Workflow: Production – Basic Farming Practices

Toolkit 3.4
Irrigation

target audience

Farm managers and supervisors.

what it is

Water is essential, and consistently meeting the water requirements of each tree is critical for optimal production. This can only be achieved by means of a proper irrigation system.

The annual water requirement of a mature citrus tree is in the region of 900mm per annum. The daily irrigation requirement varies from 1 to 5mm/day in winter and summer, respectively. Therefore, irrigation systems should be designed to deliver 50m³ of water/day/ha under maximum demand.

why it is important

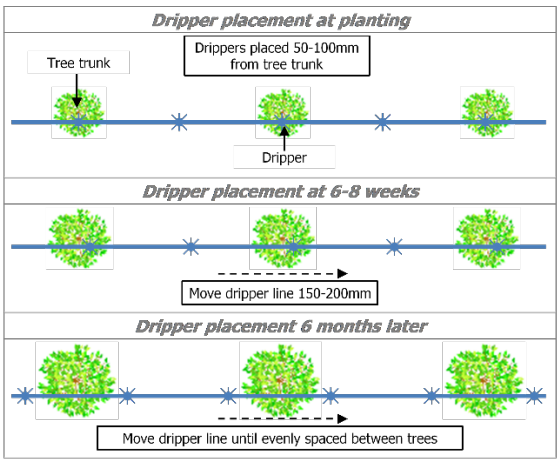
There are a number of fundamental requirements for a healthy, high yielding tree, namely light, nutrition, pest and disease control, and water. But without water, all other factors are nullified.

In the summer rainfall areas of southern Africa, rains generally arrive mid-October or later. The flowering period for citrus is in September and it is essential that the soil profile, which is up to 60cm in depth, is kept at field water capacity (FWC) from the end of July. Any moisture stress during this period will inevitably cause poor flower and shoot development which will result in a poor yield. Also, July to August is the period when fertilisers are applied. Water is required for delivering fertiliser to the plant and ensuring up-take. Good irrigation is also critical for fruit size development.

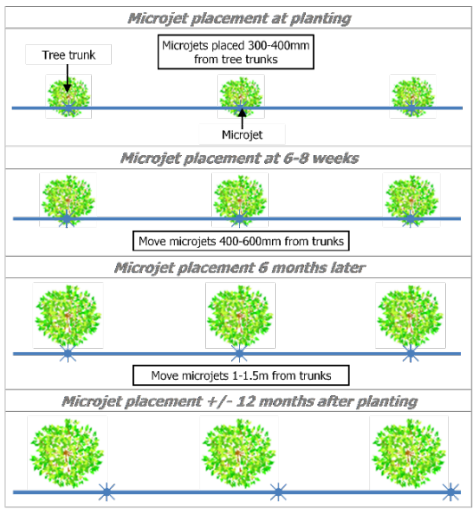
success factors

- **Infrastructure** – The ability to get the right amount of water to your trees when required depends completely on your irrigation infrastructure. Assuming secure access to enough water (plus a safety buffer), this includes the mainlines and reticulation system to each tree and the correctly functioning and calibrated dripper or micro-sprayer at each tree. Success also depends on the ability to pump the required quantities at the correct pressure, and this in turn depends on reliable power with a back-up generator.

- **The Irrigation System** – Your irrigation system is set up properly and adapted as the orchards mature from newly established to mature trees. Ideally, your system allows for fertigation.



Dripper placement at planting



Microjet placement at planting

- **Measurement** – Measurement of how much water is used and how much delivered is an important factor. Water is a scarce resource and sometimes in short supply so waste should be minimised. On the other hand, maintaining the correct soil moisture is vital for tree health, flower, and fruit development. Both require measurement.
  - Measurement of the irrigation system per se, including pumping capacity and pressure, and how that translates to what is delivered by each micro-sprayer or dripper.
  - Soil moisture measurement using tensiometers, electronic moisture-sensitive probes, and/or neutron probes.
  - Measurement to deliver fertiliser my means of fertigation.
- **Scheduling** – The aim is to maintain soil moisture at field water capacity (FWC) in the root zone area during winter and summer. FWC is defined as that point when all free water has drained away and the remaining water molecules are bound to soil particles.
  - It is generally accepted that FWC for most soils is -10kpa (Mostert, 2006). So, in spring and summer, irrigation will typically follow a pattern of a 'long' irrigation followed by a number of 'short' irrigation cycles since the top of the soil profile will dry out more quickly than the lower part of the root zone. If 'long' irrigation cycles are consecutively applied there are many negative consequences, such as energy and water wastage, waterlogging and subsequent leaf drop, susceptibility to Phytophthora infestation, leaching of fertiliser and general poor tree health.
  - In winter, after harvest, a mild degree of moisture stress is exerted on the tree to induce dormancy or rest. It is not desirable for trees to flush or flower in winter due to abundant water together with relatively high winter day temperatures. It is recommended that during winter that soil moisture below 30cm depth is held at -60kpa.
  - However, instruments are just tools, and can only assist management decisions. The final decision should be made in conjunction with what you observe in the field and what physical soil tests using a soil auger reveal about your soil's moisture status.

execution steps

Refer to resources.

assessment questions

Please Note: There is no minimum / maximum amount of questions you can add

1.	Is your access to water adequate and secure with an additional safety buffer?
2.	Is your water quality adequate?
3.	Do you have sufficient water pumping capacity and the necessary power (back up) required to drive the pumps?
4.	Is your irrigation system in good order, i.e., irrigation lines, microjets and drippers working as intended/designed?
5.	Can you measure how much water is delivered to each tree?
6.	Is your irrigation scheduling according to a proven standard, given your specific conditions?
7.	Does your irrigation system allow fertigation?

resources

1.	Citrus Academy production learning material – Irrigation
2.	Citrus Academy production learning material – Water Quality
3.	Citrus Academy skills sheets – Water sampling