Operating manuals

1) Wicking box instruction manual

Wicking boxes are the smallest and simplest of the wicking system. They are usually used on balconies or window boxes.

If you are new to the wicking system we recommend you start with a wicking box, they are very simple and can be made for next to nothing, when you are comfortable with the system you can move onto larger wicking systems.

You will need a waterproof box of some sort. These can be very simple such as a polystyrene vegetable box or storage container which can be bought from many discount stores.

The dimensions are not so important; the height depends on the type of vegetables you want to grow but generally between 250mm and 400mm. Unless you are growing a deep rooted plant anything over 600mm may lead to stagnant water at the bottom.

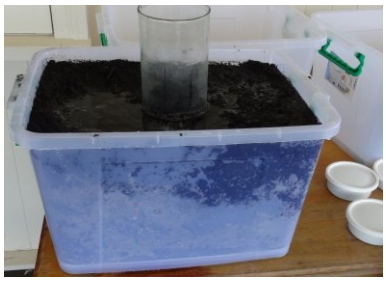
You can simply fill this with soil and rely on the saturated soil at the bottom to act as a reservoir. Significant water is held in the saturated soil. This is the key principle of our wicking system. The soil will hold more water if it has a high sand content. Adding sand to clay is generally beneficial as is adding clay to sand. The critical component is the organic material which you can add or grow in your boxes.

You can if you so wish increase the water holding capacity by using an upside down container to provide an extra water reservoir. This is as additional improvement which can extend the time between watering but it not an integral part of the wicking system.

The height of these water containers can be up to a third of the container depth. This picture shows 3 containers and some baking tins which just happened to be on special, just costing a few cents. A plastic container would have probably been better for the water reservoir but there was none of the right size on my shopping expedition so I used the tin foil containers.

I used two containers at they were not very strong. I made a small hole with a knitting needles in the corner of each container and used a piece of dish cloth to act as a filter to stop the dirt getting in although with two containers with the holes on opposite corners this was probably not needed. With a stiffer plastic container the cloth, held in place with sticky tape would be needed.

Two of these water reservoirs fitted nicely into the main box leaving enough room for the soil to drop to the bottom of the wicking bed to provide a wicking track. A single container for the water reservoir would have been OK provided there is enough room for the soil to fit around the water chamber.



I used a circular flower vase, which I just happened to have, to help form the compost pipe. Any round object would do equally well. Actually I prefer a piece of pipe as I have got shed full of off cuts but I used the vase so you do not think that a real pipe is needed. (The larger bed may have a pipe but I want to save space in the smaller box by combining the compost hole and pipe).

Here are my three boxes with one having a plastic pipe to form the compost hole. Now what really matters in wicking boxes is the soil - to get mineral and vitamins from the plants means we must have healthy soil. It is very difficult (read virtually impossible) to get really good soil. The solution is to make your own soil. Many people think wicking beds are just about saving water, but the aim is to make healthy soil.

I am always experimenting with different soils; the first box on the left is filled with decomposed sugar cane mulch (mill mud). I live in a sugar cane growing area so this is readily available and cheap. You may find a suitable source of agricultural waste in your area. Mushroom compost or vermicast (worm droppings) make an excellent base for healthy soil.

The second box was filled with lumps of clay. This is really terrible, just lumps of inert clay without any life. I am doing this to show that you can make healthy soil from the worst possible base. The soil biology will ‘convert’ this clay into healthy soil (it will take a while) but the soil biology must be fed with plant material. Virtually nothing would grow in such terrible soil so I have given this box a kick start by filling the spaces around the lumps of clay with compost and put a thin layer (at least 10mm so the plants can get established).

The third box is filled with compost, nothing special just house hold waste which has been well rotted.

It is really best to use a mixture to start you soil. Rich material like vermicast, compost and mill mud are really too rich for many plants by themselves but making a mix of rich material, clay and sand gives a better balance. Good soils need a ‘base’ of inert particles with a range of sizes from coarse to fine plus the organic material.

This is the compost pipe after the plastic pipe (or whatever) has been carefully pulled out. The soil needs to be slightly damp and compacted around the pipe so it does not collapse.

If just a little soil falls down this can be cleaned out by hand.

You can just see the foil at the bottom of the hole. This needs to be covered to the top of the water chamber with compost.

It is now time to add the worms. As they say ‘oils aint oils’ and worms aint worms. You need the correct varieties, compost worms to consume the compost you will be adding and the amynthas worms which will collect the rich material from the compost pipe and distribute this throughout the rest of the soil and so aerating the soil.

This shows a small container in which we supply a mixture of worm varieties specially selected for soil generation.

Clear plastic boxes have the advantage that you can see the water level, but they do degrade faster than coloured boxes.

To avoid saturating the soil you need a drain hole which is typically drilled about one third up the height of the box. Alternatively you can fit a clear inspection pipe on the outside of the box using an irrigation ‘T’ piece and rubber grommet. This also lets you drain the box if needed.

This box is a little small but I am going to grow one of my soil trees (senna alata). Here you can just see the mycorrhizal fungi powder I have place in the bottom of the hole. The fungi will spread out over the entire box so I will not need to re-inoculate again one the fungi is established. The fungus happily spreads from plant to plant transferring nutrients from the deep rooted senna to young seedlings.

I find this tool very useful for transplanting. It makes a very clean hole and when you extract the plant it fits perfectly into the hole.

I have now finished planting the seeds. I have filled the compost hole with compost and pour water down this compost pipe filling the box from the base. This also washes the compost 'tea' throughout the box. When the water level drops I will top up again, I will be careful not to water to often letting the water level drop before topping up.

When you put in seeds you will probably need to water from above until the plants have germinated and put down roots. The surface of a wicking box is normally dry, this is the way it should be to avoid loss of water by evaporation, but this is no good for germination so watering the surface is needed.

I will add fresh compost to the compost hole as it decomposes. I will make sure I add plenty of green compost so the micro biology has fresh food. I will also add fertiliser to the compost hole, typically I use processed chicken pellets and blood and bond to provide the main nutrients and the special mix of mineral and trace elements which we supply commercially.

With the box filled with clay I will also add dolomite to help break down the clay.

The main point of this process is to get this mineral into the plants and then into us.

Maintenance

If you are setting up your boxes using quality compost there is probably no need to add extra fertiliser during construction. In the boxes shown one was filled with heavy clay clods. I did put some dolomite in to help start the breakdown. But in the other boxes I did not add any extra fertiliser, just the worms and the mycorrhizal fungi.

However the whole point of the wicking system is to harness the soil biology which has to be fed on a regularly. Compost and fertiliser should now be added on a regular basis. I add a little pelletised chicken manure, blood and bone and most important the minerals. The compost should be balanced with a good supply of green material, generally household waste does not contain enough green leafy matter, The senna can be pruned to provide extra greens and keep the plant small so it does not grow too much and swamp out the crops.

The compost hole should be covered with something dark as worms do not like light, an easy way is just to collect the household waste in a small container, sprinkle a little fertiliser and minerals on the surface and turn upside down over the compost hole.

Only add small amounts of fertiliser, in a conventional garden water is always flushing out the nutrients so it is necessary to add reasonable quantities, in a wicking box, particularly if it is on a balcony with no rain there is no natural flushing. Nitrogen in the fertiliser is used to

decompose the compost and some goes into the plants, but that is a very small amount. If you over fertilise then the water will become too strong and the plants could actually die.

How do you know how much to add? Just look at your plants.

It is easy to tell if you are adding the right amount, if there is not enough nitrogen the plants will start to look a bit yellowy and will not grow well. Then add a little fertiliser and minerals, may be just a spoonful.

If you are adding too much they will initially grew very fast looking very green and healthy then they will droop over and may even die. Add water to flush out the system.

The boxes shown have been split into four areas so with three boxes that give 12 different plants. The varieties should be changed when possible to give some crop rotation.

The plants I am growing in these boxes are tomato, radish, lettuce, oregano, peppermint, dill, lemon balm, parsley and sage.

2) Wicking bed instruction manual

Wicking beds are usually installed in a garden and typically are less than ten metres long and narrow so it is easy to access the plants, a typical size would be two metres by one metre.

They are constructed on the raised bed principle; there are many commercial varieties of raised bed made from galvanised iron, plastics and timber. In practise many beds are home made from material which just happens to be available.

The big advantage of any raised bed is it saves on bending so they are very suitable for older people.

It is easy to convert any raised bed into a wicking bed by simply lining the box with a sheet of plastic. Make sure there are no sharp objects and do not cut the plastic, just fold and pleat at the corners.

Now here is a word of warning. The water reservoir should be about one third of the height of the bed, but plastic shrinks over the years, so is it better to line the entire bed with plastic then fold down one side to provide the drainage. Again do not cut the plastic so you have extra to allow for shrinkage (which may take five years to occur).

As wicking beds are in the open drainage is essential. This can be nice and neat with holes drilled in the side of the bed or it can be very crude, just a stick down the inside of the bed where the fold is to allow the water to get away.

A wicking bed can be very simple, just put in a couple of compost watering holes and bingo you have a basic wicking bed.

However some people prefer use a more sophisticated system.

In a small wicking box space is very tight so combining the water feed with a compost hole saves space. In a wicking bed there is more space so they can be separate with a down pipe, bend and distribution pipe on the base. A separate hole or box with large holes in the base can then be used to make a compost worm bed. This should be buried in the soil so it is always moist and covered so it is dark.

If you want to increase the water holding capacity you can also include upturned boxes to act as water reservoirs.

3) Open wicking beds instruction manual

Open wicking beds are similar to the closed wicking bed which have an enclosure to support the sides but instead there is a simple earth bank around the sides.

This does mean that some water will be lost to the natural soil by water wicking sideways. On the other hand deep rooted plants, such as trees can be planted just outside the bed and will automatically receive water.

Open wicking beds can be made much large than the closed bed with constructed sides and can easily be made over twenty metres.

They are typically made by removing the top soil, lining the trench with a plastics sheet, installing the pipe work, filling with any available organic waste, then putting the top soil back on top of the bed.

The soil in these open wicking beds will gradually sink down as the organic material decomposes with time so extra soil must be added from time to time. The top of the bed must be at least 300mm over the surrounding surface of else the plants will end up trying unsuccessfully to grow in water.

4) Wicking Furrows

Wicking furrows work on exactly the same principles as the other wicking systems but are suitable for much larger areas as the furrows can be very long.

A furrow it made along the contour line to form what is essentially a long skinny bath. They can be lined with plastics, just like a wicking bed, however in these large bed there is a danger of damaging the plastic. An alternative is to let the natural sealing effect of the waxy leaves of desert plant to seal the soil.

Here were are about to plant a row of senna alata beside a wicking furrow. The trees will be pruned and the waxy leaves put into the furrow, these will decompose with time releasing the waxes which help seal the soil and reduce water leakage.

The roots are inoculated with mycorrhizal fungi.

The sennas are deep rooted and will pick up moisture and nutrients from deep in the soil and share this with the crop. Although they may appear to be in competition to the crop they are actually assisting the crop plants in a synergistic relationship. The sennas from a permanent home for the mycorrhizal fungi which will inoculate the crop allowing nutrients and water to be transferred between plants.

The best shape for the furrow is still under research but here we started with a conventional 'V' shaped furrow, which makes maintaining the furrow difficult as weeds cannot be cleaned by machine. This is why we prefer the asymmetric 'V'.

Here we are making an asymmetric 'V' so the furrow can be slashed or mowed with a side mower so putting a layer of mulch on the surrounding soil. Weeds will still grow on the steep side which cannot be mowed but these will be close planted with sennas which can out compete most weeds particularly as they mature and shade out their rivals.

Wicking furrows are ideally placed along a contour line so they are level and can hold water. This also catches any rainfall flowing down the slope. However tests have been done on converting conventional irrigation furrows with significant success. They do not hold water like a horizontal furrow so required more frequent watering but in view of the immense number of irrigation furrows already in existence these converted furrows could be very important in providing a cheap and convenient way of improving soil.