

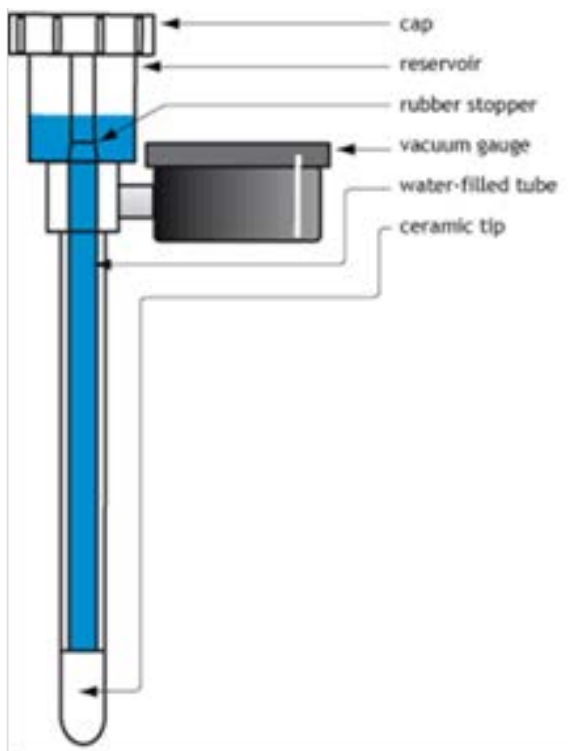
# Tensiometer tips

August 2014 Primefact 1359 First edition  
Agriculture NSW Water Unit

## Tensiometers provide an easily interpreted guide to soil moisture levels

A tensiometer is a closed tube with a porous ceramic tip at the end. Most models have a vacuum gauge and water reservoir at the top. Tensiometers are filled with water and installed in the ground, with the ceramic tip located within crop rootzones. As the soil dries out, water is drawn out through the ceramic tip, creating a vacuum in the tube which can be read on the gauge. When irrigation or rainfall occurs, water is drawn back into the tube through the ceramic tip, decreasing the vacuum.

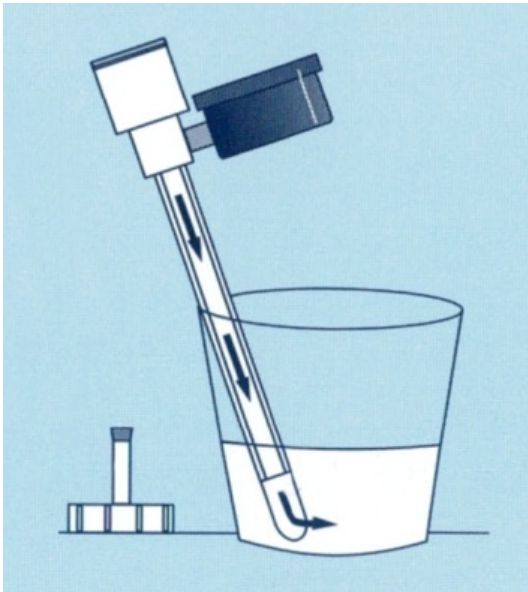
A high vacuum reading on the gauge indicates that the soil is dry, and a low reading shows that the soil is moist.



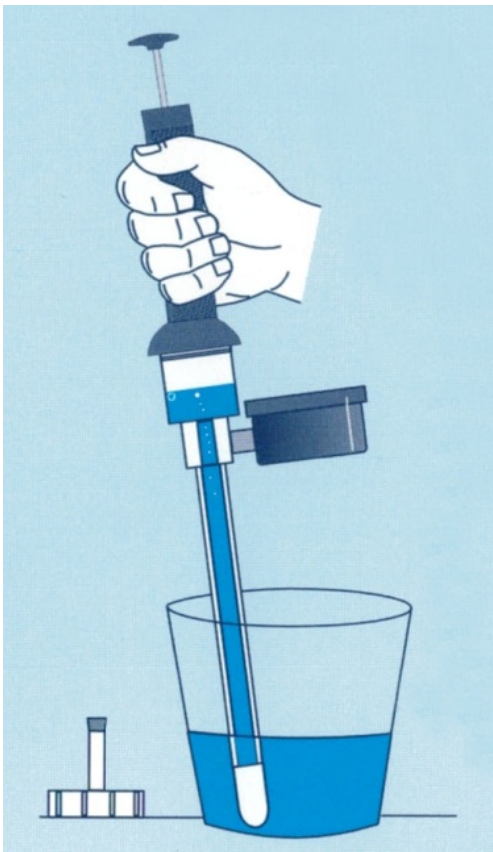
## Preparation

Proper preparation is essential for the tensiometer to have any chance of performing correctly.

1. Fill the tensiometer with clean water, leave the cap off and allow it to drain through overnight. This saturates the tip and confirms that it is porous to water movement. Do not handle the tip.



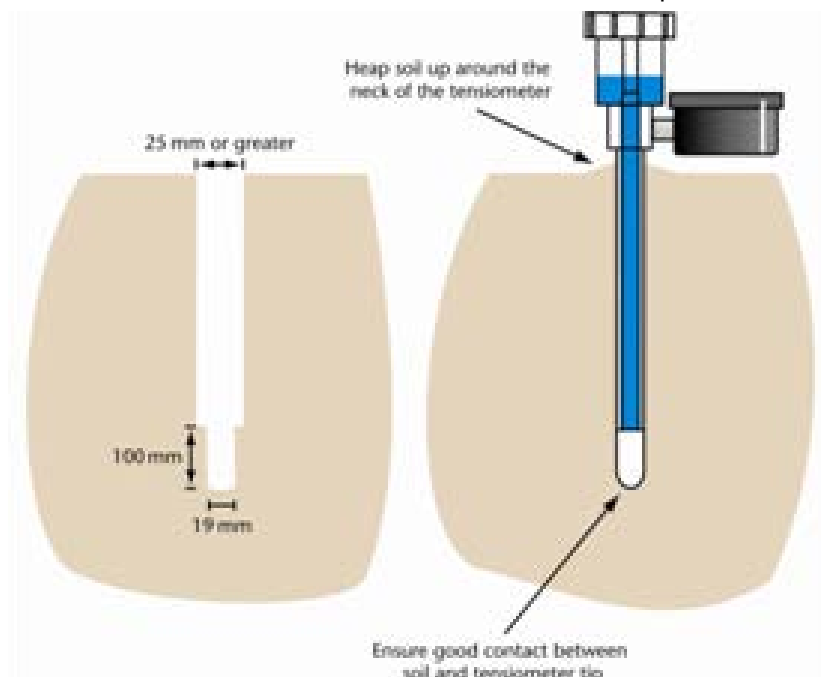
2. Fill the tensiometer with a mixture of rainwater (1 litre), methylated spirits (50 mL), and a few drops of food dye. To remove any trapped air use a vacuum pump to create a suction while the tip is submerged.



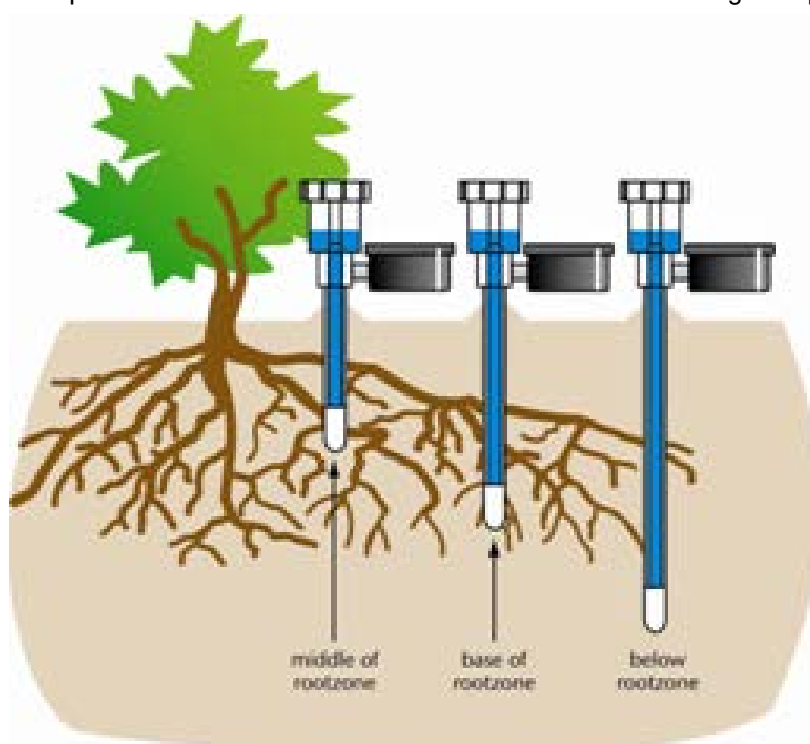
3. To test the tensiometer, replace the cap and leave the tensiometer free standing for a couple of hours. The reading on the gauge should rise as water evaporates from the ceramic tip.
4. Place the tensiometer into a bucket of water. The reading on the gauge should drop within half an hour. The tensiometer is now ready for installation.

## Installation

1. Make a 25 mm (or greater) diameter hole that is 100 mm shorter than the length of the tensiometer being installed. Make a 19 mm diameter hole for the remaining 100 mm. This ensures tight contact is created between undisturbed soil and the ceramic tip.



2. Push the tensiometer firmly into the hole. Fill the hole with loose soil and pack it down. Heap the soil up around the tensiometer to avoid the re-filled hole acting as a preferred pathway for water.



3. The number and length of tensiometers installed at each site depends on crop type and root depth. Tensiometers should monitor the moisture levels in the rootzone and just below this. Covering tensiometers helps prevent frost and physical damage and reduces algal growth.

## Maintenance

With regular maintenance tensiometers will provide years of reliable service. Every couple of weeks in summer, loosen or remove the cap to allow any air bubbles to escape and water to refill the tensiometer tube. A length of 3 mm tubing can be used to dislodge any air bubbles. Top up the reservoir if necessary. Replace the cap. Do it up until firm, then tighten an additional half turn only. **Do not over-tighten!**

Perished stoppers cause problems. Replace these stoppers annually. When tightening ensure that the tensiometer unit does not twist within the hole as this can loosen the ceramic tip.

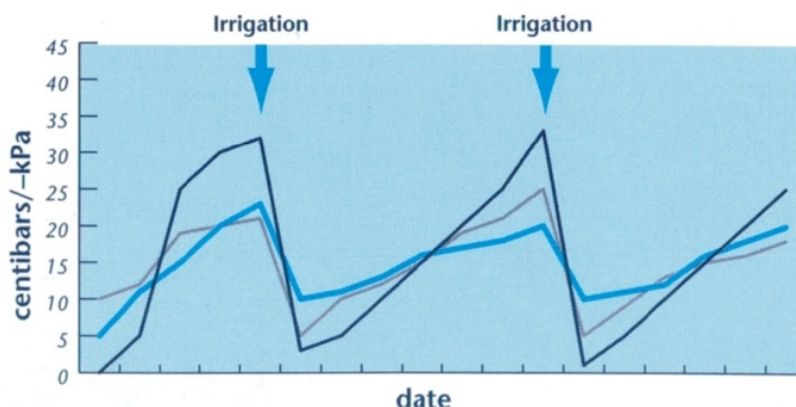


## Interpretation

READING (Centibars/ kPa)	INTERPRETATION
0–8	Soil is saturated (0) to near field capacity (8). Continued low readings indicate waterlogging.
8–10	Field capacity.
8–25	The best conditions of soil moisture and aeration.
25–35	Consider irrigation at critical stages of crop cycle.
35–50	Mild stress on well-drained soils.
50+	Soil is becoming very dry: this will affect crop yield and possibly fruit quality.

## Recording

Tensiometers should be read and recorded regularly, 2–3 times per week in summer. Ideally the figures should be graphed to provide a picture of soil moisture movement.



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## Signs that your tensiometer is not working correctly

### Gauge always reads zero

(If correct, a zero reading means the soil is saturated from irrigation, rainfall or poor drainage.)

Possible causes:

- No water in the tensiometer, or lost suction due to low water level: service and refill.
- The gauge is faulty: check and replace.
- A connection is leaking: check the general assembly including ceramic tip and all O-ring seals. Test with a vacuum pump.

### Tensiometer does not seem to record the true soil moisture content

Possible causes:

- There is poor contact between the ceramic tip and the soil: reinstall correctly.
- The gauge is faulty: check and replace.
- Tensiometer tip is incorrectly located, either outside wetting zone or crop rootzone: reinstall correctly

### Tensiometer requires frequent refilling

Possible causes:

- Filler cap or filler cap seal leaking: replace the seal or cap.
- Check for other seal leaks.

### Trouble sign: Tensiometer responds slowly to irrigations

Possible causes:

- Water is slow to infiltrate between the ceramic tip and the soil. The ceramic tip may be sealed by salts: clean or replace.
- The gauge sticks (from minor damage): tap to test, and replace if faulty.
- Water level in tensiometer is low: refilling required

## More information

Primefact 1364 *Irrigation scheduling principles for horticultural crops*

### Acknowledgment

Jeremy Giddings Irrigation Industry Development Officer (Horticulture)

Tensiometer tips, Jeremy Giddings, NSW Agriculture 2000

Tensiometers need periodic maintenance, John Gillett, NSW Agriculture, 2000

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