started to introduce the idea that the nutrients in the soil play a critical role in health.

What's to come

I want to debunk the view that our bodies are just some dumb machine and we can control our weight and health by simply restricting our calories intake.

Our bodies have a highly sophisticated control system based on hormones. We need to eat the type of food which will change our hormone balance. Instead of depriving ourselves of food so we run around craving more food we need to eat the type of food which make us feel satisfied so we no longer want to keep on eating.

The China Study

One of the most important studies on diet and health was the China study which came to the uncontested conclusion that a diet high in vegetables leads to better health. Now this was a well conducted proper scientific study and I am not suggesting that the results are in doubt - but there is one interesting anomaly that the computer analysis completely missed.

The Himalayan plateau

In the high Himalayan plateau in the West of China live tribes of people who eat virtually nothing else but meat yet are still very healthy with long and active lives. The numbers of people are so small compared with the size of the study that they are not seriously significant - just a statistical anomaly.

Now it may not be very significant in the statistical sense but to me - as a thinking human - this could be highly significant (in the popular sense of the word).

The climate in this region is pretty adverse (b cold) so it is virtually impossible to grow vegetables so people live off the meat of animals that forage wild. They just freely roam over the mountains eating whatever they like until it is time for them to be eaten - how cooperative.

Apart from the climate this region has two features - the soil is young volcanic rock full of minerals and trace elements - and there is the widest variety of vegetation in China.

Now the statistics don't prove this but a possible explanation is that what really matters in diet is the quality of the soil and the variety of plants eaten.

May be it is totally irrelevant whether - we eat the healthy plants directly or - whether we eat them indirectly by eating the animals that feed on plants. What matters is eating a wide variety of plants grow in nutrient rich soil.

As I try to understand the relation between diet and health this seems pretty significant (in the popular rather than mathematical sense).

The sausage factory

In a previous Chapter I expressed my concern about the sausage factory approach adopted by our dietary advisor. In part this was because it resulted in too many carbohydrates. But also because of the standardised diet - everyone gets the same food - without finding out how each individual reacts.

So now I want to tell you about how we approached the problem. This is purely personal which you are welcome to follow but is not a scientifically based recommendation.

Hormones and hunger

The human body is a sort of heat engine converting energy into movement. But is shortage of energy our problem? Very with our modern diet definitely **NO** - but we do have a problem with **our control system**.

We have a highly sophisticated control system with a whole array of hormones which control our appetite. Given a chance it will regulate how much food we eat and how we manage that food, whether it goes into energy - is stored as fat - goes to rebuilding our body - or is simply disposed of (in our poop).

This highly sophisticated control system has evolved over millions of years and given a chance works well - but we have totally screwed it up.

Many experts try and convince us that we manage our weight by regulating the amount of food we eat - one cup of this and two cups of that.

Sorry that is just wrong - we need to select our diet to manage our internal control system.

Diesel car

What really matter is the quality of food and how it reacts with our body rather than the quantity.

Imagine a friend was complaining to you that his diesel car was not running well and in chatting he told you he was running it on aviation fuel. You tell him that his car was not designed to run on aviation fuel which has too high an energy content and recommend that he goes back to filling it up with diesel (or at least retunes the engine).

He thinks about this and says ‘too much energy eh! Thanks for that I will still use aviation fuel but only fill the tank **half full** next time’.

But this is analogous to what many dietitians are recommending; they know we have screwed up our control system (for example by eating foods like high fructose corn syrup). But instead of fixing the control system (which is the real cause of the problem) they try and solve it by rationing the amount of food - so many cups of this or that.

It simply does not work, it never has and it never will - we have to get to the root cause and fix our control system.

Some calorie restricted diets may actually work, but because the diet includes more healthy types of food - not because they restrict calories.

Our aim is to learn how we fix our control system. We can do this by allowing our bodies to tell us what and how much to eat.

Another aim is to learn how to regenerate our bodies. When an engineer designs a *thing* she knows that some part will wear out over time so she must provide a system of replacement parts.

Our bodies are full of parts which need replacing. Our cells are continuously being replaced and we need to eat the right sort of food - **regeneration food**.

Again our bodies have evolved to do this very well without any interference from us - but they do depend on getting the right ingredients.

Providing these raw materials is more than saying - eat more Kale or whatever - we have to look at the total process going back to the soil that the plants were grown in.

The calorie myth - the energy balance on a human body

The first law of thermodynamics says that in a closed system energy remains constant, it is just as basic as the law of conservation of mass) and unless you are in the business of atomic power (which blows both principles away) it is one of the fundamental laws of nature.

There is however a second law which dates back to over a couple of hundred years ago when the French were concerned that the English may be making a jump with their steam engines and sponsored a Monsieur Carnot (a singularly smart cookie) to work out how steam engines really works.

He understood that energy has a **quantity** but also a **quality**, which can be described by a technical term called entropy. But this is just a chatty article so I will simply call it quality. If you want to know about entropy ask my friends Mr. Google and Mr. Wikipedia - they will be happy to tell you all about it.

He described the way we should analyse a heat engine (we are basically a heat engine turning chemical energy into mechanical energy). So to do a proper thermodynamic analysis of our bodies we should look at the amount of **high quality energy** we eat, the amount of energy we convert to **mechanical energy** and the amount of **stored energy** (fat)

we store in our bodies, and the amount of **low quality energy** we breathe out (carbon dioxide and water) and excrete (poop and pee).

I have yet to see any analysis which considers the amount of energy we excrete (but I live in an eco-village with a composting toilet and I have to use my tractor to empty the steaming mass so I know it is significant). No one (but me) seems the least interested in the calorific value of poop.

Coming home from shopping

But let us not get bogged down - let me tell you about my last trip home from shopping.

My car has a gauge which tells me how much fuel I am using. Doing 100 kph I am using about 7.5 litres per hundred kilometres. Or more simply it takes about 750 ccs of fuel, about the size of a can of coke, to push my car 10 kilometres.

Now for me to push my car 10k would be quite an effort. I am not sure exactly how much but I guesstimate about 5 man days of human energy - that little can of fuel holds a lot of punch.

But when I carry the shopping out of the car I feel there is quite a weight, getting on for 20Kg. I can do a few quick back of the envelope calculations and it is obvious that the amount of energy food I am eating is far more than I use up in mechanical work, not just a little bit - a lot.

So if I wanted to cut down my weight by eating less and exercising more it is totally pointless to just cut down by a bit, I would have to make a dramatic reduction in food intake. I would virtually have to starve myself.

Eat right not less

I am not going through the numbers here because the ‘eat less exercise more brigade’ have made an even bigger mistake then getting the thermodynamics wrong, they have assumed that our bodies are some simple energy device which converts food into energy.

If I wanted to be technically correct I would say that our bodies have evolved an adaptive control system - but I am going to be a bit technically sloppy and just call it intelligence.

Over millions of years our bodies (and that of most animals) have evolved to keep us alive. So when it senses a lack of food it goes through a sophisticated shut down procedure which will keep as alive for as long as possible - on the hope that food may just arrive before we die.

There has been experiments on rats (I am glad I was not borne a lab rat). They started off with grossly overweight rats that were reasonably active (many people are fat, active and healthy too) and progressively cut down on food intake. While there was enough food it really made no difference, the rats just carried on as normal and they did not lose weight.

When the food intake dropped to the level that there was not enough energy - which was a serious reduction of food - the rats simply became less active, they were real couch potatoes and remained fat - just fat and lazy.

The control system protected the body by saying **'slow down and have a rest'** rather than burn its store of fat - which it conserves to protect the rats life.

As the food supply continued to be cut even further the rats 'control system' progressively sacrificed bits of the body to stay alive. As they were no longer active they could sacrifice muscle mass but they hung onto their fat storage for as long as possible.

Now these are rats - not people - so I am a little cautious about transferring finding but there was a period in my life when I was looking for ways of providing sustenance food in drought times in Ethiopia. I could not help seeing what happens to the human body as it slowly starves.

At first people become lethargic and just hang around conserving energy, then their legs and arms become very thin as they lose muscle mass but their stomachs begin to bloat.

Fortunately by that time the NGO's emergency relief cuts in to save their lives.

Believe me - you don't want to try make a permanent reduction in weight by cutting down on calories - it simply does not work and causes a great deal of harm. You just end up yoyo eating, diet, loose a bit of weight; get hungry put it back on again, diet again and so on.

We need to stop this silly idea that the body is some simple machine and learn how the body really works as an intelligent system.

Coming up in the next Chapter

In the next chapter I make the rather obvious point that our bodies react differently to different diets and how it is possible to experiment to find out which foods activate our hunger and full hormones so we don't have to force ourselves not to eat but leave it to our bodies to control how much we eat.

How to grow (or buy) healthy food

Colin Austin 28 July 2015

Chapter 4 Finding a diet by self-experimentation

The story so far

So far I have been a bit dramatic on how diet affects our health and then trying to unravel the opposing views on dietary recommendations which maybe led me to being a bit tedious on the statistics on which much of our health advice is based. Basically the answer is to forget about calorie restriction and eat food that will control our hormones so we no longer feel hungry.

What's to come

I talk about experiments to find which foods operate my control system and - eat food from plants grown in nutritious soil.

But when I say nutritious I do not just mean nutritious for the plants I mean the nutrients and trace elements we need in our bodies to regenerate our bodies.

Finding the base minerals is pretty easy but making then available to the plants is another issue. Soil biology can do this for us but we can't just buy soil biology in a bottle - we have to learn how to farm it - how to grow the good bugs while keeping the bad bugs at bay - not so easy.

Dumb, dumber but perhaps not so dumb

There is a widely used - but hidden assumption - that the body can be treated as some dumb machine which can be analysed like an engineer does with heat engines.

However we have evolved over millions of years and our bodies have developed a control system to keep us alive when things are bad. I hate to use the word intelligence as that implies active thinking but certainly we have an adaptive control system which determines how we eat.

Just look at the hormones which we know are in the body controlling our appetite.

For example we have Leptin, Cholecystokinin (CCK), Oxyntomodulin, Peptide YY (PYY), Glucagon-Like Peptide-1 (GLP-1), Adiponectin which reduce our appetite.

On the other side we have Insulin, Ghrelin, Cortisol Glucagon which enhance our appetite.

In addition to these hormones we have bacteria in our gut which are sending out signals to our brain to eat food which they (not us) need to eat. They are making us **want** the food that they **need**.

I am blown away by the sophistication of our chemists and physical chemists. They seem able to analyse and give the molecular structure of complex chemicals at a drop of a hat.

They analyse the hormones in our body and the phytochemicals in plants (there are over 10,000 phytochemicals which have been analysed - tomato contains over 1,000).

To an engineer who struggled as a kid to work out how a carburettor worked this is amazing.

But we seem to have very little understanding of how our brain uses these chemical signals. We know it receives these chemical signals - as information - from all over the body and sends chemical signals back to tell the body what to do - as controls.

We have a sort of hypothetical valve in our body to manage fat - switch it one way and it goes into out tum and bum and switch it another way out it goes as poop and pee.

But we have no idea how our brain controls this magic valve - wouldn't a lot of people like to know?

We may try and lose weight by using calorie restriction but this doesn't work because we are fighting this **intelligence system** in our bodies which is there to **protect us**. Failure is assured.

Just as a somewhat silly analogy. Thinking about the body as some dumb creature is about as smart as thinking about a modern airliner as some giant paper aeroplane that we get airborne by getting all the passengers to push the aircraft down the runway until it takes off. Like crude dietary control it will never work.

Now put the passengers back on boards and use the controls - up she goes no problems.

We need to learn to manipulate our control system that operates our bodies.

There's veggies and veggies

Despite the apparent battle among the experts there is unanimous agreement that highly processed foods full of sugars and fat are harmful - so I do not even talk about them here.

Just avoid them.

There is agreement on the health benefits of a plant based diet, but there are veggies and veggies. You can buy a perfect looking veggie that has been forced fed with nitrogen fertilisers and grown in soil which has become depleted in micro nutrients.

It may look great but is lacking basic nutrients.

Or you can buy a veggie which has been allowed to mature naturally in soil rich in micro-nutrients and has possibly suffered from insect attack. It may not look so good but is packed with nutrients.

Under insect attack plant defend themselves by producing chemicals which are known as salvestrols) and there is evidence that these are beneficial for us as they may well be anti-cancerous. (Ask my friend Mr. Google he knows all salvestrols - he's smart - almost as smart as Monsieur Carnot who created thermodynamics.)

Why are the correlations so small?

The body is much more sophisticated than in the simple heat engine models - the brain and hormones have a much greater control than we assume.

However there is wide variation between people on how these controls work. This is obvious when we look around - some people stay thin regardless of what they eat while others get fat even on a highly restrictive diet.

Let's see what this could mean in a real life situation. Take the controversial case of fats and say for the sake of argument that there is a 15% correlation in some study saying that fats are harmful.

It does not necessarily mean that all people are equally effected, it could be that 85% of the population could actually benefit from eating fat while - having a positive benefit of 3.5% while 30% of the population will have severe problems with a negative benefit of 100% (that is a euphemism for their arteries clog up and they die) from eating the same amount of fat.

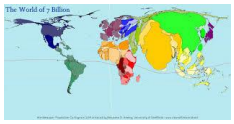
This can explain why experienced doctors can come to different conclusion and why correlations - on average - are so low.

Some surveys are conducted on large populations which are large enough to be considered random but with no control on what people eat - not really very good statistics. Other are done in clinics with strict controls but ignores the fact that people who go to clinics may already have a health problem so are a biased sample - better science but even worse statistics.

So what does this mean for us? (Specifically what does that mean for Xiulan and me but it may be important for you too). We needed to start experimenting on ourselves to learn how we react to different diets so we can choose one appropriate for our bodies.

Self-experimentation

There are some 7 billion people in the world and the dietary industry has been aiming to develop a standard diet which will make them all healthy - and they have failed - they have not even reached the starting blocks as they can't even agree amongst themselves on what is a healthy diet let alone try and implement it.



Now let me be totally selfish here. I don't care what the perfect diet is for 6,999,999,998 people (actually I do care or I would not be writing this but I am using author's privilege to make a point). I just don't think there is one diet which suits everyone.

I just want to know a good diet for Xiulan and me.

To find this I have to learn how my body works, how I react to different foods. I need to experiment (on myself) finding out how my body and particularly my control system responds to various foods.

This is an easy experiment to do. I can start off by finding out which food make me hungry shortly after eating and which one make me feel satisfied. It does not take long for me to work out that for me - if I eat pizza I just want to keep on eating or even worse cheese cake - I just love the stuff and could eat it until I burst. But as it triggers my control system I should avoid it.

This does not mean I totally deny myself - if I am at a party and am offered a piece of cheese cake by a group of very sexy hosts I fully understand that I mustn't offend them and can have just **one** sneaky

piece - but that will make me crave for more so I really must say **no** to the second (and third and fourth slice).

In further experiments I went onto a totally vegetarian diet. I knew I had to keep going for several weeks to let my gut bacteria and body acclimatise. I did not feel that this was really the right diet for me - I found it boring and I didn't really feel satisfied or had the energy levels I wanted - and I kept on craving for a piece of cake.

But I did not give into my cravings - I wanted to remain scientific - so I modified the diet. I wanted to keep the carbohydrates down so I looked at the fat option but avoid straight meat. Xiulan buys these little Chinese sausages which are absolutely delicious but full of fat. So I started putting just one in with my stir fry vegetables.

This has a dramatic effect on how my body (and psychology) worked - it made the vegetables far tastier so I actually looked forward to eating.

I also ate a lot of fruit after the meal - I know it is full of fructose but it worked. I ate as much as I liked and stopped feeling hungry and stopped wanting to pick on naughty snacks after the meal and I felt better in myself. But this is just a diet for me.

I also found that a piece of chocolate after the meal would make me feel full - but I am not sure this is totally scientific and not psychosomatic - but it is nice.

Conclusion

So the conclusions are pretty simple - experiment to find which foods operate your control system and - eat food from plants grown in nutritious soil.

But when I say nutritious I do not just mean nutritious for the plants I mean the nutrients and trace elements we need to regenerate our bodies.

Coming up in the next chapter

It is pretty clear that for me I need a diet which is largely vegetarian but supplemented by some fats (and of course chocolate and red wine). But I need fruit and vegetables which are full of nutrients so we now get to the real heart of this story - how to grow nutritious fruit and vegetables.

Finding the nutrients is pretty easy but making then available to the plants is another issue. Soil biology can do this for us but we can't just buy soil biology in a bottle - we have to learn how to farm it - how to grow the good bugs while keeping the bad bugs at bay - not so easy.

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 5 Nutrients essential for health

The story so far

I have talked about how important diet is to health and what makes a healthy diet and how Xiulan (my wife) and I are looking for food that will regenerate our bodies and also help manage our internal control system or hormones.

We need energy to power our bodies, but that is simple - plants, algae and plankton use sunlight to break up carbon dioxide and water to form carbohydrates. There is an abundant supply of carbon dioxide, last time I looked the sea was full of water and the amount of energy from the sun is simply huge, a few square kilometres in outback Australia could power the world.

If we wanted we have the technology to produce carbohydrates synthetically without bothering about plants - but plants can do it cheaper and people prefer to eat a tomato than a pill.

Energy food is abundant; there is so much that the food companies have to spend billions of dollars in advertising to get us to buy it.

But we also need food that builds our bodies. This comes from soil with the needed minerals and nutrients and the biology to make these available to the plants.

Coming up

We are now almost ready start to work out how to get the essential nutrients into the plants.

But before I get into the heavy stuff I want to talk about the method of approach. To get nutrients into the plants it is no god thinking about just adding a few nutrients - life is just not that simple.

Instead we have to look at the total chain from the minerals in the soil - how insoluble rocks are broken down by the soil biology (such as the fungi) into soluble but still relatively simple compounds which the plants can absorb and then convert into complex chemicals - the phytonutrients - which we can digest and then our bodies convert these to hormones which control our body.

We obviously need the skills of the reductionist scientist at each stage but we also need the skills of the engineer in getting things done in a state of ignorance.

Minerals

Take iron - which is a funny element with an affinity for oxygen - things made from iron go rusty. We use iron in our bodies to transport oxygen from our lungs to all parts of the body and brain.

Without iron we would be dead in seconds.

Before racing out and buying a bag of nails for lunch there is a snag. There is plenty of iron - West Australia is full of it - but we can't digest it. It is actually iron oxide which is a very stable chemical - so stable it has been there for billions of years without dissolving or being used up.

It is so inert that even plants cannot use it directly. They need soil biology to dissolve these inert materials and make them available to the plants which we in turn can eat. In return the plants provide the biology with sugars they make by using the suns energy.

Iron is just one essential element and using techniques like gas chromatography and mass spectrometry we can readily identify the essential elements in our bodies. But like iron they are not in our bodies as simple elements but complex chemicals which are made by the soil biology, plants and in some case our own bodies.

We do understand some of these complex chemicals and can synthesise some vitamins. Others - like the hormones which play a crucial role in controlling our body - are highly complex and we are only just beginning to learn what they are and how they work.

We have identified over 10,000 chemicals produced by plants. When we have no idea what they do - we generally referred to as phytochemicals, simply plant chemicals. If we think they play an important part in our bodies - we call them phytonutrients.

We have evolved over millions of years with plants and - in a natural state - we get all the phytonutrients we need without even thinking about them or understanding there role.

Factory farming

Modern food production however has moved so far away from the natural process and become so obsessed with energy (and profit) that our modern diet is often lacking these essential phytonutrients leading to major health problems often referred to as the metabolic syndrome which leads to diabetes, heart attack strokes etc.

We eat junk food - our bodies are not satisfied - we feel hungry and eat more junk food.

In this chapter we look at how we can set up a chemical chain, starting by adding the essential elements to the soil - creating an environment in which soil biology can flourish to make these essential elements available to the plants - which in turn can produce these phytonutrients - so we eat a heathy diet.

It is not difficult to set up this nutrient chain by adding minerals to the soil, farming the soil biology and producing plants which will make us healthy - any dedicated gardener or commercial grower can do it.

I am going to illustrate the basic principles by talking about the system I am using on my block. It is a more complex than modern factory farming and requires thought and a paradigm shift away from modern factory farming.

The punch line

But first a little side track.

The probability that the processed food industry is going to adopt these principles and provide us with food rich in phytonutrients is as likely as the tobacco companies admitting their product is killing people and stopping production.

However I believe people can have access to healthy food by community action, particularly in the internet age. Fifteen years ago I started to promote wicking beds; the idea has been picked up and transferred from web site to web site, blog to blog and through Facebook and the like with the result that wicking beds are now totally global. May be we can do the same thing with healthy food and phytonutrients.

I have a personal interest - my wife Xiulan was heathy - eating a traditional Chinese diet rich in fresh vegetables. After coming to Australia and swapping to a conventional western diet she developed diabetes and came very close to having her foot amputated. I blame the food.

If I can initiate a community action so other people can avoid this trauma I will feel this is a satisfactory achievement at the end of my life.

Follow the principles - not the details

I am going to describe the system I use. This is not intended to be an instruction manual (that may come later) but to illustrate the principles of growing healthy.

I have a couple of personality characteristics (that's euphemisms for failings) which have influenced my system.

The failed bum

I have to tell a little story against myself. I used to lecture at the Royal Melbourne Institute of Technology and often had evening lectures.

Driving home one night I heard Bill Mollison being interviewed about the system of permaculture he was introducing.

I got so excited about what he was saying about the dangers of monoculture I had to pull off the road to listen - and there and then decided that this was the life for me.

I took the road to self-sufficiency and paid homage to the principle of poverty. I actually approved of poverty in practise - as long as it applied to other people - not me.

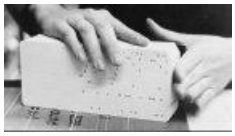
I was born and Hitler declared war (just flip back to cause and effect and element C in my tirade about the rubbish talked about statistics in the previous chapters).

Hitler tried to force England in submission by starvation; I grew up knowing poverty and food shortage. Not fun.

When I was a University student I was still poor and had an ancient ex-army motor bike that must have been over the Sahara desert several times during the war. It cost me ten pounds - and I was done. I had this ambition of doing a journey without having to stop and get my tool kit out for road side repairs. I never made it.

Now I really like a car that goes brrm brrrm when I turn the key.

Yes I am a bit tight (I call it financially prudent) and recycle everything and am probably a bit fanatical about recycling but you do not have to follow me.



So I felt I needed some activity which would provide at least some money and as at that time I had just discovered computers (punch cards would you believe, way before Bill Gates).

I could see how they were going to revolutionise my profession of engineering so taught myself computer programming and started to write engineering software. It was like grabbing a tiger by the tail and my company ended up being the most successful exporter of technical software from Australia.

So my self-sufficiency did not last long - if I had to write a CV it would contain the phrase ‘Bum – failed’. Actually I don’t have a CV as I classified myself as unemployable.

But those concepts of sustainability have stuck so now many years later I live on an eco-village where we have to manage all our water, drinking, gardening and waste (rainbow water). I am a bit fanatical about this but I do understand that the systems I am going to describe may not be appropriate for many people.

However the basic principles could be applied in a commercial system if there was the demand.

Messy man

Xiulan calls me messy man - when she wants me to dig a hole or whatever she does not call out ‘Colin’ - no it’s ‘messy man’. When I was younger my nickname was ‘shambles’. Yes it is true - I really am a messy, shambolic, disorganised sort of person.

But I can be organised - when I was Chairman of Moldflow I travelled around the world twice a year giving one day lectures and flew to the next town that night ready for the next lecture - and I never missed a plane in twenty years.

I used to do my washing before I went to bed, hang it up on whatever I could find in the hotel - next morning I would put my semi-wet washing into polythene bag and move onto the next city. At the next hotel I would whip open my suitcase and hang my semi-wet washing on any rails, pictures chairs that I could. This became known as Colin’s exploding suit case.

But when it comes to growing food I am hoping to convince you that being messy is not all that bad. I have two gardening friends - Peter and Joe. I go to their gardens and everything is so neat and tidy. Plants nicely spaced on a 154.2mm grid - not a weed or rubbish in sight.

I get back home feeling thoroughly demoralised. The system I use is messy - but again you do not have to follow me.

Reductionist science and holistic thinking

But I do understand science and how it works. Science has two great weaknesses - don't get me wrong I am totally committed to the scientific process - but there are two great traps.

In my previous life my job was developing software to solve the complex simultaneous equations of heat transfer and fluid flow. Something which is actually impossible to do (correctly) - but it is possible - using approximate numerical methods - to come up with solutions which works well enough to be practical.

I used to meet people who would introduce themselves as say a '*theoretical rheologist'*. I knew I was in for a hard time as they would tell me everything that was wrong with my solutions - and of course they were absolutely right. But I had a solution which worked well enough in practise and **they had nothing**.

The reason I was able to come up with a solution was nothing to do with intelligence but the way of thinking. I looked at the problem as a whole - what people now call holistic or system thinking - and was prepared to be pragmatic rather than seek perfections.

The other weakness is that scientists are just as prone to prejudice as ordinary people - but they are very clever at putting powerful arguments forward which appear totally convincing.

Look at what happens in the world of diet. There is a paradigm in dietary theory that the way to lose weight is to restrict calories. Sounds perfectly reasonable and they even go to great length to conduct statistical analysis to prove that this is true.

The snag is that the statistics that they put forward to prove their case do exactly the opposite - but they use their intelligence to think up claim that still supports their case.

Eat less get slim - wrong - eat healthy get slim - right.

People may lose weight on a calorie restricted diet but probably after the trial is finished the victims are so ravenous they pig out and put on more weight than ever.

If they had stopped being so focused on their speciality they may have seen the error. I know China and America reasonably well. I have even learned a little Chinese but struggle with American.

China has had a history of things going bad, starvation has been a continuous theme in Chinese history over the centuries - so the Chinese are inveterate savers - however poor they save some money for when things turned really bad.

By contrast life for the American middle class has - until recently - been one of comfort and has been envied worldwide. The American middle class were the world's largest borrowers. Now of course America has been high jacked by the economic extremists so the middle class has now been converted to the new poor.

Had the dietitian thought about this they would have seen that our bodies work in a similar way.

Deprive our bodies of food and they will lose weight (fact) but it puts the body in a state of alarm generating cravings so as soon as food is available the body converts this to sugars which is stored in our fat cells to ward of bad times (just like the Chinese savers).

I learned this by my 'self-experiments'. I went on strict vegan diet and lost weight, but I felt miserable and had craving for something to eat.

I did not give in and scoff five bars of chocolate I so desperately craved. I read that extreme vegans can suffer from vitamin B12 deficiencies. Normal plants don't make B12 but on reading I found a plant - Ashitaba - that contained vitamin B12.

I bought some seeds but someone told me that vegemite (yeast extract) contains B12. Better - but I still felt a bit hungry - not totally satisfied.

Then I found a product called malt extract. I put a spoonful into my drinks and almost immediately stopped craving - I actually felt bloated and no longer wanted to binge eat. (ps this is not science this is what worked for me - you have to do your own trials)

What's the point I am trying to make? Stop focusing on one particular bit of the food chain, look at the entire chain from the soil - how we grow the plants - how we cook and eat them and how we feel after we have finished eating.

Coming up in the next Chapter

I look at the minerals that we need for our health - not just to make the plants healthy.

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 6 The what and where of Minerals

The story so far

I have talked about how science and technology need to work to solve complex practical problems - the methodology - which may not turn many practical growers on. Now it is time to leave the debating chamber and put on our boots and get out into the block and get muddy and messy. The fun bit!

What's to come

This chapter is pretty straight forward. I simply look at what minerals we (not just the plants) need and where to get it.

So let's get to it - how to grow healthy vegetables

Just over a year ago I gave a talk at Wuhan University in which I went into details about the nutrients our body needs.

This is available at http://www.waterright.com.au/Newsletter_8_May_2014.pdf

I don't want to duplicate so I am basically going to pick up from that talk.

Among the key points were that we have a good understanding of the needs of plants and so we grow healthy **plants**. However we humans need a much wider range of minerals and nutrients. We need to grow plant that will make **us** healthy.

This is shown in this section reproduced from that talk.

Widely reported deficits in a modern diet

Elements needed by plants	
Elements available from the air or water	carbon, oxygen, hydrogen
Primary elements from the soil	N, P, K
Secondary elements	Ca ,Mg, S
Trace elements	Mn, Fe, B, Zn, Cu, Mo, Cl, Co
Widely reported dietary deficits	
Elements needed by plants but we may need higher doses	Ca, Mg, Zn, Fe ,Cu
Essential extra elements needed for health	Selenium, Iodine, Vanadium, Chromium, Yttrium ?
Vitamins humans are generally short of	Omega 3, B12, B6, E, K

*However the farmer has little incentive to add the minerals which **we** need but the **plants** do not.*

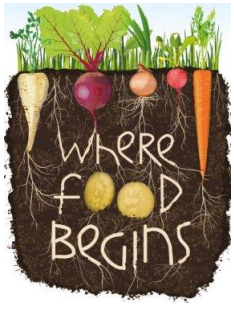
Selenium is used by our cells for the reproduction of our DNA and there is a view in the medical profession that lack of selenium in our diet is an issue with cancer which is caused by rogue cells not reproducing correctly.

Lack of iodine is well recognised as a cause of loss of brain function – a polite way of saying it makes people stupid or imbecilic.

I often come across interesting snippets (which are probably totally useless). It is well known that fertile women need extra iron however another snippet balances the sexes. Apparently male semen contains a high proportion of zinc, enough to drain the body of its normal intake.

So the message is clear for men; - either give up sex or get some more zinc into your bodies. This may just be the most motivating part of this entire talk.

The long chain from soil to tummy



The nutrient requirements are well covered in this Wuhan talk so I won't duplicate. In growing healthy food there is not one step - there is a chain right through from the soil to eating which we need to examine.

The four steps in the healthy food chain are;-

Minerals - First we must get the minerals into the soil. This is easy - there are several sources.

Soil biology - Secondly we need soil biology to release the nutrients to the plants. Soil biology could be a study for several lifetimes but you don't need to know everything - the basic rules can be as simple as stop killing them with chemicals and churning up the soil - just let them get on with it. May be a bit slow and you need something to kick start the process.

I will describe the way I 'farm' them.

Growing plants - Thirdly there is how to grow our plants - I find that most of my readers are keen gardeners and already have a high level of knowledge so this is not a gardening manual. Different varieties of plants provide us with their own set of phytonutrients and minerals so I am a great believer in consuming a wide variety of plants.

I call my diet a **varietarian diet**.

Every plant has its own particular requirements or horticultural protocol. I find this vast amount of information mind boggling and have long since given up trying to absorb this mass of information and settled down to the idea that I need to buy some of my plants.

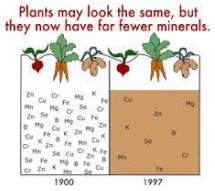
I will make a few comments on my experiments with making a largely vegetarian diet tasty - but as I am probably near the world's worst cook this may be your chance to gloat.
It is also important to study how the diet affects us as individuals by self-experimentation.

Being part of a community - I just don't think it practical for each person to grow every single plant that is needed to give the variety for a really healthy diet. I know I have tried self-sufficiency - yes it is possible but a diet of pumpkins day after day is boring and not particularly healthy.

So later I want to talk about how to have a community where plants can be bought and sold. There is more to this than meets the eye.

Getting the minerals in the soil

If it is not in the soil it can't be in the plant.



This is so basic I feel embarrassed by saying it but I read so many articles where the author describes the minerals in a particular plant without thinking about how they got there - I feel I have to make this obvious but important point.

Even if you grow common plants which have no recognised benefit for delivering minerals - if they are grown in nutrient rich soil they probably will also be rich in nutrients.

There is no little sentry in the root system saying to a particular mineral - *'sorry we don't need you - on your bike'*. No one seems to have a kind word for the nutrient value of the humble lettuce but grow them in nutritious soil and they can have decent nutrient content.

I go very carefully with the big three Nitrogen, phosphorous and potassium (N, P, K) particularly nitrogen. They may make the plants grow fast but slower growth does not worry me - I want to give them time to develop the phytonutrients which are essential for health. I am adding a lot of green compost to the soil which takes up a lot of nitrogen - so I watch this carefully.

I use manure and blood and bone as my source of primary nutrients.

While plants need a certain amount of the secondary minerals such as calcium, magnesium etc. we need these in larger quantities than plants. I use significant quantities of gypsum and dolomite which is available everywhere.

However I really focus on the trace elements that we need but the plant has no need for or only in small quantities - minerals like magnesium, zinc, chromium, selenium and iodine. In many commercial farms these have been exhausted from the soil but they really are essential for our health.

Sources of secondary and micro nutrients

There are several sources. Volcanic rock dust often contains a broad spectrum of trace elements. It is not necessary to have your own private volcano, it is quite expensive putting a hole down to the earth's mantle and the neighbours may object anyway.

Instead I use quarry dust which can be bought dirt (or dust) cheap from a local quarry. But you may need to find out what actually is in the dust by having it tested.

You don't have to worry about sustainability issues with trace elements. The Himalayan Mountains are volcanic and are quite big (I have seen them - they are seriously big) and will keep humanity going for the next million years of so.

Alternatively you can buy trace elements packs fully tested but often at exorbitant prices.

Another source is probably right under your feet. The top soil may be denuded but there could well be an adequate supply deep in the ground. Don't worry I am not going to suggest that you set up a mine, there are plenty of deep rooted plants that will bring them to the surface for you.

Life on an eco-village

Let me tell you the system I use which obviously will not suit most people but works brilliantly if you live on an eco-village or acreage where you have to dispose of your waste.

I have all this nutrient rich waste water, what I could euphemistically call rainbow water but is really grey, black and green but missing blue so it is not really rainbow water.

I score pretty low on the squeamish scale but even I baulk at putting this nutrient rich but yukky - water straight onto my lettuce plants. So I use a two stage approach - the first is really yukky - just using any and every bit of organic yuk I can find. (I told you I was mean).

I divert all the rainbow water into a depression. I then grow a whole bunch of plants in this depression; I select plants which have thick soft leaves which will make excellent compost and deep roots so they go right down into the subsoil.

I use plants like Senna Alata (which is a legume), Queensland Arrow roots which has fantastic leaves, comfrey and even bananas and if I am honest any weeds which decide they might like to take a holiday in this nutrient rich plant paradise.

I can then use these soft squelchy leaves to provide the food to farm the biology. (More on my yukky biozone later).

Marine sources

Other excellent sources of trace minerals are sea based products, such as seaweed, processed fish remains etc. I have some concerns about heavy metals in these products so I am careful where I purchase them. Fortunately Australian waters are pretty clean.

Coming up in the next Chapter

We look at what some people (well at least me) think is the most important part of the nutrient chain - the root zone. Well it is certainly the most neglected.

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 7 The rhizosphere

The story so far

We now have a list of the mineral we want to get into us - via the chain of soil to biology to plant and then to us.

What's to come

We now have to turn this into a practical system starting with what happens in the root zone.

Biology and the rhizosphere

Everyone has their little foibles and I would have to say I am a bit compulsive - and if I was a teenager I would say I am *into* rhizospheres. When they are buckling me up in the straight jacket I will still be shouting *'I love rhizospheres - they will save the world'.*

I seem to have spent my entire life living on really heavy clays, what they call Saturday soils, on Friday they are a bog, on Sunday they are a rock but on Saturday they are just workable.

I once set up what was really quite a major research program to find out how to turn clay into soil, I evaluated all the common so called clay breakers (a better name would be wallet breakers) and none of them really worked properly, but I did notice how the soil in the root zone was entirely different.

While these soil additives may have some benefit it is essential to find some plant that will grow in these heavy soils and also to keep the soil moist.

This was many years ago and then I had no understanding of the importance of soil biology but now we have experts like Elaine Ingham (see her on YouTube) to guide us and explain how soil biology really works.

Plants exude sugars to attract and feed soil biology; they also produce mulch to act as dessert for the little fellows. It's no different to us where when we find someone we find attractive - we invite them out to dinner. Food is more than nutrition.

There is a whole chain of these creatures; they start off by coating the microscopic particles of clay with a glue which they bind into small particles. They consume most of the food provided by the plant but they die and in turn are eaten by bigger creatures which may do a bit more soil binding and release some nutrients into the soil for the plants to eat.

The soil biology - particularly the fungi - mainly the Mycorrhizal fungi but virtually all fungi - will attack the insoluble rocks and dissolve them to release the nutrients. The hyphae of fungi are incredibly fine so they develop very high stresses at their tips - they also release enzymes which further help dissolve the rocks and make the minerals available to the plants.

There is a whole chain of microorganisms and eventually we have the macro creatures – the worms and the like - which bore through the soil making it like Goya cheese - full of channels through which water and nutrients can pass - voila we have soil, and it all happens in the root zone - all thanks to the soil biology. Can you let me out of the straight jacket now please?

Experts like Paul Stamet and Elaine Ingham have done such an excellent job of describing how soil biology and fungi really work that I am just giving these few introductory words - just go and ask my friend Mr. Google - how does he know so much?

I want to focus on turning this knowledge into practical benefit.

Putting soil biology to work

Hopefully by now I have convinced you of the benefit of soil biology - you would not be alive to read this if it was not for soil biology - but how do we put this into practise?

You may be tempted to race out (or go to Ebay) and buy a bottle of biology. I feel tempted to say you can't buy biology in a bottle but clearly you can and even I have set up a little facility to grow soil biology which I sell to converts - but there is much more to soil biology than just dosing your soil with a bottle or two of biology.

I feel tempted to say just stop killing them and let them get on with it. There is some truth in this but what I am really saying is that we should learn to farm biology just as we farm our plants.

Let us face it - by the time you have studied soil biology, learned about all the various types of herbs and plants, studied how the body works and diet and health, worked out how best to cook your food, and pickle or ferment it to preserve it and worked out how to make your web site responsive so it works on a mobile phone, let alone worked out where the on - off switch is on your mobile phone - your (and certainly my) brain has reached saturation point.

As an aside can anyone tell me why they don't have on off switches on mobile phones - mine beebs at me in the middle of the night even when it is supposed to be off and I sure get fed up with taking the batteries out all the time? So smart but so dumb.

The point I am making is that you do not need to know all the thousands of known different varieties of creatures which inhabit our soils (which is only a fraction of what is actually out there). All that is needed is to know how to create the environment where the soil biology can flourish.

The wonderful world of ecology

If you visited our eco-village you may at first be envious, you would see the lakes with the wide assortment of water birds, the hundreds of kangaroos hoping about, the native bush which probably hasn't been disturbed for thousands of years and you may say *'Colin – what a marvellous place to live - to be so at peace and harmony with nature in this hassle free rural environment'*.

I would probably agree with you that it is a pleasant place to live but there is no peace and harmony in nature.

It is cruel and vicious nature, there is no such thing as being in harmony with nature - it makes ISIS look like a bunch of wimps.

Everywhere is a battle for survival. I think that when Richard Dawkins conceived his famous book ‘The selfish gene’ he must have visited our eco-village.

Right now I am watching a herd of kangaroos grazing peacefully on the grass. We have just finished the wet season so there is plenty of grass, the kangaroos have bred so there are numerous baby kangaroos which even I have to admit look cute.

But now we are entering the dry which can last for nine months. The grass will turn brown, the kangaroos will start to starve and become aggressive for food. Then the rains will come again and the grass will shoot and the young bucks will start there ferocious fights for the right to mate.

Harmonious nature – bah humbug as scourge would say.

But this conflict is everywhere - the animals the kangaroos, possums, rabbits are after my food, a python ate my favourite cockerel and Xiulan (who is definitely not a snake person) said no more chooks.

I found out she was not a snake person when she was working away on her computer and felt something crawling over her feet. When she looked down and saw it was a python I learned she was not a snake person.

I had to have a new floor laid with no holes.

The birds are probably the worst; they are tame and will come to get a bit of food when we are eating on the veranda. But they insist on pecking our mangoes to see if they are ripe. I don’t mind them having a mango or three but why do they have to peck every single mango to see if there is one that is ripe.

Did they learn nothing from my previous article about statistics? If you sample three and they are all as hard as bullets then the probability of there being one ripe one is virtually zero.

Stupid birds – but the crows are the smart ones. I put some fish in a sealed polythene bag out to thaw on the veranda. It disappeared. It was day later when I found the bag which they had carefully pecked open that I knew where my lunch had gone.

But it is not just the animals; the plants engage in chemical warfare which would make George Bush invade our eco-village if he were still president. We have casuarina trees - a native with fine needles that make beautiful singing noise in the wind.

But they are aggressive, they send out toxins which kill off all other plants which may think about entering their space. They are not just passive aggressive, they are active aggressive by sending out runners which will pop up tens of metres from the mother tree and start to poison the soil with their toxins.

May be I should check under my bed to make sure there is not a forest emerging.

‘Am I just prattling on or is this leading somewhere?’ you may rightfully ask. Your right - it is leading right underground to the wonderful world of soil biology which it the most aggressive place under the face of the earth.

The ecosystem paradigm

Modern agriculture has adopted the philosophy of focused aggression against the predators.

We have a vast array of poisons to control virtually anything and everything. When farmers began to appreciate the importance of soil biology they adopted what I though was a horrendous approach.

They would cover the soil with tarpaulins and fumigate the soil with methyl bromide - a highly toxic chemical which kill anything and everything.

They would then go and inoculate the soil with '*known'* good bacteria.

This was all done with the best scientific advice possible at the time. My reaction was what an arrogant approach - we are just at the birth of soil biology - we simply do not know enough about soil biology to manage it in this crude way.

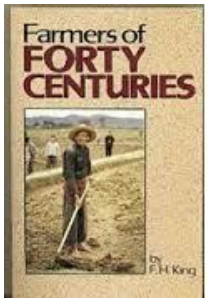
They may have a case based on short term profits but I don't grow plants for profit - I want to grow plants so I can be healthy and enjoy the remaining days of my life on this earth.

Actually I have been trying to work out how to donate my body to soil biology when I die. You have no idea of the regulations which prevent me from just sneaking into one of my wicking beds and donating my body to the worms which have been part of the gang that provided me with healthy food while I was alive.

Bureaucracy Huh!

Old books

I rather like to read old books on farming - it is really interesting to see how farmers managed before agriculture became so dominated by science at the beginning of the last century.



One book everyone with an interest in food should read is 'Farmers of forty centuries'. In ancient China they didn't have to worry about bureaucrats saying what you could or could not do with your deceased - out into the fields they went. They recycled everything.

But one particular practise which intrigued me is the way these old time farmers managed inoculation of clover. They did not appear to have any understanding of the microbes which capture nitrogen around the roots of clover. But somehow they had learned that they needed to collect soil from the roadside or wild country and mix this with the seeds.

So why can't we have a modern day version of this? Well if you were found digging up soil in native bush you would soon be arrested so I have developed my own and legal version.

On my block there are areas which have never been tilled. I am also surrounded by native bush and creatures which visit my block to steal my food but they also bring with them an active biology.

So as I told you I set up an area to be a 'bio-reserve' based around my waste water disposal system. I am now extending this to the total perimeter of my block - an area which will not be worked.

I established a variety of plants which will both mine nutrients and also develop a biologically active rhizosphere.

I may make a few barbs about buying biology in a bottle but I also cheated and bought various commercial inoculators - particularly mycorrhizal fungal spores. I know mycorrhiza are there already because I have seen the mushroom heads but I am a bit of a belt and braces person.

So now I have what I call a bio-zone full of soil biology - I never grow anything in these zones apart from plants for my second stage compost. They are essentially sacrificial land just to breed soil biology.

I use this two stage composting process with all my totally yukky rubbish, the rainbow water, household and garden rubbish, over persistent door to door or mobile phone salesmen - anything vaguely organic that can't walk away - and use this in my first stage composting.

This is not the nicely balanced carbon - nitrogen compost that you see in gardening shows - this is serious rubbish. It is shaped like a horseshoe with the gap for me to load the rubbish facing away from the house. This is an attempt to keep Xiulan happy. I hoped it might help her accept my messy ways. Wrong!

But my explanation that this would make a nice place for the python to live so it did not come into the house did not go over at all well.

I do not use this compost directly in growing my crops - I use the foliage from the plants that grow in the yuk to feed the soil biology and provide nutrients.

Coming up in the next Chapter

We have got to the point where we have this beautiful pile of rich nutritious leaves and soil full of active biology, but it is sitting in the middle of a totally yukky eco zone. So now we have to look at transferring the goodies into our growing areas while leaving the yuk behind.

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 8 Transferring the nutrients and biology to growing beds

The story so far

I have talked about a two stage composting type process. If you are one type of person you could look at this and say what a beautifully functioning eco system – if you are another type you may say what a pile of messy yuk.

What's to come

Now we have to look at the process of extracting the nutrients and active biology and transferring to the growing region. Then I have a little anecdote about the history of wicking beds and managing ecosystems.

Bio-baskets

Now I have to get the biology into the areas where I want to grow my plants. I fill my bio-baskets with a mix which will be highly attractive to soil biology with all good things for them to eat - come to dinner little bug.

I grow plants in these baskets which develop a strong and active root system which grow through the mesh at the bottom of the basket and down into the soil well beyond the basket.

Also I have selected plants which actively attract the biology.

Then I sit back and wait for the little microbes to accept my bait - takes a bit of time but nature has its own pace - after all it's been doing this for a few billion years and no doubt will be continuing to do this after the next financial crash has thrown the world into chaos so we abdicate in favour of the cockroaches.

I call these bio-baskets and essentially they are a mature rhizosphere with an intact root system full of biology.

Now I have trapped a living breathing biological system which I can transfer to the area where I want to grow my plants.

Transporting the biology

When the rhizosphere is thoroughly impregnated and full of biological action I can lift out the basket - with the root zone intact and take it over to my garden beds.

I can irrigate through the bio-basket which will flush the biology into the surrounding soil. The bio-basket will be full of worms and I can tempt them out by giving them food - vegetation from the bio-zone - outside the basket.

Back to the biological war zone. I think I have shown my prejudice against trying to kill off all the badies with chemicals. I don't dispute that economically this may be the most cost effective but I am not running a business - I am trying to stay healthy.

So my approach is to feed the goodies and hope they can out-compete the badies. In all honesty I would classify this as moderately successful, I never get rid of all the badies and they keep on coming back but at least I get a plentiful supply of nutritious food.

The second stage of composting

The first (yukky) stage aims to grow what I call my soil plants, e.g. plants purely grown to improve the soil.

In the second stage I take the fresh juicy leaves from these plants and use them as food for the soil biology which will in turn provide food for my food plants.

There are a number of ways I use these green leaves. One way is to put them in trenches in my cropping areas. The trenches also provide irrigation channels to help spread the water.

Composting is room temperature and therefore slow. I may have three trenches in various stages of decomposition in a sort of rotational composting.

One of the nominal disadvantages of having such a high organic system is that it is continuously decomposing requiring topping up. I don't believe in digging - that's for youngsters - so I get the worms to do it for me by a regular application of mulch and burying my green compost.

This is 90% successful - I occasionally need to aerate the soil by pushing a fork into the soil and just levering back until the soil cracks - but no digging.

Serious gardeners may be appalled by this apparently messy process which does involve sacrificial land which in not directly productive. But it does satisfy my aim of producing top quality nutritious soil with the minimum of work (and cost).

Wicking and sponge beds

I live in a very dry area which can have no effective rain for nine months of the year so water is a big problem so most of my vegetables are grown in wicking beds - both open and closed - and sponge beds.

I have written so much about wicking beds (www.waterright.com.au) I am not going into detail with them here - other than to mention that there big advantage is to prevent the loss of both water and **nutrients** beyond the root zone. My numerous newsletters and articles contain a mass of information on wicking beds.

Wicking beds - It's the soil that matters

However I do just want to tell a little about the story of about wicking beds which will be useful for when I get around to talking about the power of community action.

About fifteen years ago I was asked to go to Ethiopia to see if I could find a way of providing sustenance food in time of drought.

I had two ideas. One was to collect local weeds - which were inedible but plentiful - to provide nutrients. The second was to make a trench lined with plastic - put the weed in the base - then the soil on top. The weeds would provide nutrition while the plastic would store water in an underground reservoir.

This is a very simple and effective system suitable for people who are earning $2 a day. It works just a well as the complex and expensive wicking beds I see marketed now. Where did this idea that things have to be complicated to work come from - mobile phone companies I guess.

I wrote about this on my return and the idea was picked up by one particular person who failed to understand the need for nutrition and thought the weeds would rot down so the bed would need topping up. (This of course is true but is solved by adding a bit of mulch - no problems).

She decided to promote this the idea of wicking beds on her web and she was very good at this, much more artistic than a grumpy old engineer like me. This web was highly successful and the word started to spread like wildfire. I am very happy about that.

But there are two important lessons to learn from this about how community action and the internet work.

On her web she replaced the nutritious organic material with stones covered with cloth which provides no nutritional value.

This has now established a paradigm - which verges on religious fervour - that wicking beds must have stones. Sadly it is wrong - so people are just not getting the nutrition they should out of their wicking beds.

I also get a string of questions from peoples whose wicking beds have gone putrid. You need to let the roots get down into the water level - it's about the rhizosphere - oh dear here come the little men in white coasts with the straight jacket.

But one really important lesson from this is the need to follow what is now an accepted protocol in community activities and is now embedded in the principle of Creative Commons.

A fundamental principle it that while work can be copied and used for private (non-commercial use) the original source should be acknowledged.

Unfortunately she did not follow the normal convention of acknowledging source so people could see the original system and now the stones and cloth wicking bed system has become the norm. Stones and cloth has almost become a religion (at least not as dangerous as ISIS) but still a lot of people are missing out on vital nutrients.

The fact is stones just don't wick and a good open soil will hold more water than stones. They simply do not give the nutrition of a good soil.

The wicking bed story - which has literally exploded around the world - has shown the power of the internet to spread information - but also the importance of following the principles of Creative Commons where people can copy and use information for private use but need to recognise the source. This gives people the opportunity to go back and study the original works.

That's enough ramble – back to the main theme.

Sponge beds

As sponge beds are a relatively new experiment for me I will just say they are essentially a wicking bed, but instead of having a waterproof base to stop the water and nutrients leaking away they have a soft sponge underneath which works like a babies nappy to hold he water.

The picture shows a sponge bed under construction using plant material created from the yukky first stage composting.

These two beds are terraced so the water can flow from one to the next. I think the Chinese beet me to this by about 4,000 years.

Soils for wicking beds

But first a few words on soils for wicking (and other water retention) beds.

Soil is the single most important part of a wicking bed - but the requirements for a wicking bed soil are very different to a general purpose soil.

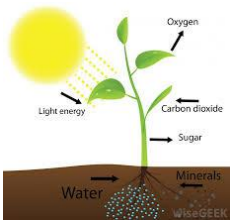
You could just nip down to the local supermarket and buy a bag or three of potting mix and the plants would grow quite happily into good looking plants. This is certainly the easiest and cheapest way of filling a wicking bed. It will give you good looking plants but they won't be high in nutrient - you need both minerals and biology.

But my aim (and hopefully your aim) is to grow plants with the maximum nutrient contents - that's minerals, vitamins and those elusive phytonutrients which are important for health. This is a bit more complex and expensive than just buying a bag of regular soil mix.

Unfortunately getting the key minerals into the plant is not as straight forward as adding minerals and fertiliser to the soil. I could simply say you need minerals and soil biology to make them available to the plants but I think it is must better to explain how the system that nature has developed actually works.

The synergistic triplet

Plants have not evolved in isolation - they evolved in conjunction with both soil biology and animals in a complex synergistic relationship. (Synergistic means working together for the benefit of everyone - just like the directors of food processing companies and our Politician's do).



Plants do one thing superbly well - and we all depend on this ability.

They take carbon dioxide from the atmosphere and extract the hydrogen molecules from water and combine them together to create complex hydrocarbons.

These hydrocarbons are the energy source which power the whole cycle. If plants did not photosynthesise you would not be reading this article so give them a friendly smile.

The bulk of a plant's mass is created from this carbon dioxide and water, only a very small proportion of the plants mass come from the soil. It is the minerals they extract from the soil that enable this whole process of photosynthesis to work.

But plants can only take up minerals which are in solution - plants simply cannot extract the critical minerals like calcium, zinc, potassium, magnesium etc. from insoluble rocks. Any minerals in solution are likely to be washed away in the next rain storm - the soil biology releases them slowly like a slow release fertiliser.

Plants and soil biology

So the plants have chummed up with the soil biology in the deal of a century (actually millenniums) in which the plants emits exudates - largely carbohydrates and sugars - which provide food for the soil biology - Mycorrhizal fungi is just one example. Plants also die and their decaying remains provide food for a whole range of soil biology. (Just google Elaine Ingham if you want to get stuck into the real science).

In return the soil biology is continuously dissolving the minerals - providing a steady stream of nutrients for the plants. It's a slow release process so the biology delivers breakfast, lunch and dinner to the plants on time. This is a very simple synergistic relationship and you don't have to be an ecologist to see the benefits to both parties.

Unfortunately soil biology is a mix of goodies and baddies - the conventional approach for getting rid of the baddies is sterilisation - which may be acceptable to many people who just don't like the idea of bugs - any bugs (even though we are full of bugs providing an essential service in digesting our food). But these bugs are essential to a healthy diet and this obsession with killing them all is one of the roots causes of our lack of nutrients.

In a natural environment the goodies and baddies reach a stable equilibrium - if we want to take advantage of the beneficial micro-organisms we have to learn to manage this balance.

Learning from nature

Controlling the badies without resorting to toxic chemicals is an ongoing problem. But there are some actions we can take.

My two stage composting system is one. I developed this as a way of disposing of potentially hazardous wastes - but the fact is growing beds can become infected with badies as well. It is virtually impossible to get rid of badies simply by hot composting but this system of two stage composting - (where the contaminated compost is never used on the growing beds but used to grow plants whose leaves are used) - provides an effective barrier.

Look at what happens in nature. Plants just do not grow in nice uniform rows of the same species - it is a total shambles with different plant all growing together. We can now see why this works so well.

If a plant is under attack it produces chemicals to fight off the attack. But in addition plants can communicate with other plants by a mycorrhizal network.

It sends out chemical signals which travel down into the mycorrhizal network and are received by other plants like an air raid warning so these plants defences are also activated.

But this is where the neat bit comes in. Many plants we grow for food do not have very effective defence mechanisms so the badies win and the poor plant get well and truly worked over.

However if we look at what happens in nature we can forget our love of regimentation and put more effective defender plant in our food crops.

Smelly plants like marigolds, pyrethrum daisies etc. are good candidates.

When our food plants are attacked they send out their distress signal to their mates next door and up comes the cavalry to the rescue.

When we look at nature we see that many plants survive as a species by producing vast quantities of seeds, this is true of many vegetables such a lettuce and the Chinese cabbages and mustard greens.

I understand that if you are a commercial grower supplying the supermarket they want to receive a delivery of the same size plants on a given day so the grower has to clear the beds and start from scratch for each crop. But if you are growing for yourself why bother. In any case you want a continuous supply of vegetables - not a truck load on one day.

I will let some of my plants go to seed, partly for two reasons. I want the seeds which are produced in abundance so I can seed at a high density and progressively consume or transplant. But secondly I want to maintain the soil biology and they need a root zone to live in. So I never completely clear my beds just leave a home for my little wriggly friends.

When I first went to Africa and looked at how the local tribes were growing their plant I thought at first it was a total mess. They would dig up a plant to eat or because it was past its prime and then just put a new plant in. Their beds looked a mess of young, middle aged and dying plants. I now realise that for them this is a very effective way of growing in their situation.

Anyway I am a messy man so I say you can keep you regimented gardens - I am going to live up to my name of messy man - because it is a better way to grow (for a private grower).

Plants and animals

The benefits the third group - the animals - make are far less obvious. But the fact is that animals and plants have lived and evolved together for millions of years.

Most plants cannot move about, the only exceptions I know are John Wyndam's triffids (read the book it is a classic story) and my pumpkins which have the capacity to march across my garden, immune to my attempts at control with the lawn mower.

Animals (particularly birds) provide an obvious service to the plants in transporting their seeds far and wide. Animals also provide a service in providing manure as a concentrated fertiliser and the heavy animals also provide a service by working the surface to aid seed propagation. The mutual benefits are clear.

But animals also eat plants and if I were a plant I would need some convincing that being eaten benefits me. However when I look at my baby-greens I can see a benefit. The top of the plant is chewed off (in this case by me) but the plant bounces back producing very vigorous regrowth. At the same time the plant is increasing its roots structure and hence its ability to grow.

This is a pretty steady state process, me eating and the plant regrowing (with very tasty new shoots, much more nutritious than mature leaves). But me - being human and messy - will eventually miss my part of the cycle and the plant will produce massive seeds heads - far more than if the plant had grown without my continuous attacks.

I think we both come away winners in the end.

Coming up in the next Chapter

More on the basics of soils which will grow plants which will make us healthy.

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 9 From soils to cooking

The story so far

We have reached the point where we are growing plants – maybe in wicking or sponge beds.

Coming up

Now we have to have a little chat about soils and how they actually work. Then a little discussion on the tricks I use to overcome my disorganisation and lack of cooking skills.

Surface chemistry

Soils look so simple - just a pile of dirt but as it is the year of the soil we must acknowledge the complexity of soils. We may start with the minerals in the soil, then follow up introducing the soil biology to release the nutrients but the next role of soil is to hold onto the nutrients.

This is done by surface chemistry; we need to have a soil surface which can hold onto the nutrients. It's even better if the soil has a large surface area. Clay fills both roles very well, but is only needed in small quantities in the mix.

Vermiculite is another material I use which has a large surface area with the right surface chemistry to hold onto nutrients until needed by the plants.

Hydrophilic and hydrophobic

But with wicking bed soil we need two fundamental features - the soil must wick (which is a question of surface chemistry and particle size) and porosity.

Soils can be either hydrophilic e.g. water loving which is exactly what we want in a wicking soil or it can be hydrophobic which means it repels water.

This combination of the chemistry of the soil particles themselves and how they are coated by the bugs is what holds the nutrients

For example sand is naturally hydrophilic which makes it a good material for wicking however if it develops a waxy coating - as often happens in sandy soils under gum trees - it can become hydrophobic and useless as a wicking bed soil.

Many types of compost are hydrophilic and make good wicking soils but one of the best materials is roots, which have naturally evolved as nature's water transport system.

I take advantage of this property by seeding my baskets so while they are being inoculated with the soil biology they are also developing a root mass with a very high wicking capacity.

Porosity

Another major difference between a conventional and wicking soil is porosity. Conventional soils need some porosity to provide drainage but if they are too porous any water just flows straight through and is lost (often with the nutrients).

In a wicking bed the bulk of the water is stored in the soil itself. In recent work carried out by Peter Van Beek (www.easygrowvegetables.net) he measured the water holding capacity of various soils, sand and stone mixes. He found that good soils can hold more water than the stone or sand mixes which are often used in the base of wicking beds. He found that the void content of soils could be over 50%. I have used his method to measure the water holding capacity of my mix at over 60%. Basically it is full of holes.

I call the soil which has been prepared this way and inoculated with biology Wickimix®

What plants to grow?

You may be expecting me to go into detail on all the types of plants which you could grow.

Well I do grow a lot of Chinese style vegetables, cabbage, Bok choi, mustard green etc.

I know that there are various classifications for the nutrient content of plants - usually topped by kale - but I think that if you have genuinely healthy soil then any plant will be both nutritious and grow easily.

My aim is variety.

Helping out messy man

I have to admit that I am more than a bit disorganised. I could claim that I travel a lot and can't always be available to put in the seeds when I should to ensure a continuous supply of vegetables - but the fact is I am an experimenter - that is my focus so more often than not I either have a total surplus of some plant because I tried four different method of growing and they all worked and provided an excess that I have no hope of eating - or conversely they all fail and I have nothing.



So I have developed some good friends in the vegetable world to overcome my disorganisation.

The first three are staples, Kang Kong, Purple Amaranth and Egyptian Spinach. They grow so well in my area that they could almost be considered weeds but they have helped me over a bad patch more than once.

The other cover for my disorganisation is baby greens. These are a little more mature than shoots or micro-greens but have more body. So if see I am going to run out of vegetables I simply seed a fresh wicking basket to quickly grow some baby veggies.

I just cover the entire basket with seeds and within a couple of weeks or so the baby greens will start to be big enough to eat - later I can transplant them from the baskets to full scale wicking beds.

Cooking and my lack of culinary arts

I would rank amongst the world's worst cooks so I should not be giving culinary advice - but I will make a few comments. I once went onto a strict vegan diet. This was essentially a no fat diet. At first I felt good but as the weeks went by I turned into Mr. Notsohappy. You can get awfully fed up with steamed cabbage. I felt hungry and started to get cravings. I began to think about the old joke that giving up wine, women and song does not make you live longer - it just makes it seem longer.

I wanted to stay on a largely vegetarian diet but as I read about how fat slowed down the speed of digestion I decided that I should experiment with certain amount of fat in my diet.

I tried to get maximum variety in my diet but for now I will focus on what has become almost a staple, not every day but frequently. Previously I had been almost exclusively steaming with no fat. Now I started to fry my vegetables in olive oil. But in addition I would put a few pieces of Chinese sausage in with the vegetables.

I have no idea what they put in those sausages but they really are tasty. The fat and flavouring would transfer to the vegetables and made an immense improvement to their flavour. I would then add apple vinegar, maybe some soya sauce and a good old dose of spices. This was a big improvement but the stock was watery and really not so nice.

I then added thickening to make a richer gravy. I used a variety of thickening agents some commercial but many times flour, maybe semolina, sometimes good old fashioned oats or one of the many grains that are widely available.

This was an immense improvement in terms of pleasure in eating and how I felt - but there was still something missing. I though it may be a vitamin B12 deficiency and started to eat a lot more vegemite (actually Dick Smiths Ozimite). Again a bit better bet then I discovered malt extract.

I started to add this to milk drinks (soya milk) and tea (I drink Chinese green tea).

I actually felt full for the first time in a long while and the craving disappeared.

I came to the conclusion that it is really important to monitor yourself and find out just what food make you feel satisfied. I think the calorie restrained diet which leaves you feeling hungry are ridiculous, the trick is to find out a food mix that stops your body craving. This means checking how you feel just after you have eaten and particularly a couple of hours after that.

Food is also a pleasurable social activity; I have no intention of aborting going out for a nice meal with friends.

I make sure I cook enough vegetables that I feel full after eating and I do have a nut snack between meals with a cup of tea. I feel this is a good 'base' diet but I have a weakness, I just love chocolate. The cocoa bean is extremely healthy - the problem is that the vast amount of sugar that is added to commercial chocolate. I have partially overcome that by buying cooking chocolate and - when you get used to the lack of sugar - actually tastes better.

But this does lead me into the next section which is about buying healthy plants.

Coming up in the next Chapter

The reality is that it is verging on the impossible to grow all the variety of plants that we may like on schedule - so we need to talk about sharing or trading plants

How to grow (or buy) healthy food

Colin Austin 28 June 2015

Chapter 10 Community action

The story so far

We have talked about the technology of growing plants which are healthy for us. But we are not finished.

Coming up

Only the super human can grow all the plants they need on schedule, some people cannot grow at all so we discuss the social issues of health and buying and sharing food.

Buying healthy plants

I refuse to believe that I am the only person on the face of the earth who is disorganised and fails to produce a continuous stream of plants just ready for picking. I also refuse to believe that I am the only person who has a finite brain and just does not have the expertise to grow all the range of plants and herbs, each with their own specialist horticultural protocol that they would like to eat.

But the current imbalanced diet - too much energy - not enough nutrients - is causing the number 1 health problem globally and many people cannot even think about growing food as an alternative.

The obvious solution is simply to go out and buy what you can't grow - but where to go?

Supermarkets are very good at what they do - which is to make money. There is no secret on how to make money - buy as cheap as possible (which they can do by squeezing the grower) sell at a high a price as you can get - which they do by high pressure advertising and branding and - sell as much as they can.

I am not saying this is criminal or unethical - there job is to make money. If they don't maximise profits they will be penalised by the financial establishment who have zero concern for my health - these are the rule of the society we live in.

I live in a horticultural area and have got to know many of the local growers. I prefer shopping in the local market rather than the hassle of a Supermarket.

I feel moderately comfortable with what they have to offer. They are also pretty straight dealers. I once just mentioned in passing that the water melon I bought last week was a bit overripe - just chatting really - so he knew he needed to pick a bit earlier. He immediately gave me a new one; no receipt no argument - that does not happen in Supermarkets.

Xiulan loves markets; they are a form of entertainment for her. She demonstrates her Chinese heritage by being a master bargainer - sometimes embarrassingly so - I tell the stall holder to raise the prices when they see us coming so she can bargain them down.

Buying at the local market is a good start and I guess I am luckier than most - but I want to go further. I am convinced that the root to healthy food starts in the soil (excuse the pun) so I ask myself how I could solve the problem of wanting to buy plants knowing for sure that they been grown in nutrient rich soil.

I don't think I am alone in this, although I am better placed than most people I have a large block and don't have to go out to work. There must be millions of people around the world who for reason of time, space and knowhow simply cannot grow the food they would like but would still like to buy nutrient rich plants which means they are grown in nutrient rich soil.

Another twist to this problem is that eating fresh is so much healthier and tastier. If food is picked and eaten straight from the plant is just taste so much nicer.

Peas are the classic example, eating a pea straight out of the pod within minutes of picking is just a totally different experience that unfortunately many people just don't have.

Wicking baskets

My aim in developing wicking baskets was to give people the benefit of eating fresh home grown produce without having to do all the work of growing everything themselves.

Wicking baskets are just like a small wicking bed. They are simply filled with nutritious soil Wickimix) which sits in a bucket which acts as a water reservoir.

However the idea behind wicking baskets is much broader than a simple wicking bed. A commercial grower could grow plants to maturity either in a multiple wicking baskets or in a mother bed.

When mature the basket could then be passed onto a customer who can then pick fresh vegetables as needed. I use the chop and chew method, just pruning the outside leaves and letting new leaves shoot. A plant can be a productive source of food for many months with this system.

However when the plant is finally exhausted the customer can get a refill basket from the grower.

I use wicking baskets extensively even though I have a large block. The reason stems from my state of disorganisation.

I am daily surprised that at night time it gets dark (some people are very slow learners) and realise that I have forgotten to go down the block to pick my vegetables for dinner. Having a few wicking baskets sitting on my veranda gives me an immediate source of vegetables without having to run down the garden in my underpants (or worse - it gets hot in Queensland).

Of course wicking baskets could be used as a primary source of production but the quantity of vegetable that can be grown all the way from seed is limited. However they can provide a valuable source of nutrients growing plants like water cress and herbs.

Motivation

I have put a great deal of effort into studying diet and particularly how to grow healthy food. Obviously helping Xiulan has been the primary motivation and thankfully her health has improved dramatically as she eats a more healthy diet.

The rate of increase in diabetes is just staggering, it's not just the numbers of people who are already diabetic - the really scary statistics is the rapid increase in the number of people who are pre-diabetic. This is not just a problem for Xiulan and me - there are already nearly a billion people around the world that are already diabetic - and the number is going up daily.

I have the technology which if know can help - at least for Xiulan and me - but how do I spread this technology - feel I need to do what I can to help - but how?

I realise that many groups are already co-operating with growing healthy food - but only on a small scale. I would like to see this expand across the globe in the way that wicking bed technology has spread simply by people spreading the word on the internet, whether by webs sites, blogs or social media.

The system of Creative Commons gives us a mechanism for this to happen but in a much more controlled way than happened with wicking beds.

The Punch Line

We can take some things as undisputed scientific facts

1) The body needs energy or fuel, its gets this from sugars and carbohydrates generating energy by burning carbon and hydrogen
2) The body needs certain chemicals, which it cannot manufacture itself so we must eat. These are vitamins 13 which are undisputed (but up to 27 have been reported in the literature).
3) Plants produce a whole range of phytochemicals which have been scientifically identified but we are not sure exactly what role they play in our health but they seem critical.
4) Our bodies need various food in addition to fuel to regenerate our body parts
5) The world is suffering from a major health crisis as a result of poor diet

Despite any negative comments I make - the modern food industry actually produces an abundant quantity of energy food at low cost - **but is lacking in vitamins and phytonutrients**.

I built a successful career based on examining scientific evidence and where scientific evidence was lacking or debatable still coming up with practical solutions that worked. This is called a 'working hypothesis'.

My working hypothesis is that these phytonutrients are essential for health, if they are not in our diet our bodies senses the lack - we fell hungry and tend to pig out on high energy - low nutrient - food. Diabetes here we come!

This is what I call the hungry beast inside.

This may be a working hypothesis but I have tested it out using myself as a guinea pig - I eat until I feel full and generally feel satisfied between meals - I feel my energy level for my age is good and although my weight may be marginally above ideal it is stable.

Working on the basis of a considered evaluation of available data (as opposed to undisputed scientific fact) I feel confident in promoting this approach to diet as the best available solution to the global metabolic syndrome problem.

My solution is that people should supplement their diet with a variety of plants grown in nutritious soil with a full range of minerals and trace elements and with an active soil biology to make the minerals available to the plants.

I have tried to illustrate the basic principles that I use to grow plants with these essential phytonutrients.

While is does take more effort in growing I can see this being practical for some people who have land and time to grow their own high nutrient food with these essential phytonutrients. I see this as practical because they only have to grow enough additional food to supplement their diet. I see no point in them trying to replace the high energy food which forms the bulk of food intake and which can be readily purchased.

However I realise that many, if not the majority of people may find this impractical because they lack space, time or skills. There needs to be an alternative solution for these people.

I cannot see the traditional massive food system - dominated by short term profits - producing this high nutrient food - they are the cause of the problem.

But I can see a community action developing where people are motivated by ethics and providing a genuine service, rather than dominated by profits. Naturally members of the community need to cover their costs if they are volunteering there efforts but there is an opportunity for businesses to make reasonable profits - but it should not be the dominating motive. I am still naive enough to believe in ethical business.

This would need appropriate awareness within the community of the importance of phytonutrients the cooperation of home growers and ethically orientated commercial growers to supply the food.

A community project

Ignorance

One of the first jobs in creating this community action is getting the message out.

Before Xiulan was diagnosed with diabetes I really did not know much about it - I was ignorant. When it got the point that she looked as though they may have to amputate her foot I realised what a terrible disease it is. Diabetes is the most common cause of amputations and blindness and a poor diet lacking in nutrients is a major part of the problem.

I should at least make an effort to get the message out - but how? I know the number of people googling '*rhizosphere and diabetes'* is going to be pretty small so I am not going to achieve that much by myself. Simply putting these - and the many articles I write - up on the web won't have the needed impact. It just gets drowned out by the noise on the web and the desire for a three second sound byte.

But I look back to the wicking bed story. Probably very few people using wicking beds are even aware of my web site, they have just learned about it second, third or fourth hand. It is a little unfortunate that the message got a little scrambled but it is great that that at least got the basic message.

Since my original publications the system of creative commons has evolved. I am not sure whether people really appreciate the significance of creative commons but it is a major development allowing people who have creative ideas to cooperate with others in a community based projects.

I cannot do it myself but I can ask people reading this to take action. This could be as simple as telling friends and referring them to my webs, putting the message on Facebook or whatever social media they use, if they run a web put it on their site and if they are master film makers put it on YouTube or similar. This cost virtually nothing and all I ask is to follow the principle of Creative Commons.

Let us learn from experience with wicking beds - many people have been involved with wicking bed technology - member of our eco community and all those people who send me emails often with excellent ideas and information. The ideas are not all mine but I accumulate information and use my web as a central source of information. I am happy to adopt a similar role in centralising information on growing healthy food.

Delivering the goodies

Once we have got the message out there - people are going to ask *'where can I buy this high nutrient food and how can I be sure that it really is high nutrient and not some marketing scam?'*

Home growers

I know from my experience that I often end up with surplus food that I would prefer to pass on rather than put back into my composting system (however much I love it). This must be happening all over the world so why not benefit from this by selling (or giving away if you prefer) this surplus produce.

I know that this happens already - when I have a surplus I often just give it to my friends and they give to me when they have a surplus. But this is the age of the internet - why not do this on a bigger scale - using the internet as a medium for creating new contacts.

Commercial growers

But I do not see this as limited to the home gardener. I live in a horticultural region and I know that many of these growers are decent honest people trying to earn a living by selling healthy food. I know that many of these growers are being squeezed by the big supermarkets and would welcome an alternative.

Again the internet provides a mechanism. Even if they are selling at the local market it is more convenient for both customer and grower to have orders placed on line and pick up at the market. Additionally there are growers groups who are already running a home delivery service.

What is currently missing is a way for the customer to be sure that the plants are grown in nutrient rich biologically active soil. This would require some system of certification but would undoubtedly benefit customer and grower. If there is the interest from growers I can set up such a system.

Healthyfoodassociation.com the community bulletin board

The internet has changed the world we live in by providing a global means of communication.

I have set up a web site www.healtyfoodassiocation.com which is essential a free bulletin board. At this moment it is just a trial to learn people reactions but it can be refined as needed. The idea is simply to create a free bulletin board where growers and buyers can post and make contact.

Growers producing healthy food can post that they have their product available, this is a non-trading non-commercial web site - anyone interested in buying the produce can then contact the grower directly and arrange whatever commercial and delivery arrangements suits them. This could be either direct contact or at a local market.

This is a totally free web site where growers can post information on the produce they have available and promote their expertise in growing healthy regeneration food. It aims to bring consumers and growers together free of commercial hype so people can avoid the drama that Xiulan and I have been through.

Certification

I anticipate that customers will be looking for some sort of assurance that the plants really are grown in nutritious biologically active soil. At this moment I am waiting to see how these ideas float with growers but I see that a system could be set up where growers could use a name such as ‘Grown in Wickimix®’ so they can promote that the produce is grown in this nutrient rich soil.

This would be a system somewhat similar to organic produce. Many certified organic growers may use this system but there would be an additional emphasis on the nutritional value of the soil in addition to avoiding the use of toxic sprays.

Authors plea

In this series I have tried to give useful information about diet and health - I hope this benefits the home grower and dedicated growers. However there are billions of people around the globe who are suffering from poor health from eating unhealthy highly processed foods - high in calories but low in critical nutrients. I make a plea for community action to make healthy food readily available to anyone concerned about their health - whether they are gardeners or not.

If you are sympathetic to this aim please contact me at colinaustin@bigpond.com

Colin Austin