Lochiel Park
COMMUNITY GARDEN

# Wicking Bed Design and Construction

## What is a Wicking Bed?

*Fabric strip – lower end in red food colouring - shows capillary action drawing colour up the strip*

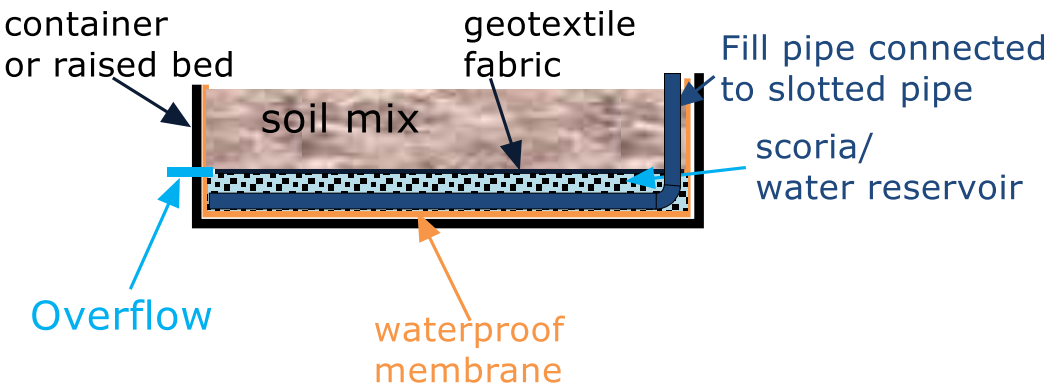
A wicking bed has been described as a 'water-well pot on steroids'. With a water reservoir at the bottom of the bed, the growing medium is kept moist as the water rises against gravity via capillary action in the tiny spaces between soil particles. This is essentially how water gets to the top of trees. We have several now at LPCG, with more planned, and in our situation surrounded by very large trees, have found we have found them successful.

## Benefits

- Soil is more evenly watered, so plants can grow with the minimum of stress.
- Higher moisture levels at the bottom of the bed encourages roots to go down, making the most of nutrients and helping plants survive heat waves better.
- There is a barrier to tree roots, so nutrients and water are not lost from productive gardens, reducing the need for water and fertilizers.
- Filling the reservoir is usually needed only weekly, and even this can be automated if desired
- The very top of the soil remains relatively dry (unless mulched) so weed seeds are less likely to germinate
- Can be built on concrete, paving or contaminated soil, so can turn these areas into productive gardens
- Water reservoir means plants can be watered less often, allowing for work and holiday schedules.

## And disadvantages…

- Construction costs can be higher, depending on what you have available and can recycle
- Soil depth is limited to about 300 – 350mm (water will not wick higher than this) so deep rooted plants may not be suitable. This is ample for most vegetables.
- Drier soil at the top means hand watering of seeds may be needed until they have established a deeper root system.
- Salts can build up, especially if non-organic fertilizers are used (we don't encourage these anyhow), and with use of hard water.



## Key Features

1. A raised bed around 450mm-650mm deep (100 -300mm reservoir, 300- 350mm soil and 50mm for mulch). This will also hold the soil, so needs to be strong enough. It can be a large container, a raised garden bed lined with heavy-duty plastic or pond liner. It can be partly dug into the ground to the depth of the reservoir, or built on a platform or on top of fill in a higher raised bed. The bed needs to be level. Smaller versions can be made with polystyrene boxes, or other recycled containers.
   *We used orange builders plastic to line raised beds – widely available and up to 4 m wide. A recent purchase of black builder's plastic (cheaper than orange) has proved problematic due to holes in it. Not sure if this is due to a bad batch??*
2. The water reservoir is filled with scoria or gravel, (some use sand) around a length of slotted (agricultural) hose (used for drainage at the bottom of retaining walls etc). This provides extra void space to hold more water and allows water to quickly flow throughout the reservoir.
   *We had scoria delivered from Garden Grove (10mm) and had some 20mm scoria donated for herb area beds.*
3. The slotted hose (Ag pipe) is connected to an upright pipe for filling the reservoir. This allows the water to quickly disperse when you are filling the reservoir.
   *We have used both 50mm and 100 mm slotted hose - comes in 10 m rolls so share with a friend if you want – the more hose used the more void area which can be filled with water.*
4. On overflow pipe at the top of the reservoir, so excess water or rainfall can drain. This is particularly important in areas with high rainfall. If the soil profile fills up with water your precious plants will drown. This pipe (and the inlet pipe) should be protected so mosquitos do not get in to the reservoir. We used tank fittings, available at hardware stores. These have a couple of plates that sit either side of the orange plastic to seal it. (Picture 5 below)
5. A membrane so that the fine particles from the soil cannot clog up the reservoir. We have used geotextile fabric, which we would recommend over shade-cloth or other similar materials as doing the job much better.
   *Available from Glynde Mitre 10 and Newtons.*

Gravel/scoria can be one of the more expensive bits of the construction, however you may have access to free scoria or gravel – just make sure it is not contaminated with leaves and other organic material. Scoria is more expensive, but has more small spaces within it and may wick better. 10mm scoria has more small spaces, but 20mm will theoretically hold more water – your choice.

We are planning to experiment with geotextile wrapped open crates (obtained free – probably not worth it if you have to purchase) to provide extra water holding capacity and reduce the expense of gravel.

## What you will need for a raised bed/ conversion

1. Good quality organic soil. Wicking into the soil is more effective with higher organic content – better for your plants also!
   *We added mushroom compost to the soil we removed and replaced in the beds.*
2. Sturdy sides of raised bed to at least 450mm
3. Orange builder's plastic that will cover the bottom and up the sides of your bed. Needs to be one piece – no joins! Purchase a 4m wide length.
4. Sand, old carpet or other material to cover the soil – to protect the orange plastic from sharp rocks. (We got a few bags/bucketsful of quarry sand from the Newtons – filled them at the yard and transported in the back of the car, to keep costs down.)
5. Agricultural (slotted) pipe – 50 mm adequate - 100mm diameter gives more void for increased water capacity. PVC elbow to fit Ag pipe and upright. Do not need to be glued together.
6. PVC pipe (50 0r 100mm) to depth of bed + a little more to go above soil
7. Cap to fit upright pipe to exclude mosquitoes and other creatures.
8. Gravel or scoria to at least cover Ag pipe by 10-20 mm. (We ordered 100mm x area of the plot. (1cu m of scoria is about 0.9 tonne.) You can make the reservoir deeper but not more than 300mm.)
9. Geotextile fabric to cover the area of the bed. Can be overlapped OK

Some have used bark or other organic materials in the reservoir. These will eventually rot down, needing replacement, and may become very smelly in the process. Not recommended!

Some put the overflow pipe well up into the soil profile, effectively making the bottom part of the soil part of the reservoir. This may also result in smelly rotting organic matter.

10. Outlet pipe (see 4 above)
11. Good organic soil mix. (approx. 300 mm x area of bed). Add organics to the soil you take out of your bed for a conversion. A small percentage of clay added aids fertility and soil structure of bought mixes.
12. Scissors, hacksaw, hole saw for drilling outlet through bed sides, wheelbarrow, shovels, rake etc
13. Tarps to put removed soil and delivered gravel and organics etc on. *(Some in green shed at LPCG. Find a place as near to your bed as you can to minimise work. Consider neighbours re smell of composts etc – cover if you can't use immediately.)*
14. A few energetic friends to help with the shovelling (and maybe some liquid refreshment?)

## Order of work

1. Dig old soil out of bed, or put up edges to at least 450mm (up to 650mm max – some can be below ground level, but only up to the level of the top of the reservoir). Level as well as you can.
2. Spread sand (10-20mm deep) or lay carpet etc in bottom or hole. Sand can help with levelling the area. *(Picture 1)*
3. Spread out lining over bottom and up sides. Be careful not to puncture this (it's pretty tough!)
4. Put in Ag pipe, elbow and upright. *(Picture 2)*
5. Start filling with water. This has many functions
    - presses the plastic out to the edges of the bed
    - Checks the liner is waterproof (no holes). Mark the level of the waterline and leave for several hours or overnight.
    - Cushions the addition of the scoria
    - Allows accurate levelling of the scoria
6. Add gravel/scoria. Take care not to puncture plastic. You may need to weigh the Ag pipe down temporarily until it is covered with the scoria.
7. Level scoria. This is easy to do if you add water to the level of the scoria. *(Picture 3)*
8. Place geotextile fabric on top of scoria. (*Picture 4)*
9. Drill a hole in the side of your walls for outlet. The bottom of the outlet pipe should be at the level of the geotextile (ie top of the reservoir). *You can put this lower down and add an elbow on the outside to get the right level if you want. This has the advantage that you can drain the reservoir – essential in areas where it freezes in winter, but probably not necessary in Adelaide!*
10. Cut a small hole in the liner and put outlet pipe in place. *(Picture 5)* Cover the inside end of the outlet pipe with a bit of the geotextile up against it to exclude mosquitos.
11. Fill with soil. *We made a 'lasagne' of soil and compost. Leave some space for mulch on top.*
12. Trim liner. The top of the liner can be stapled to the bed walls if you have wooden sides, or tucked under a slit hose placed around the top of metal sides for safety and neatness. *(Picture 7)*.
13. Top up reservoir over the next few days via the vertical pipe until wicking wets the soil profile.
14. Check out what you will plant!

## Some other considerations

1. It will take a few days for the wicking to get going. You might like to water from the top to assist (just this once!) Check the level in the reservoir (you can see down the inlet pipe) and top up frequently especially if your soil is dry to start with.
2. I added Wettasoil as the old soil was hydrophobic, also some GOGO Juice and rock minerals for good measure, and to get good microbial activity started. Bokashi scraps can also be added periodically, or a worm pipe (see 5 below) constructed at any stage.
3. Place your outlet pipe where you can see it from the inlet pipe, so you know when the reservoir is full (you can see it overflow!) *(Picture 6)* You can also check the level by noting where the water comes up to in the inlet pipe.
4. You might like to add some posts to the corners (outside the liner but inside the wall) to support shade-cloth (50% white seems to work well for us).
5. Some have added a couple of larger (capped) pipes vertically into the soil to use as mini worm farms. These have several holes drilled below soil level, and vege scraps can be added to the top. The idea is that the

worms will break down the vege scraps and keep the bed fertilised at the same time. You may need to add some worms also as the bed is now disconnected from the soil.

6. You will need to add organic matter (compost, manures, Bokashi, worm casings etc) on a regular basis as with any productive garden, and mulch with pea straw, sugar-cane mulch etc in the summer. Rock dust is also helpful. Check the pH from time to time, and check your plants for nutrient deficiencies, pest and diseases (and produce ready for harvest) as you would in any garden. Fertilize as needed.
7. Frequency of watering will depend on rainfall, weather and your reservoir capacity and system wicking efficiency. Check the fill pipe water level and soil moisture (finger test a couple of centimetres under the surface) weekly or more often especially in hot weather and until you get to know how your system functions. *We have left previous automatic dripper systems on some of our beds as it seemed a waste to dispose of them, and they work well also. Some have added a float valve to the system for automatic watering, but as you need to check your garden regularly this seems unnecessary for most people.*

1 – level the hole and add sand, carpet or other protective material

2 – Loop the Ag pipe around in the bottom of the hole.

3 – scoria leveled to the water line

4 - geotextile fabric spread over the scoria

5 – tank fitting placed through plastic lining and bed wall

6 – fill until water flow out of the overflow pipe

7 – edges of plastic trimmed

Jenny Bates - Nov 2015

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