

Annexure E: Irrigation monitoring equipment – Tensiometers

USING TENSIOMETERS TO SCHEDULE IRRIGATION

Management of soil moisture content is a crucial element of good avocado orchard management. Soil moisture needs to be maintained within certain levels. Soils that are continually saturated are conducive to root rot, and a lack of soil moisture causes tree stress which can result in fruit drop and increased incidence of internal fruit physiological disorders such as grey pulp.

Basic principles

* A healthy root system will result in a healthy tree capable of bearing a good crop.

* The following are necessary for the development of a healthy root system:

1. Sufficient nutrients.
2. Sufficient water.
3. Sufficient oxygen in the soil.

The aim of scheduling irrigation is to supply sufficient water, without water logging the soil which deprives the roots of the oxygen they need. To achieve this, a method of determining soil moisture availability is necessary. The use of tensiometers is one of the simplest methods of determining soil moisture.

How to use tensiometers

Tensiometers are installed in pairs, in the root zone of a tree that is representative of the trees in a particular orchard. A tensiometer measures the tension that roots must exercise in order to absorb water from the soil. As the soil dries out, the water tension increases, making it less available to the tree.

In avocado orchards, a tensiometer station consists of one tensiometer that reads moisture tension at a depth of 30 cm and another that reads soil moisture tension at 60 cm depth. The 30 cm tensiometer is used to indicate when to irrigate, and the 60 cm tensiometer is used to indicate how much water to apply.

When to irrigate

Irrigate when the 30 cm tensiometer reaches -55 kPa. Irrigation should be applied until the soil moisture tension measured by the 60 cm tensiometer has dropped to about -5 kPa.

Preparing tensiometers for installation

1. Fill the tensiometer with cold, boiled water.
2. Suspend so that evaporation can occur from the ceramic tip.

3. Top up water in tube as required. Repeat this process up to times to make sure that water has replace the air in the pores of the ceramic tip.

4. Fill the tube and close the screw top.

5. Put the instrument in a bucket of water, making sure that the ceramic tip is submerged. The gauge should register 0 kPa after about 10 minutes. If it does not read zero, the gauge must be adjusted to read 0, or if adjustment is not possible, the reading must be recorded and used as a correction factor.

Site selection

Choose a site representative of the orchard in which you wish to measure soil moisture. The tensiometers should be placed under the tree canopy in a position representative of average water application from the irrigation system.

In orchards tending to be too wet, tensiometers should be placed in the South Eastern side of the tree, which remains wettest. Where soil dries out rapidly, tensiometers should be place on the North Western side.

It is very important that tensiometers are not installed in a hollow, as they will tend to indicate that the orchard soil is wetter than it actually is. Remember that tensiometers measure the moisture tension in a very small volume of soil. Placement is therefore extremely important.

Installation

Dig a hole deep enough to accommodate the tube of the 60 cm tensiometer. Pack soil tightly around the tips of the tensiometers and fill up the hole. Of vital importance, is that the contact between the ceramic tip and the soil is very close. Initially, there will be no roots in around the tip of the tensiometer, but they will rapidly grow into that area.

Maintenance

Tensiometers must remain filled with water. Dissolved air accumulates at the top of the tube. Top up with cold, boiled water when the bubble reaches 1 cm in length. Topping up must only be carried out when the soil is wet.

If the soil has dried out to the extent that all the water has been sucked out of the tube, the tensiometer should be removed, and the pre- installation procedure described should be followed.