

Irrigating Tree Crops - Custard Apples

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Introduction

Irrigation can be as simple or as complex as you like, the best place to start is with your cropping goals and your specific environment.

Physiology

Understanding the mechanics of water use in the orchard provides the opportunity to manipulate crop yield and quality.

Roots absorb water from the soil which travels and evaporates from the leaves in a process known as transpiration (Figure 1). The water travels upwards from the roots to the leaves in a group of tubes called the xylem and is commonly referred to as sap flow. Water flows to the leaves where it is lost to the environment via evaporation through small pores on the lower side of the leaf called stomata.

Environmental factors such as temperature, relative humidity and wind speed all impact the rate of transpiration (Figure 2) and the tree's ability to manage stress in periods of low water availability.

Custard apples are particularly sensitive to changes in relative humidity, closing stomata when levels drop below 70% (1). The closure of stomata causes a reduction in the rate of photosynthesis which can cause problems with growth, development and fruit size if endured for extended periods.

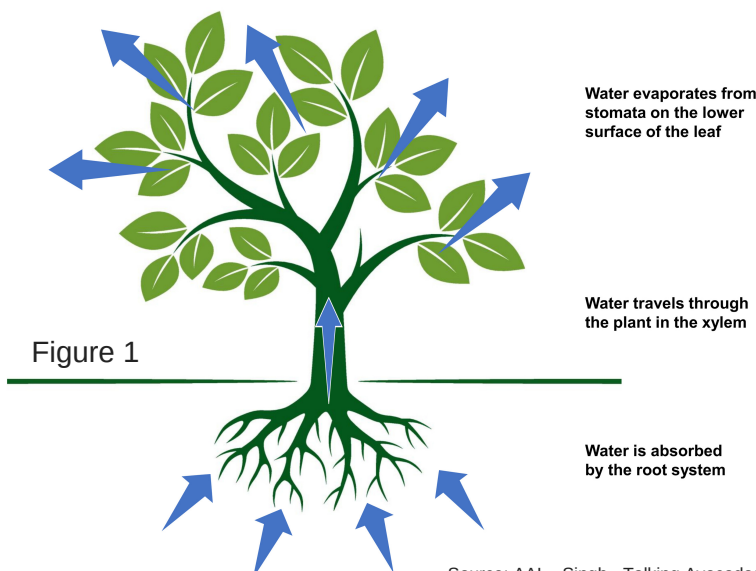


Figure 1

Source: AAL - Singh - Talking Avocados Autumn 2018

Phenology

Crop cycles identify critical growth stages. A balance between vegetative growth and the production of flower buds is essential. Irrigation manipulation of the environment can maintain the high relative humidity favourable for custard apple pollen viability and good set. Water restrictions during the early stages of fruit cell division can negatively impact final fruit size.

Tree Water Relations

Understanding the function of water availability in the tree can assist in manipulating crop growth and development with irrigation as seen in Figure 3.

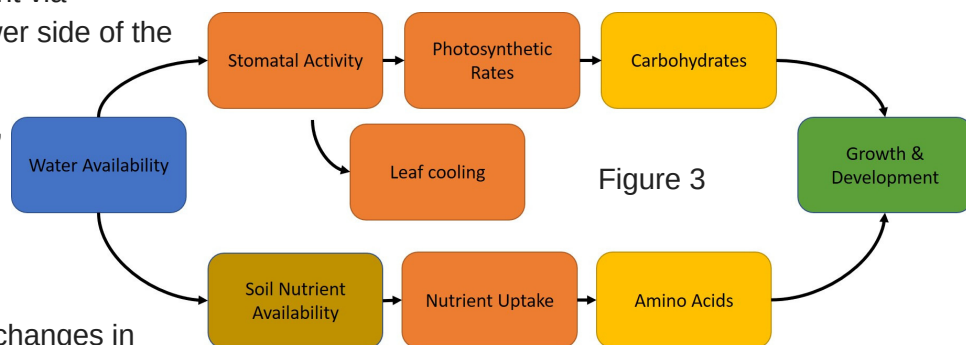


Figure 3

Temperature

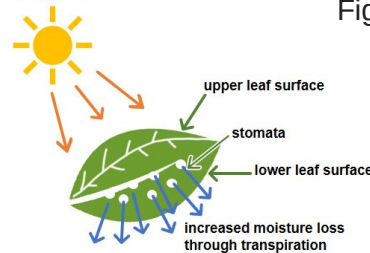
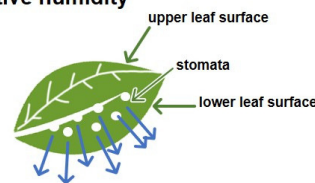


Figure 2

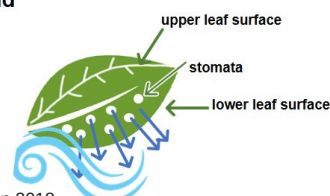
As leaf temperature increases, so does evaporation of moisture from the stomata

Relative humidity



Decreases in air moisture surrounding the leaf increases tree moisture losses through transpiration

Wind



Increased air movement removes the layer of moist air surrounding the leaf surface, causing the tree to increase transpiration to replace it, therefore increasing water loss

Water Use & Monitoring

Custard apple's requirement for high relative humidity probably implies the use of sprinkler irrigation but generally there is no wrong choice between sprinkler or drip irrigation, both can be managed to suit your specific situation. The more important questions are related to meeting crop water requirements - **when, how much and water quality issues.**

If installing irrigation ensure your designer is qualified and the system has the capacity to meet all your requirements including fertigation.

It is relatively easy to calculate your orchard daily water use or to develop annual water budgets using

Evapotranspiration - ETo and a crop coefficient (Kc).

Not all crops have a standard crop coefficient and as such an estimate can be extrapolated using similar crops, in this case deciduous tree crops that have an early, mid and late season water use pattern.

The use of **soil moisture monitoring** equipment to understand changes in your rootzone soil moisture and visual crop condition will assist in the development of effective irrigation strategies to manipulate your crop growth and achieve your yield and fruit quality goals.

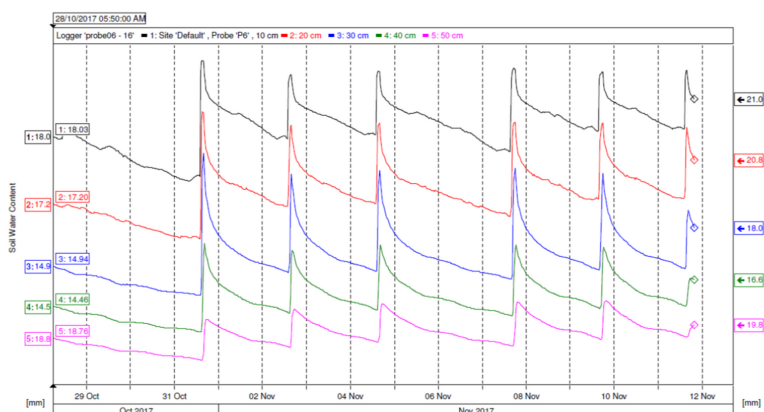
When considering a monitoring device make smart decisions based on data and ensure you can access data anywhere - Figure 4 example.

Two choices are gypsum blocks and capacitance probes.

Gypsum Blocks are economical and accurate in dry- moist soils. They require accurate installation and have a lifespan of 2-3 years. Data can be accessed remotely.

Capacitance Probes are expensive but have sensors at different depths in the root profile providing good spatial data. The probes require professional installation and maintenance and are not calibrated to soil type. Data can be accessed remotely.

Figure 4



Points of Interest

1. Crop uniformity is the name of the irrigation and nutrition game.
2. Irrigation and fertigation managed well provide the opportunity to produce industry leading yields and quality.
3. Understanding your soil type and rootzone capacity will assist in developing effective irrigation methods.
4. Understanding rootstock vigour is important when irrigating. Cherimoya has high vigour. Excessive water applications will lead to canopy promotion and reduce the production of flowering buds.
5. Sprinkler irrigation can be used for orchard cooling during flowering to maintain the 70-80% relative humidity favourable to pollen viability and fruit set. Orchard cooling can also reduce leaf temperatures and sustain photosynthetic rates during heat waves.
6. Irrigation can be used to support the development of canopy, photosynthesis and the carbohydrates essential for future crops.
7. Water quality is important for crop growth and development as well as fruit quality. Sugar apple is reported to be sensitive to salinity.
8. Tree mounding is used in other horticultural tree industries to provide a more protective root environment.
9. Watering at night has been employed in many other horticultural industries as a water saving technique, reducing water losses caused by evaporation.



1. Scientia Horticulturae, 45 (1990) 137-147

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"Irrigation and Nutrition is our speciality - we work with growers 3-4 times a year at critical growth stages to manipulate yield and quality"

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