



Wicking Beds

A water wise solution to growing your own vegetables

The Bureau of Meteorology has called it; the summer of 2018/19 in Australia was the hottest on record! Headlines in major media outlets also informed us that the Town of Gawler is among nine local government areas in Australia most vulnerable to the impact of extreme heat (1). Gardens are becoming increasingly stressed under these conditions, at the same time as it is important to cultivate green space in our urban and peri-urban areas to help cool our communities. Drought adds the challenge of balancing water conservation with keeping gardens alive in periods of low rainfall. In early 2019 Gawler Environment Centre presented Climate Smart Communities North, a series of free workshops on water sensitive gardens and urban greening to help local gardeners maintain productive gardens and keep their homes cool in hot weather. A series of handouts, like this one, were developed for the workshops and are available from the GEC office.

How do Wicking Beds Work?

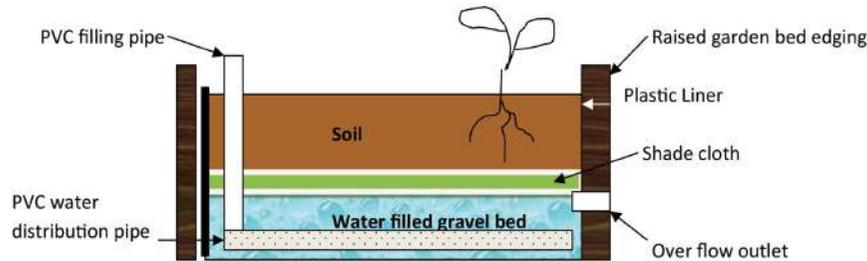
Wicking beds consist of a growing bed on top of a contained water reservoir. The reservoir is filled with a substrate, usually gravel, which allows the water to wick up and into the soil through capillary action, providing optimum moisture for the plants. In wicking beds the root zone is always moist but does not get too wet, ensuring an adequate oxygen supply for the roots. A common challenge of gardening is supplying plants with the correct amount of water, wicking beds deliver water in response to the water requirement of the plant, so in principle each plant should get the amount of water it requires, eliminating the problem of deciding when and how much water to provide. The reservoir also allows you to water less often, so you can even go away for a week in summer without your garden dying.

Wicking Beds vs Surface Irrigation

Wicking Beds avoid some of the water losses experienced with a conventional surface irrigated garden bed. With all forms of surface irrigation, a percentage of water is lost due to evaporation at the soil surface, watering from below prevents this. If too much water is applied from the surface it can pass beyond the root zone, wasting water and leaching nutrients, wicking beds stop these losses as they are a contained system. Scientific research has shown that compared to best practice surface irrigation used by commercial growers (requiring extensive knowledge and equipment) wicking beds perform as well or better in terms of water use efficiency, yield and quality, and require less manual watering. Also, at high temperatures the soil in wicking beds remains cooler than in surface watered beds (2).

Anecdotally people who use wicking beds report water use reduction of up to 50% compared to surface irrigation, plus a significant increase in production. Less water near the surface of the garden bed also helps prevent weed germination and infestation. The closed system of a wicking bed prevents

tree roots entering the garden bed and allows produce to be grown in urban areas where soil contamination is an issue. Wicking beds are low tech and can be inexpensive and easy to build, giving domestic gardeners a water efficient way to grow their own vegetables.



Types of Systems

Open Wicking Beds. The simplest version of a wicking bed. A trench is dug below the root zone and lined with a plastic sheet. Conventional irrigation is used but any water passing the root zone is now caught in the plastic and the soil will become saturated. This provides a volume of water that is not tightly held in the soil and will easily wick up to the root zone. Open wicking beds can also allow the water to wick up, then sideways and downwards outside of the reservoir. This might be seen as a downfall but makes it a suitable system for deep rooted plants such as fruit trees. It also allows microbiology and worms to enter the system.

Closed Wicking Beds. Soil is totally isolated from the surrounding soil, they are more suited for shallow rooted plants such as vegetables.

Closed Wicking Beds. The simplest form is a semi raised bed created by scooping out 20-30cm of soil, line the trench with plastic, place the distribution pipes, back fill with gravel then replace the top soil.

Water Capture Wicking beds.

A wicking bed can be modified to capture and amplify rain by simply adding wings. The wings are made from plastic covered in rocks angled into the bed so even small rains and dew can be harvested.

Above Ground Wicking beds. Made in some sort of container e.g. a foam vegetable box, bath tubs, wine barrels or water tanks. Sleepers or corrugated iron can also be used to create a raised bed. You can also use one pre-purchased from a hardware supplier, like the one used in our workshop.

Design considerations

The design and construction of wicking beds can be quite varied, common recommendations include a reservoir depth of 15-30 cm and soil depth of 20-40 cm, with the depth of the reservoir kept less than the soil depth. It is generally accepted that excessive reservoir depth is unnecessary, and indeed it has been shown in a scientific study that a reservoir depth of 15 cm was able to perform as well as one of 30 cm (2). The action of wicking/capillary rise has a limit, therefore there is a limit to the depth of the reservoir beyond which wicking into the soil will not occur, and this will vary depending on the solid media used to fill the reservoir. If you make the reservoir too deep there will be a stagnant pool of water remaining which cannot feed the root zone. For the best results the soil needs to be friable sandy soil. If your soil is heavy then mix it with sand and mulch to make it more friable.

Watering

Surface irrigation is needed for a short time after seedlings are first planted. Once plants are established irrigation is only needed when the reservoir is empty, however you can top up the reservoir before it is completely empty.

Adding a 'Bio Box'

The maintained soil moisture in a wicking bed is not only ideal for plants but also for microbial action. This includes mycorrhizal fungi that form beneficial relationships with plant roots, increasing the surface area by a thousand times.

By adding a plastic tube or 'bio box' to the bed you can add food scraps and organic waste and allow bacteria, fungi and worms to breed up. This will also help to add nutrients into the system.



Useful Information

Wicking bed fact sheet:

<https://littleveggiepatchco.com.au/blogs/news/building-a-wicking-bed>

Gardening Australia DIY wicking bed

YouTube:

<https://www.abc.net.au/gardening/factsheets/wicking-works/9438608>

References

(1) 2020 Vision Plan: Make urban areas 20% greener by 20/20: https://2020vision.com.au/media/162691/wsattg_combined-lr.pdf

(2) Semananda, Niranjani & Ward, James & Myers, Baden. (2016). Evaluating the Efficiency of Wicking Bed Irrigation Systems for Small-Scale Urban Agriculture. Horticulturae. 2. 10.3390/horticulturae2040013.

