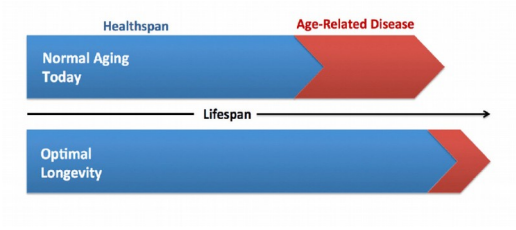
The Gbiota bed story

Wicking and Gbiota beds



What the difference between a Wicking Bed and a Gbiota bed. The answer could be nothing.

The purpose of Wicking Beds is better use of water.

The purpose of Gbiota beds is to create biologically active nutrient rich soil to grow gut food (Gbiota food) - they are about how to make soil that will improve our gut biology and hence health span.

Soil simplified

Soil has two properties, nutrients and structure. Clay has plenty of nutrients but has a terrible structure that kill many plants, sand has an excellent structure but little or no nutrients.

But different levels of soils have different jobs.

The top level is for germination - that is all about an open structure for the tiny roots to develop in and ensure there is just enough moisture, but not too much so the seeds rot. Some of the better mediums I have found for germination are Vermicast and crusher dust, just a fine crushed rock I can get from my local garden supplier for paths etc. It holds the water well but has virtually no available nutrients.

The next level down is for the root zone or rhizosphere, this is where the plant gets its nutrients and the local soil biology breeds to make the nutrients available to the plants.

Below that is a zone which can act as a water reservoir but can also be a breeding ground creating the next generation of soil.

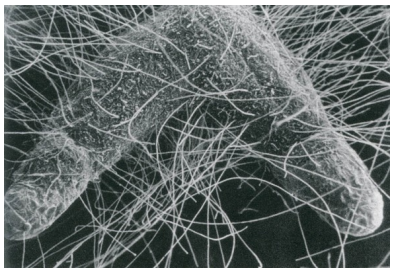
How to make soil

There is nothing new about making soil - they have been doing it for billions of years. They being the bugs.

This is how it works. Start of with a bit of rock (which is made up from minerals - the more the merrier but too much of the mercury, lead, cadmium and definitely no arsenic), add a bit of biology (bacteria, fungi, algae, lichen) then wait a few billion years. It takes a long time because the biology needs energy from the sun and bugs are not good at capturing that energy.

But if you already have a bit of soil you don't have to wait a billion years - you just grow some plants. The plants will take carbon dioxide out of the atmosphere, soak up a bit of

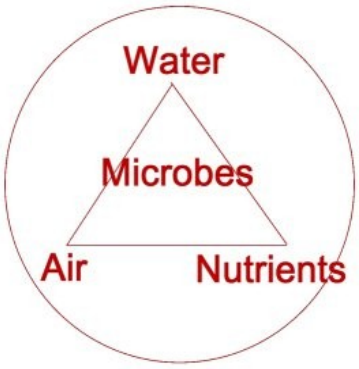
sunshine and absorb the energy and make sugars which they will exude from their roots back into the soil to feed the biology.



With the energy they can go into hyper drive and start breaking down the rocks to provide minerals for the plants. Mycorrhizal fungi are particularly good at this, their hyphae are very fine and can exert enormous pressure on the rock and they exude acids and enzymes so they break down the rocks much faster. Some fungi can penetrate the plant roots to provide them with minerals and water directly in exchange for a bit of sugar - the deal of the century.

But still not real soil!

The soil biology needs air to breath so they have worked out a neat trick. They put out a really magic stuff, which I will call sticky stuff but other people call glomalin which covers the surface of the rock dust particles (commonly called dirt) so they stick together into tiny little balls, a process know as aggregation. There is now plenty of spaces between the particle which can let air in for the bugs to breath and let the water out so they don't drown.



Great as these aggregates are the air channels are still small so there is not much air movements. What really makes the soil work is the macro creatures that make channels through the soil. There are volumes written about the thousands of species of soil macro biology but the most important are worms.

Worms are the canary of the soil, an abundance of worms indicate a healthy soil.

Some plants are particularly good at growing soil biology, I grow Sunflower because it is particularly good at attracting mycorrhizal fungi. I also grow Lucerne or Alfalfa because it fixes nitrogen and makes a real good smoothie. Buck wheat and Barley grass are great for soil structure.

I also have lots of weeds growing on my block, they are pioneer species and particular good at extracting nutrients from poor soil. That is what I tell visitors anyway in an attempt to convince them I am not a lazy gardener - they think I am kidding them but actually is true.

Breeding beneficial biology

Here is an important point. The beneficial biology we want in our guts do not breed directly in the soil, they breed in the gut of these macro creatures, then move into the plants and then into us when we eat the plants.

We can speed the process up by adding piles of organic waste for the bugs to feed on and instead of having to wait a few billion years to make soil we can do it in a few months.

The key ingredients are an ongoing supply of organic material, food waste is highly desirable and may be obtainable from you local council but this can be amplified by other source of clean organic waste, sometimes garden contractors are happy to drop a load to save tip fees.

You need a source of minerals and biology. I have negotiated with a company in Toowoomba to make a special mix of minerals and biology available to Gbiota club members and this will soon be available on line for home delivery - keep in touch.

Food and bugs

Gbiota beds do more than grow plants for us to eat, they grow beneficial biology and food to feed the beneficial biology that lives in the soil and in our guts.

Plants are naturally the best pre and pro biotics.

Plants are naturally full of beneficial biology but how it gets into the plants is a bit complicated. There are trillions of them, minute bacteria, fungi etc growing naturally in the soil but these are not the sort we want in our guts. We need sort from the gut bacteria of the numerous minute creatures that live in the soil which have a gut biology similar to ours.

There is a clear path from the gut biology of these creatures, into the soil, the plants then our guts.

But gut biology has short lives, so they need to breed and to breed they need to be fed. Plants are naturally pre and pro biotics so the aim of Gbiota beds is to breed the beneficial biology (pre biotics) keeping them well fed (pro biotics).

This is not some weird new technology, it has been going on for millions of years - we have just tended to forget about it in our modern age of technology.

We need to feed the soil biology, fortunately we can do this with with organic and food waste for next to nothing yet recycling a valuable resource. This is an important part of Gbiota technology.

Soil levels or horizons

Germination

The upper layer of horizon is where germination occurs, this required a fine tilth and may need cultivation. We need an open structure for the roots to develop. But also we need it to stay moist without drying out. Vermicast is very good but oddly enough fine rock dust

also works surprisingly (to me anyway). The hard rock particles seems to stop the moisture evaporating.

Rhizoshere

The middle layer is the rhizosphere where the bulk of the roots grow and is generally a mix of soil and well matured composted organic material. Both structure and nutrients are critical for the rhizosphere.

Reservoir and soil creation

The lower layer is made up of labile compost eg raw organic waste material which is partially or even fresh organic material. This is decomposing making the next generation of soils and the friendly worms will happily bring it into the rhizosphere for us.

The whole point of a Gbiota bed is to encourage the growth of beneficial biology which will breed and grow in the soil and enter the plant so when we eat them they reinforce our gut biology and continue to feed the biology inside us.

Types of Gbiota beds

There are three main types of Gbiota bed, sponge, wicking and flood and drain.

They all have the three levels of soil structure in common

Sponge beds

These are dead simple and are really useful in small areas which may otherwise be difficult to use.

Typically a trench is dug and filled with raw organic waste which is being recycled. This is the bottom or reservoir level. There is no water proof lining and the beds are just relying on the water holding capacity of the sponge.

The soil from the trench is mixed with mature compost, minerals such as Gbiota BioMin which contains both minerals and starter biology and any soil conditioner needed for example gypsum for heavy clay or vermiculite to open up the soil, then put back on top of the sponge. This forms the middle layer which is generally above ground. (Particularly if you live in a place like Queensland which is prone to flooding).

The top layer is for germination where structure is more important than nutrients. Vermicast, rock dust and mature compost can be mixed to make a good tilth.

Water management

Like all Gbiota bed a nice moist Goldilocks soil is needed, not too wet and not to dry.

They are simply watered from above using a sprinkler system just like any raised garden bed. They are usually watered sufficiently for the water to soak into the lower sponge layer which will then allow water to wick back up into the root zone.

They work on the principle of the hanging water table with the fine particle size in the root zone holding onto the water so it does not flow down into the layer below which has a much coarser structure with less surface tension.

The big advantage of sponge beds is they are so simple and can fit in almost any where, the snag is that there is no way of catching excess water so you have to be much more careful with irrigation.

There is no natural correction of the water content as in Wicking beds so they have to be managed carefully considering the moisture content. This means they are difficult to automate with a standard timer based system without loosing lot of water (and nutrients).

Wicking Beds

Wicking beds have been around for years as a means of reducing the need for frequent watering.

Fake Wicking Beds

For reason of better publicity than science they often are in a box with a layer of stones covered with cloth at the base which creates a water reservoir. These are not Gbiota beds and as stones have virtually no wicking acting they are neither true Wicking Beds. They work by water evaporating from the water reservoir and condensing on the hydrophilic soil above.

In a genuine Gbiota Wicking Bed the bottom layer is labile (young) compost and with no barrier between the root zone and the lower water storage zone.

One reason why some people like the stone system is that is does not rot down but that is missing the point.

They are so simple

People seem to somehow find me on the web and so I get a string of questions about how to make Wicking Beds and the questions are typically about the hydraulics, how to connect the pipes to manage the water. I don't understand why but there seems to be a view that Wicking Beds must be complicated when the hydraulics can be really simple.

You can take any old polystyrene box from the super market, and instead of punching holes in the bottom just punch a hole in the side - fill with good soil and voila you have Wicking bed.

I find the snag is that people will insist in over watering Wicking beds, the plants need to use up the water so air gets into the soil and with this method there is no way of knowing how much water is in the bed.

So just poke a pipe down to the bottom of the bed and you can either see (if its a big pipe) or use a dip stick to see when the water has been used up. You can also use the pipe to fill the bed with water from the bottom which is saves a lot of water from evaporation.

Next trick is instead of just punching a hole for drainage put a pipe with an elbow in with an extension so you can twist to adjust the water level (or drain) and you have perfectly functioning Wicking bed.

But it is still not a Gbiota bed for growing plants which will lead to a healthy gut biota.

Making the worlds second simplest Gbiota bed

But that is easily solved, when you are making the bed just fill be base with organic waste, preferably food waste so you are recycling a valuable resource.

Now you need to add the minerals that our bodies need together with the microbiology to make them available to the plants. I have now arranged with a commercial supplier to make a mix of essential minerals and biology specifically for Gbiota beds available. (Gbiota BioMin).

Last step is to add some worm eggs as the worms wriggling through the soil give the needed soil structure while the worms are adding their gut biology to the soil. Again I have organised for a worm farm to supply Gbiota worms.

And now you have a fully functioning Gbiota bed which will grow food to feed your guts.

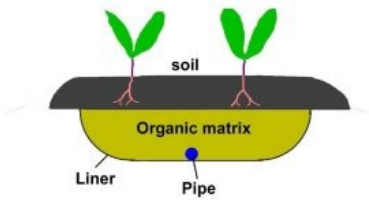
So easy!

Feeding the biology

The whole point of Gbiota beds is to breed beneficial biology. For them to breed you have to to supply them with a continuous supply of their food which means recycling waste organic material in nutrients. That is the way we grow active biology for our gut biota.

This means that the Gbiota Wicking beds need topping up with waste organic material - that is the whole point.

Open Wicking Beds



Wicking beds can also be open beds meaning that instead of being in a closed box they are simply made by digging a trench and lining with a plastic sheet or other water proofing material.

Open beds have the big advantage of allowing soil biology to move into the bed from the surrounding soil, the disadvantage is that there is some water movement into the surrounding soil. If plants, particularly deep rooted plants or trees are

grown just outside the bed they will be automatically watered and mop up any water moving into the parent soil.

Irrigation scheduling

One big advantage of Wicking Beds over Sponge beds is the ease of irrigation scheduling.

With a Sponge bed if you apply too much water it is lost. It is not just the waste of water - it is the waste of nutrients and what they do to the environment.

With a Wicking bed you get an immediate indication when you have applied enough water.

You need some way of inspecting the water level so you can keep on adding water until it reaches the required level (just below the root depth) then letting the plant use the water until it has been largely used up.

This is a common mistake with Wicking beds - keeping on topping up with water so the reservoirs never dries out and lets fresh air in.

THE BIGGEST MISTAKE YOU CAN MAKE WITH A WICKING BED IS KEEP ON TOPPING UP - BEDS MUST BREATH

Automated flood and drain beds

Good intentions are not enough

Sponge and Wicking beds are great for the home gardener. But the whole point of Gbiota beds is to increase peoples health span in the current food system of high sugars and fats and low nutrients. Our guts form part of our intelligent control system, they sense the lack of critical nutrients, create food craving so we end up eating more sugary fatty foods low nutrient food.

This actually starts from a young age but the effects only become noticeable after the age of thirty or child bearing for women.

The whole aim of the Gbiota club is to create a community who really understand this and commit to spreading the word among their friends and local cafe owners. But that won't bring success unless there is an economic way of producing Gbiota food.

Automated flood and drain beds for commercial production

The whole point of the automated flood and drain bed and the tipping system is to make gut food readily available at an affordable price - and that means an economic commercial system.

External water reservoir

The structure of the soil with the three layers is the same as in sponge and Wicking Beds, the difference is that water is stored in an external reservoir, the bed is partially flooded then water allowed to drain back into the reservoir by the leaky dam system.

External reservoirs have two major advantages. The first is technical, the bed is allowed to drain at every cycle - the water is never allowed to stagnate so can never go putrid.

The second advantage is they are easy to automate. You should never fit a float valve to a conventional Wicking Bed to maintain the water level - this is an open invitation for the water to go putrid.

With an external reservoir you fit a pump to refill the bed and a float valve to top of the reservoir - this means they can be virtually totally automated. But bear in mind that automated does not mean maintenance free. We are pumping what is really compost tea around the system, highly nutritious for the plants but there are a lot of particles floating around with a sadistic desire to block up any small orifices.

Not a problem with proper maintenance but after the virus has gone you simply cannot take a sabbatical year of for a world tour and expect them to be still working when you get back.

More later when I talk about tipping.

There is absolutely no reason why you can’t set up a commercial operation with Wicking Boxes enclosed in green or shade houses to keep out the insect and also to mange the climate to keep in production in the winter months in cooler climates.

But if you live in a warmer climate then the simplest and certainly the cheapest is to set up open beds directly into the soil.

Open Gbiota beds for commercial production

A drainage pipe is laid along the base of the bed then up and over the leaky dam which is nothing more that a dam made from porous soil. The bed is flooded by a pump and timer to the level of the top of the dam (about a third of the depth of the total bed then the water slowly leaks through the dam and back into the external reservoir. This is topped up with a float valve so the process it totally automatic. But note there is a difference between automatic and maintenance free.

Hydraulically it is very similar to aquaponics with a fish pond (and fish can even be added to the reservoir but the key difference is that the beds use soil to breed the essential biology.

Scheduling and water waste

You set the times so it has enough time to fill the reservoir, when full excess water will simply flow back over the leaky dam and back into the reservoir so there is no waste of water. All you have to do is make sure you run the pump for long enough to fill the bed up

to the height of the leaky dam. This is obvious because you can see the water running out of the pipe.

You need to allow enough time between irrigations to let the bed completely drain - again obvious by looking at the outlet pipe or better digging a small inspection hole.

There is another point about using an external reservoir. In a conventional Wicking Bed there is water in the reservoir all the time so the bed needs to be water tight. In the flood and drain system the bed in only flooded for a short period of time. Not exactly perfect but if you are on heavy can you can skip the water proof liner. There will be some leakage of water but this may be acceptable and practical in certain situations.

I am currently running an experiment with a lined and non-lined bed side by side. I'll report on my blog www.gbiota.com.

Getting into recycling

Think of the bugs in the soil like miniature cows and you are the farmer. Cows need to be feed every day and so do bugs. If you don't feed them bug food they will just die and within a few days too.

Fortunately bugs are easily satisfied they just eat decomposing organic material so an important part of being a Gbiota farmer is to locate a suitable and ongoing source of waste organic material.

And sadly that is up to you - I can't help on that one. I can tell you some of the tricks I have used. Obviously I collect up all my food waste from my house and any gullible neighbours I can chat up to collect their food waste. (My neighbours think I am weird anyway so nothing lost).

For many years I lived on an Eco village with no water or sewage. I did not want to use sewage directly so I set aside an area of land and just grew plants in the dubious waste to provide me with clean organic material. Now days I collect water weed from a local swamp which is also providing a useful local service.

Sea weed is an excellent source of nutrients and currently I am searching for someone who can supply Gbiota club members.

Anyhow however you do it you will need to find a source of organic waste.

Forget the compost books

I know some people are fanatical about composting (actually you can include me in that groups of fanatics). They

carefully measure out the green and brown content, make sure that all onion and orange skins are removed and build them into layers with pipes to let the air in - regularly turn their piles - real masterpieces of organic structure challenging the Parthenon. No doubt they have street parties to show of their masterpieces to the neighbours.

Well congratulations and I would hate to be a party pooper but the best way is for you to simply bury the organic waste deep in he ground. One of the thousands of species of creatures in the soil will find whatever you give them as a bug Kings feast and happily eat it and reprocess it for you without you having to do a thing.

Now I admit it takes a lot longer than hot composting but in the bottom of Gbiota bed that is actually an advantage.

Now you may ask - I have this beautiful pile of rotting garbage attracting the flies, how do I get it to the bottom of the bed?

Don’t do it (hurt the mycorrhizal fungi)

Why is there always a snag in life? We have a beautiful working Gbiota bed everything is going fine until all the organic waste is used up and we need to replace it.

No what you don’t want to do is to dig it all out and start again. First it is a lot of work and secondly you will have grown a nice mycorrhizal network. Gbiota BioMin contains mycorrhizal fungi spores which will put out their hyphae and break down the rock dust and release the minerals so the plants can access them.

So we now have to solve that snag, we have collected a beautiful pile of organic waste (which is the bug food which powers the whole operation) and we want to get that to the bottom of the bed so the bugs can eat it.

We could cheat and just use it as mulch and let the worms bring it down deep into the soil. That works, is easy and helps keep the weeds down but that is not really the best way, the oxygen in the air will burn much of the carbon up and the flies will think they have hit the jackpot. It is just so much better to get it down deep into the soil and let the soil biology munch it up.

There are several ways but the simplest is a small local trench.

The trench

It takes a while for the mycorrhizal fungi to get established and put out their hyphae but once they are established they grew incredibly quickly.

The last thing we want to do is to destroy our hyphae web, there is a lot of sense in no-till.

But just a weeny bit of till is OK as long as the basic structure is still there and left undamaged, so just dig a small

trench down to the base of the bed and load up with organic waste and back fill. Next time dig the trench in a new place.

This way the soil structure will soon recovery, it is the difference between having a bit of a scratch which soon heals or chopping a limb off (unless you are a lizard - well not quite but you get the gist).

When you dig your trench you now have a pile of really nice soil which you can use for the germination layer when next you seed. The soil may go round and round in an endless circle but it is slow so the biology has time to adjust.

The holey bucket

Another way is just to have a holey bucket (with lid) which you just build into the bed. Just keep on putting the organic waste in the bucket and let the worms get into the bucket (use big holes) and they will spread it nicely throughout the bed.

(The bucket is lifted up so you can see it, in practise it is buried with just the lid sticking up.)

The seedling tray

I will be talking about ‘tipping’ in a bit but if I can persuade you of the benefit of growing baby greens and tipping then seedling trays are a real simple way.

Simply grew you plants in a seedling tray which is sitting on the bed. You can then simply lift up the tray and reload the organic waste and pop the try back on top.

Home and commercial growers

As you can see from my front page of www.gbiota.com the aim is to increase health span by incorporating gut food into our diet. I am hoping this leads to a more compassionate and caring society and we move away from the combative profit focused society which is the root cause of the reduction in health span.

But growers need to receive a fair return for their effort. Whether it makes sense or not the fact it that many people will not pay that much more for food even if it offers significant health benefits so we have to look at how we can make growing gut food a viable business for them.

Life cycle of plants

Seeds contain a lot of nutrients and energy but they are often indigestible but we can release all that energy and nutrients by the popular method of sprouting. Tastes nice and is really healthy but the real work of growing has been done in growing the seeds.

If we seed into soil it may take a couple of weeks before the seeds actually put out roots and start to feed the emerging plant. From the point of view of production this germination period is really dead time.

Now we move into the baby green stage, where the plant has some roots and is absorbing energy and nutrients from the soil and air so they are just beginning to be productive. Here the plant are really young, tender and tasty. From the point of view of production they are just starting to be effective, the equivalent of a toddler in us humans.

Now we move onto the next stage where the plant has well developed roots and leaves and grows really fast but the leaves are still tender.

This is the period of peak growth from the point of view of production when they are at their peak, the period equivalent to adolescent on use humans.

Now the plant is approaching maturity and begins to think about breeding or growing seeds. The growth rate drops, the plant becomes tougher and less nutritious and no so tasty. From the point of view of production it is past its peak and is the equivalent of early maturity in us humans.

Finally the plant goes full boar into seed or fruit production, green growth slows and all the energy goes into the next generation. From the point of view of production it is well past the peak for green production but just starting the seed production stage, the equivalent of late maturity in use humans.

Some plants, seeds, fruits, nuts and tubers we really want to grow to maturity but some of the best gut foods come from the green leaves and they are at their most productive in that child to adolescent stage.

And that is what tipping is all about.

Tipping

Tipping is a way of growing nutritious food without toxic chemicals at a reasonable price.

Lets recap the life cycle of a leafy vegetable.

Seeds are full of nutrients and energy, but are often indigestible so are spouted. The only energy and nutrients come from the seed itself.

But the plant will soon put down roots and start to extract nutrients and energy from the sun and soil. These are often called baby greens.

But let them grow a bit bigger so they have a developed root and leaf system and there growth rate rises to a maximum. In this stage the plant is at peak productivity and is what we use for tipping.

After that the vegetative growth slows as the plant puts it energy into making seeds.

With tipping the plants are harvested during this period of maximum growth. If just the tips are harvested the plants will continue to grow many times.

They are planed much more densely than normal as the soil is so nutrient rich, this substantially reduced problems with weeds and pests.

What name shall we use?

So what should we all thee young plants? Baby greens is a well known phrase but we are talking about plant which have just gone past this baby phase. What word will catch on kid, child, adolescent, young, immature? I don't know so I will use kid greens for now.

In practise it is a simple process, just wait and watch the plant growing and when it reaches that magic point of just growing at an amazing rate just keep on cutting of the tips which can then be used in many ways - green salads, as accoutrements, filling in pancakes or wraps or my favourite made into a green smoothie.

Tips for tipping

Some plants just seem almost designed for tipping. Alfalfa is just amazing - I have beds which have been in continuous production for what seems for ever. I just keep on cutting of the tips and they just keep on growing back, they reseed naturally and the plants thicken up nicely and they handle my hot, dry, windy and insect ridden climate without hassle. They also add nitrogen to the soil and their root structure gives a good soil structure (more later).

The only problem is that is you let them get away (eg past the tender tip stage) the stems can get tough and thick - not a real problem as you can just strip the leaves off (when you get the knack it only takes seconds) and once you have the plant under control the new stems go back to being fine and tender - a bit like running a tea plantation.

Spinach is another great plant which is pretty tolerant of our conditions, bit more tedious to pick and grows slowly in winter but is highly nutritious but you can leave a few heads and with will reseed nicely without you doing anything.

Water cress is another easy plant to grow but does not like our hot dry summers so is complementary to spinach.

Linseed is a great health plant because it is full of omega 3 but is a bit fussy to germinate.

Radish (micro green radish not regular radish) is really a great plant to grow as it grows so fast but you really have to tip and not let it get away from you (like you can with Alfalfa). Young radish leaves really have a nice flavour but when the get a bit older they can be very strongly flavoured (too bitter for me) so you have to reseed and start again.

Some plants, such as lettuce and the cabbage family are not particularly suited to tipping and you can only get may be three or four tips before they stop growing vibrantly.

Dense planting weeds and chemicals

As you know there is a great deal of debate about whether chemicals are actually safe or not. The discussion is generally centered around potential harm to the human body. In Gbiota beds we are concerned about damage to our gut biology which is a very different question and as many chemicals used in agriculture are specifically designed to kill bugs it is reasonable to assume they are potentially damaging to our gut biology.

Right or wrong I take the view that I will avoid all potentially toxic chemicals on my block. In Queensland, where I live, this give me special problems as we get more than our fair share of insects and weeds so we have to develop strategies so we can cope.

Dense planting is one such strategy. This means making sure there is an adequate density of nutrients in the soil so even though the plants may be overcrowded by conventional views there is enough nutrients and water for them to flourish in the crowded conditions.

This certainly enables me to grow without toxic chemicals, the dense planting means there is no bare ground for the weed to get a hold and it provides some degree of protection against insects.

But at some point in time the insects win and it is time to start again which fits in very nicely with the tipping approach. This means there is a lot more germination which brings me to the next question - how to water and germinate.

Tipping, watering and germination

It is very nice to write away telling you of all the success stories, but sometimes there is more to be learned from failures rather than successes.

I have been using Wicking and Gbiota style beds for many years now and generally they work very well being highly productive while using little water with no waste.

They do however have one characteristic, the soil surface is typically dry so seeds don’t readily germinate - great for keeping down weeds but not so good if you want your seeds to germinate.

Normally what I have been doing is just hand spraying until the seeds are germinated when their root system reaches the moist layer below. Not much of a problem when it may take a couple of weeks for germination and the plant may take three to six months to mature.

But when growing say radish I may need to germinate after a couple of months so I felt that is this was to be a commercial operation I needed a more automated system.

I therefore set up a dual irrigation system. The first was the standard Gbiota system of feeding the water from underneath. The second was a sprinkler system using low pressures sprinklers I could run from the sump pump. I could just switch from one to the other.

I ran just the sprinkler system for several months over winter and everything was looking great but when spring came I noticed two problems.

The first was that the water draining down through the soil was taking fines with it so the bottom of the beds were becoming quite solid. Not a big problem and if I switched back to the subsoil irrigation the worms and soil creatures should soon restore the soil.

The second was more serious, with the sprinklers the plants and soil surface were really quite wet and we had an invasion of slugs and snails which we has never had before. One of the big advantages of using wicking to irrigate the plants is that the soil surface and plants are dry so weeds and insects are not that big a problem.

I have now gone back to just hand watering the beds under germination and it is really no problem when we have the virus and I am not travelling but is an issue I have on my list for further experimentation.

Humans are really very good at just looking at the top of the soil and applying just enough water. How to achieve an automated system which is so good is a bit of a challenge.

At this moment I am experimenting with growing in seed trays which I can locate in one spot for sprinkling, then moving them to the main beds for subsurface irrigation. I am also taking some of them back to the sprinkler zone for seed generation which is a bit of an issue with tipping.