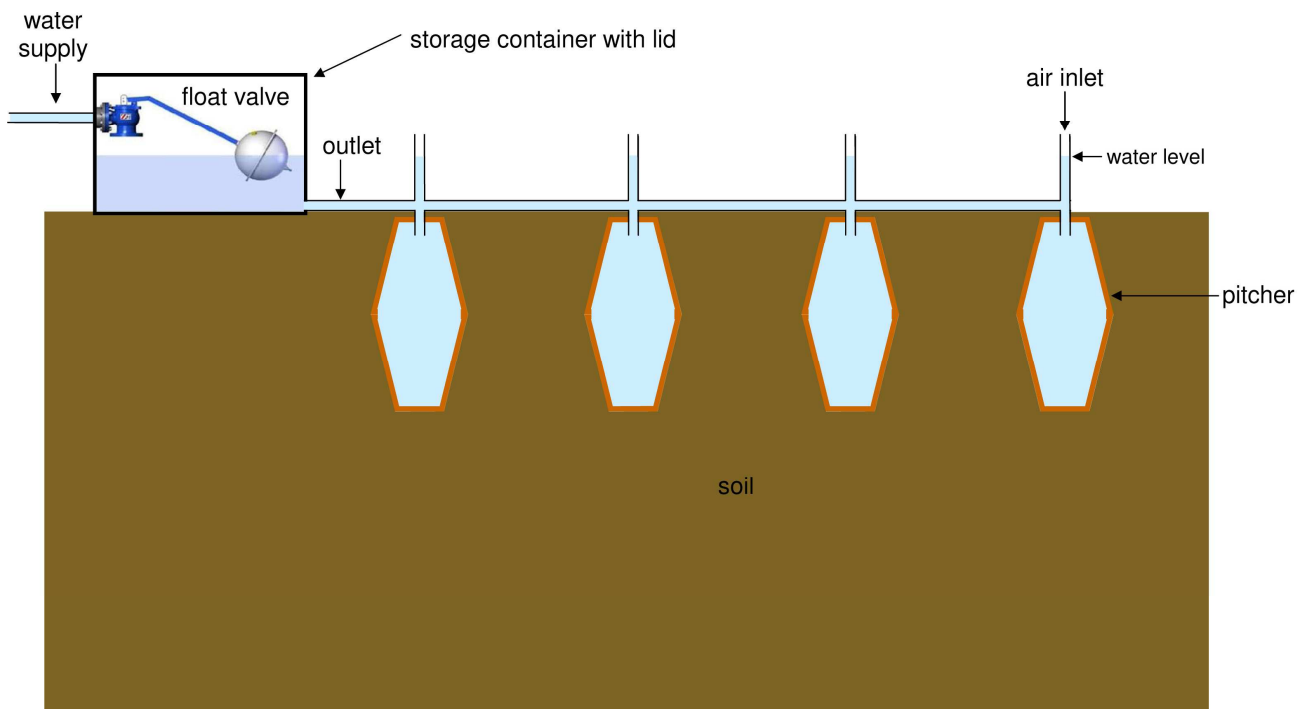


DIY automatic pitcher irrigation

food security for smallholders

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DIY automatic pitcher irrigation

DIY automatic pitcher irrigation may facilitate food security for thousands of smallholders.

- Unpowered
- For the same yield, pitcher irrigation uses less water than any other irrigation system
- Gravity feed from any water source (no pump required)
- An unlimited range of crops (fruit, vegetables, grains) can be irrigated at the same time
- Water usage responds automatically to changes in the weather and the crop requirements
- The smallholder may leave their plot unattended for months on end
- To facilitate food security, the smallholder can sell or exchange their produce at the market

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1. Introduction

It is recommended that you watch the Gardening Australia video “Irrigate like it’s 2000BC with these easy DIY terracotta pots called ollas”: <https://www.youtube.com/watch?v=0MDQsydIGlg>

With pitcher irrigation, round porous clay pots (pitchers) are buried into the soil near the crop and filled with water. The water seeps out slowly through the porous walls of the pot and reaches the roots of the plants. As the plants consume the water, more water will seep out from the pot. In this way, the pot provides exactly the right amount of water needed for the plants.

With automatic pitcher irrigation, the pitchers are refilled automatically so that smallholder may leave their plot (or garden) unattended for months on end. Automatic pitcher irrigation requires a continuous water supply.

The cost of drip irrigation is too expensive for many smallholders. Automatic pitcher irrigation provides a DIY cheaper alternative that uses less water. For drip irrigation, the smallholder has to guess how much water to give the plants and how frequently. However, for automatic pitcher irrigation, the plants decide how much water they need depending upon their stage of growth and the prevailing onsite weather conditions.

Automatic pitcher irrigation should only be used on flat land.

2. How to make DIY very low cost pitchers



Small pitcher made from two 9cm terracotta pots (AU\$1.27 each at Bunnings)
Medium pitcher made from two 12cm terracotta pots (AU\$1.76 each at Bunnings)
Large pitcher made from two 16cm terracotta pots (AU\$2.31 each at Bunnings)



Step 1. Select two identical unglazed terracotta pots and seal one of the drain holes



Step 2. Apply a bead of silicon sealant or masonry adhesive (Selleys Liquid Nails Landscape for example) to the rim of the pot with the sealed drain hole



Step 3. Carefully position the upper pot directly above the lower pot



Step 4. Gently press the pots together and allow 24 hours for the sealant to cure

Use 13mm or 19mm barbed poly tees (or crosses) to connect the water supply to the pitchers. Connect a 13mm tee (or cross) to a pitcher using a 13mm rubber grommet, or connect a 19mm tee (or cross) to a pitcher using a 19mm rubber grommet. A 13mm rubber grommet requires a 16mm hole and 19mm rubber grommet requires a 23mm hole. It is recommended that you cut off the barb before you insert the tee into the grommet.



3. DIY soil moisture probe

A very simple soil moisture probe is a length of steel pipe with a long slot. I suggest 30mm for the diameter of the pipe and 15mm for the width of the slot. An angle grinder can be used to cut the slot in the steel pipe.



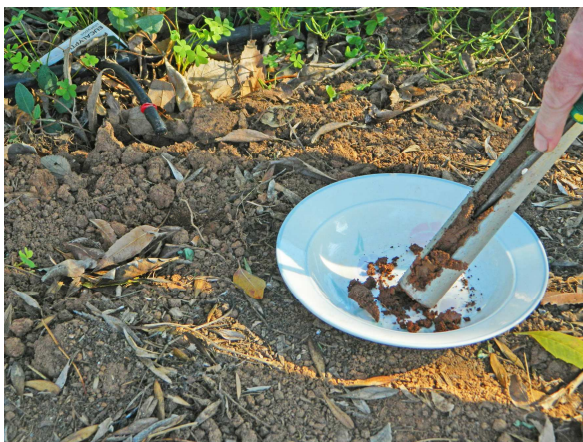
Hammer the steel pipe into the soil. Remove the steel pipe from the soil and transfer the soil in the pipe to a ceramic bowl. Record the weight of the moist soil. Place the bowl in an oven at about 110 degrees C for 12 hours or more (temperatures higher than 110 degrees may break the crystalline structure of clay particles which may cause loss of chemically bound water). Higher temperatures may be used for non-clay soils. When the soil is dry, take the bowl out of the oven and reweigh. To check that the soil is dry, you may wish to repeat the process until you get the same weight. Record the weight of the dry soil. The moisture content of the soil is the difference of the two recorded weights divided by the weight of the moist soil.



Hammer the steel pipe into the soil near a pitcher



Remove the steel pipe from the soil



Transfer the soil in the pipe to a ceramic bowl



Measure the moisture content of the soil by weighing the moist soil, drying the soil in an oven, and then weighing the dry soil

4. DIY storage container with float valve

Select a suitable float valve and then select a storage container (with lid) large enough to allow the float valve to be mounted inside the container.

Make an outlet for the container as close as possible to the bottom of the container.

Mount the float valve inside the container so that the high level for the water is about 7cm higher than the bottom of the container.



Storage container with lid

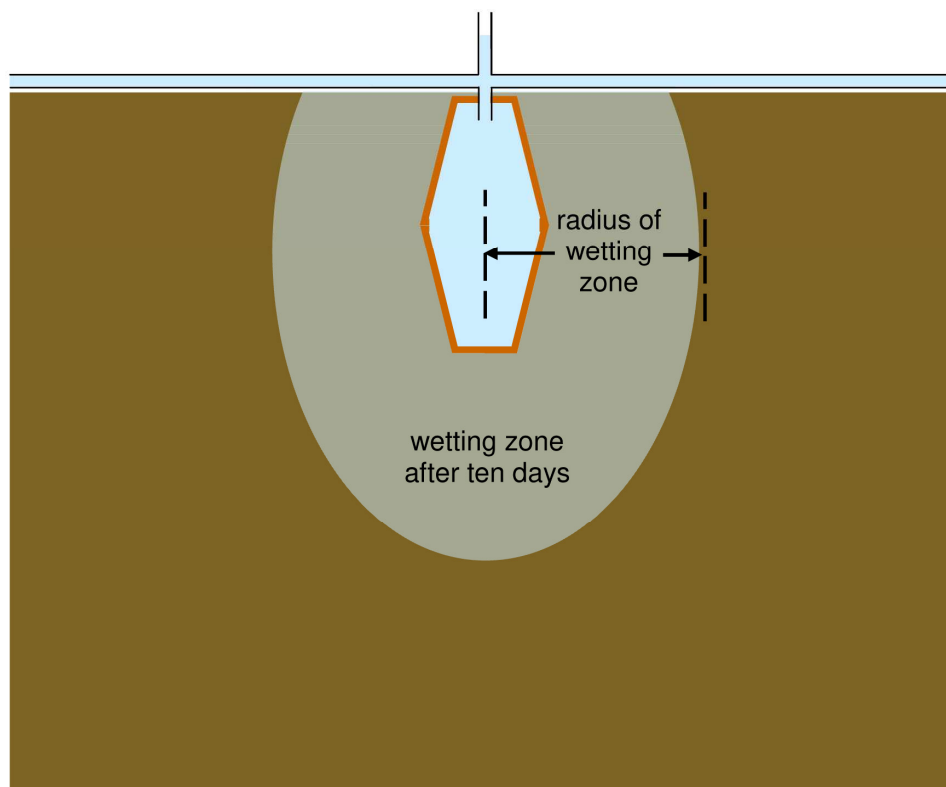


Float valve mounted inside the container

If you can't afford a float valve, you can always refill the storage container manually. If you are refilling the storage container manually, it is recommended that you use a large container so that it needs refilling less frequently.

5. Radius of the wetting zone

Position the storage container on the ground at the highest location in your garden.



To measure the radius of the wetting zone of a pitcher, bury the pitcher in dry soil and connect the outlet from the storage container to the pitcher. Connect a short piece of vertical polypipe as an air inlet. Turn on the water supply to the float valve in the storage container. After 10 days without rain, check the moisture in the soil to determine the horizontal distance travelled by the water in the pitcher. If rain is expected then the soil needs to be protected from the rain.

The radius of the wetting zone is the horizontal distance from the centre of the pitcher to the nearest location where the soil moisture content is less than 10%. Use the DIY soil moisture probe to measure the soil moisture content at various horizontal distances from the centre of the pitcher.



Bury the pitcher in dry soil



Connect the outlet from the storage container to the pitcher, and connect a short piece of vertical polypipe as an air inlet



Use the soil moisture probe to measure the soil moisture content at various distances from the centre of the pitcher

6. Installing automatic pitcher irrigation

Once you know the radius of the wetting zone for the pitchers you intend to use, position the pitchers at appropriate locations in your garden so that the root zone of each plant has access to the wetting zone of at least one pitcher.



Position the pitchers at appropriate locations in your garden

Position the storage container on the ground at the highest location in your garden.

Connect the outlet from the storage container to the pitchers using 13mm or 19mm polypipe. At each pitcher there should be a short piece of vertical polypipe as an air inlet with the top of the air inlet at least 8cm higher than the bottom of the storage container. The top of the air inlets must be higher than the high water level in the storage container.



Connect the outlet from the storage container to the pitchers