Principles of a Gbiota bed

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Aims and ambitions

The long term - and ambitious - aim of the Gbiota project is to change our food system so everyone can eat healthy.

The shorter term and more realistic target is to develop a growing system where plants grow in biologically active soil can make us healthy by improving our gut biology.

If enough members of the club can show that they feel better - with more energy and less cravings then the word should spread simply by personal contact and we may achieve our main aim.

Where do the basic principles of a Gbiota bed come from?

We know enough to be sure that gut biology is critical for health and is central to combating chronic diseases.

I can find an abundance of information on the biology's of both the soil and gut from easy to read books like Gut by Giulia Endere and the YouTube presentations by Elaine Ingram to highly technical papers written in the jargonistic and oblique language of scientific papers.

Sad to say - even Mr. Google lets me down on finding technical information on how biology moves from the soil, particularly the rhizosphere or root zone, through the plants and into our guts.

From the soil to the gut

This critical question - which we still have to answer properly - is how the biology gets from rhizosphere and into our guts.

I have watched rural Chinese making fermented vegetables. Typically they will wash the vegetables very thoroughly then scrub them with salt before covering them with previously boiled water.

Even without any 'mother' to provide a biological starter the vegetables ferment happily away and you do not need any sophisticated equipment to know that they are having a major impact our guts. I have no need to expand - you cannot avoid feeling the lower level activity and unfortunately others are likely to both hear and smell the action.

This indicates that the vegetables are already full of microbes but where does this intense microbiological activity come from?

It seems unlikely that our gut microbes - which are generally anaerobic and killed by the oxygen in the air - would have just blown in on the wind.

They could be on the surface of the vegetables but considering the amount of intense washing they have received by the energetic locals together with the salt it seems unlikely that many would have survived.

It therefore seem more likely that the biology is actually inside the vegetables and again the most likely route would be by being carried along with the solute from the rhizosphere into the plant and into the leaves or fruit.

p.s I have just found, 14 Feb my Valentines present a research paper in which they found that viruses could enter a plant roots through damage caused by insect or other attacks - seems to support my hypothesis that bacteria enter through the root system. Also the bacteria could be coming from the guts of the invader and not the soil which would help explain one issue that only some of the types of bacteria in our guts is found in the soil - it could be coming from the guts of the creepy crawlies - another bit of the jigsaw.

Of course the type of bacteria which causes a plant to go rotten is totally different to the type that causes fermentation but often leaves and certainly fruit will go rotten from inside rather than from the surface. This really requires in depth scientific research as in a bottom up approach but this is top down research where the critical issue is to find out if we eat plants which have been subject to the ongoing flushing of the biologically rich tea around the rhizosphere actually improves our gut biology.

Fortunately it is now relatively easy to have your gut biology tested scientifically but with a little practise you can become very sensitive to how your gut is working.

If you have suffered from constipation after antibiotics you will be sensitive to the changes as you recover.

Learning from ancient societies and the wild

Fortunately there have been extensive studies comparing the gut biology of people living a rural and semi nomadic existence with those eating a modern diet. These so called primitive people beat us hand down in the ‘Gut Biology Olympics’ so maybe we can learn a lot by studying how they grow or find their food and apply what we learn to growing food in the Gbiota system.

The irrefutable fact is that for millions of years, our ancestors have had perfectly healthy gut bacteria. It is only recently - since we have created a factory farming food processing system that we have ended up with the gut crisis.

I am no fan of ‘the good old days’ and ‘natural’ but we can hope to extract some valuable information from studying why people used to have a good gut biology and what has changed and extract the key information.

I am no David Attenborough but I have actually been to some of those wild places I now watch on TV like South America, Africa, India, China (and Queensland) which tells me we certainly do not want to be simply blindly imitating these societies.

But these people do have healthy guts - how and why - and what can we learn from them?

My object has been to study how plants grow in the wild and used to grow in ancient agriculture - then make some attempt to understand the mechanisms and incorporate these lessons into a modern growing system to improve our gut biology.

That is where the Gbiota beds come into play, they can provide us with both the gut biology, trace minerals and phytonutrients which may only be needed in small quantities but are crucial for our health.

What we can learn from ancient societies - poverty

Poverty is common in these ancient agricultural societies. Often this is simple a lack of some vital ingredient in the soil, such as iodine or zinc or some other trace mineral. At least modern technology allows us to identify and rectify these deficiencies. Commonly the land is not naturally deficient but has been farmed over centuries and is now depleted in nutrients and life. A few lucky places have volcanic soil which is still rich, fertile and full of life.

These so called wild places do not necessarily have abundant food. Our food plants have been dramatically genetically modified by selective breeding and are infinitely more productive than the original plants.

The major exceptions are herbs and medicinal plants and many of these ancient cultures have a thriving business in wild plants. It would be a great pity if that expertise were lost.

I very much hope that people with this expertise in rare plants will join the Gbiota club and be willing to share their knowledge.

Recycling and the eco-system

Recycling is an integral part of these ancient societies not just composting but with animals. I have yet to find an ancient culture without chickens - I did get up to about 5,000 metres in Western China and there were about the same number of chickens as yaks - but they were still there. Pigs are popular with the slightly more wealthy societies - but there are still chickens everywhere.

These ancient societies are a working functioning eco-system. I was brought up to think that plants should be put into nice neat rows into well dug and weeded soil. This is not what I saw. The locals would harvest a plant which leaves a space where they would immediately put another plant. The garden beds were never completely worked over - as we are used to here - there would always be some - if not most - of the area where the soil life could flourish and spread back into the disturbed area.

I am sure there is no need to lecture keen gardeners of the benefit of compost and recycling but maybe my aims are a little different. The critical issue is not the nutrients but feeding the soil microbes which are the whole point of Gbiota beds.

The same emphasis must be placed on not disturbing the soil - it is just so tempting to mechanically break up the soil into a nice ‘feel good’ tilth. That is a disaster for the soil biology - particularly the fungal hyphae which spread throughout the soil and spread - and make available - both water and nutrients for the plants benefits.

This balance is exactly what is happening inside our guts every day. To have a healthy gut we must be renewing the supply and feeding the biology.

Balancing the eco-system

The similarity between our guts and the farming system goes deeper - we kill of many of the beneficial gut biology with antibiotics and feed the harmful ones with excess sugars while our factory farming system kills of the soil biology with aggressive chemicals and in the case of factory farmed animals - antibiotics.

Many people argue that this is the only way we can feed the seven billion people on the earth - I have no idea whether this is really true but I am convinced that we need part of our foods to come from a balanced ecosystem with the essential biology for to replenish and feed our gut biology. This is what the Gbiota beds are all about.

Water in ancient agriculture

Water for the plants was often a major issue (either too much or too little). However it seemed to me that as they watered their plants they would be flushing the micro-biology into the root zone of the plants. I have to say that much of the water I saw being applied could only be described as biologically active.

This is one of the key principles I picked up - to flush the root zone with biologically active water - compost tea.

In the Gbiota beds - where I am after a system which could be used economically in a Western style agriculture I flush using pumps - controlled by a timer - picking up water from an small reservoir of what is essentially compost tea - circulating this through the root zone and at times through a compost zone to extract the tea without the toxic composting compounds.

The key feature of a Gbiota bed is not the pumps and pipes - that is all pretty simple engineering - it is to develop an active and sustainable rhizosphere - that magic zone where the plant roots and the biology interact.

The Rhizosphere

The Rhizosphere it the most important part of a Gbiota bed.

There is a simplistic image of how nutrients and water move from the soil and into the plant.

It starts with the nutrients dissolving in the water in the soil to form a dilute solution.

Osmosis then forces this dilute solution into the more concentrated solution in the fine hair roots.

This partially dries the soil around the root hairs which creates a water tension gradient between the rhizosphere and the surrounding soil so surface tension moves the water towards the plant roots.

Water evaporated from the leaves. Water has a most peculiar property which makes it act rather like a metal formed into a chain - water has a tensile strength. Mr. Google can tell you all about the peculiar molecular structure of water. As the water

evaporates from the leaves it literally pulls (by tension) more water up from the roots to the leaves through the plant stems.

This is the only way that water can reach the top of a tree hundreds of metres tall.

From a physicist viewpoint this is an accurate description of how plants work and is a pretty good model for much of modern agriculture where the soil is tilled into a fine tilth and soluble fertiliser added to provide the nutrients for the plants. This is a model which a physicist would be very happy with.

But it is not the way plants work in the wild or in what we may classify as primitive agriculture. This is well understood by a soil biologist.

The energy balance - the biologist view

Every living thing needs energy which mainly comes from plants which have the capability of turning sunlight into energy (some microbes can photosynthesise as well) which they exude from their roots to feed a maze of creatures - particularly mycorrhizal fungi.

It is a simple deal - the plants take energy from the sun, carbon dioxide from the air and a few minerals from the soil and manufacture a range of chemicals including sugars which they give to the fungi through exudates from their roots. In return the soil biology - particularly the fungi - supplies the plants with nutrients and water and sometimes protection from destructive pathogens like root eating nematodes.

In addition to the energy from the root exudates there is energy from decomposing vegetation and animals - I will get back to this.

This world of the rhizosphere is a bug eat bug war zone which in good times is in balance with the beneficial biology controlling the harmful biology by either direct attack or more often by the beneficial biology simply outcompeting the harmful ones for food and space.

The fungi - which the plants are happy supplying energy as sugar exudates from the roots - manufacture enzymes which travel to the extremes of their hyphae which develop very high pressures as their needle like tips push into any rocks. The combination of pressure and enzymes dissolve the rocks releasing their nutrients.

This is nature’s fertiliser factory.

Of course there are many more creatures than the plants and the fungi - in fact trillions of them with probably millions of different species. Some of these are seriously harmful killing of huge swaths of grape vines, Eucalyptus trees and many more vulnerable plants.

In a balanced eco-system the beneficial biology help control the harmful. Unfortunately it is a bit of a ratchet job, if you have an unbalanced eco-system then you are likely to suffer from these harmful ones but just because you have a balanced system does not fully protect you.

This has tempted humans to simply trying to kill of the harmful ones by aggressive chemicals. I accept that this may work if the objected is simply to grow the maximum

volume of produce but is about as daft as our breeding anti-biotic resistant bugs by feeding anti-biotics to farm animals because it makes then fatter (and more profitable).

Nature does it a lot smarter by developing a balanced eco-system in which harmful bugs are controlled by beneficial ones.

Our aim is not to maximise production volume (and hence profits) but to improve our gut health which needs a balance eco system.

The rhizosphere is not just home for the microbiology but home to a wide range of macro creatures - worms, ants, slaters and that mass of wrigglers I dig up in my garden. Typically these creatures will have guts which are full of microbiology which is helping them digest the food. The total range of biology that makes the rhizosphere home - including the gut biology of these macro creatures - is simply mind boggling.

Composting in the wild and in agriculture

In the wild plants and animal are dying all the time. They just fall down and are broken down by series of decomposers. They may be other animals or insects - so spare a thought for those industries ants running a fertiliser factory, or for the vast array of microscopic decomposers - the fungi are king decomposers.

Plants cannot access these nutrients until they have been processed by the array of decomposers. Even worse this - this labile material which has only just started to break down can be highly toxic to plants. Plants are sophisticated chemical factories and make many toxic chemicals as part of their defence mechanism.

In the wild this does not matter - something dies - plants just keep away until the decomposers have done their job and released the nutrients when the plants move in and have a feast. The ancient farmers may not have had any understanding of the complex chemistry of toxins but they knew it killed - or at least slowed down the growth of their plants so they would either let waste slowly decompose or let their chickens and pigs have a feast and use the bacteria in their guts to produce available, not toxic nutrients.

Summary of principles

The purpose of a Gbiota bet is to grow food which will make us healthy by improving our gut biology.

The aim is to create an ongoing stable rhizosphere with a balanced eco-system with a mature biology. This is achieved by a combination of permanent planting and sequential cultivation.

Compost tea is supplied to the rhizosphere to feed and reinforce the soil biology - this would typically be applied regularly by an automated pump system but could still be applied manual.