



Avocado – Hass

Water Use Study Carabooda, Western Australia



CARING
FOR
OUR
COUNTRY

This project is supported by Perth Region NRM, through funding from the Australian Government's Caring for our Country.

Irrigation System Details and Orchard Details

A micro-sprinkler irrigation system is used to deliver water to the trees throughout the year. The system is fully overlapping between the trees but partially overlapping between the rows. From the specifications, the sprinklers deliver 95L/hour and are pressure compensated to a range of 120-400kPa (17-58psi). Lateral line pressure is approx 270-290kPa. The sprinklers have a 7m throw diameter and a nozzle size of 1.75mm. Sprinklers are spaced every 3.5m and each tree has access to water from two sprinklers. The sprinklers have an average application rate of 4mm per hour (from catch cup analysis).

There is 7m between trees in older sections of the orchard (204 trees/ha) where as recent plantings are 3.5m apart (408 trees/ha). Rows are spaced at 7m intervals.

Rootstocks used at the orchard include Guatemalan and Topa Topa on the older trees. Zutano and Velvick rootstocks have been used on younger trees. Hass variety fruit is grown across the orchard.



Soil Water Properties

The orchard is situated on Spearwood soils which are classified as deep yellow free draining sands. The orchard soil has a field texture of Sand (coherence nil to very slight, cannot be moulded, sand grains adhere to fingers). Large areas of the orchard have a layer of organic matter on the soil surface which has a Sandy Loam texture (coherent bolus but sandy to touch, sand grains medium size and visible).

The soil texture can be directly related to water storage capacity or readily available water (RAW). Sand has a RAW of approx 35mm/m or 35L per cubic meter of soil. The effective rootzone is 0.4m deep and the average canopy area is 38m² (7m diameter)

Rootzone RAW

0 to 0.2m of Sandy Loam @ 45mm/m = 9mm

0.2m to 0.4m of Sand @ 35mm/m = 7mm

9mm + 7mm = 16mm RAW

Soil Water Reserve

16mm x 38m² = 608L

Soil Moisture Monitoring

Capacitance probes have been installed in the orchard and constantly log soil moisture at 10, 20, 30, 40 and 60cm. Trends from the soil moisture monitoring equipment can easily be interpreted to see if irrigations are reaching the bottom of the rootzone. Soil moisture full and refill points can be set so that irrigation applications can be altered to keep within limits and the rootzone.

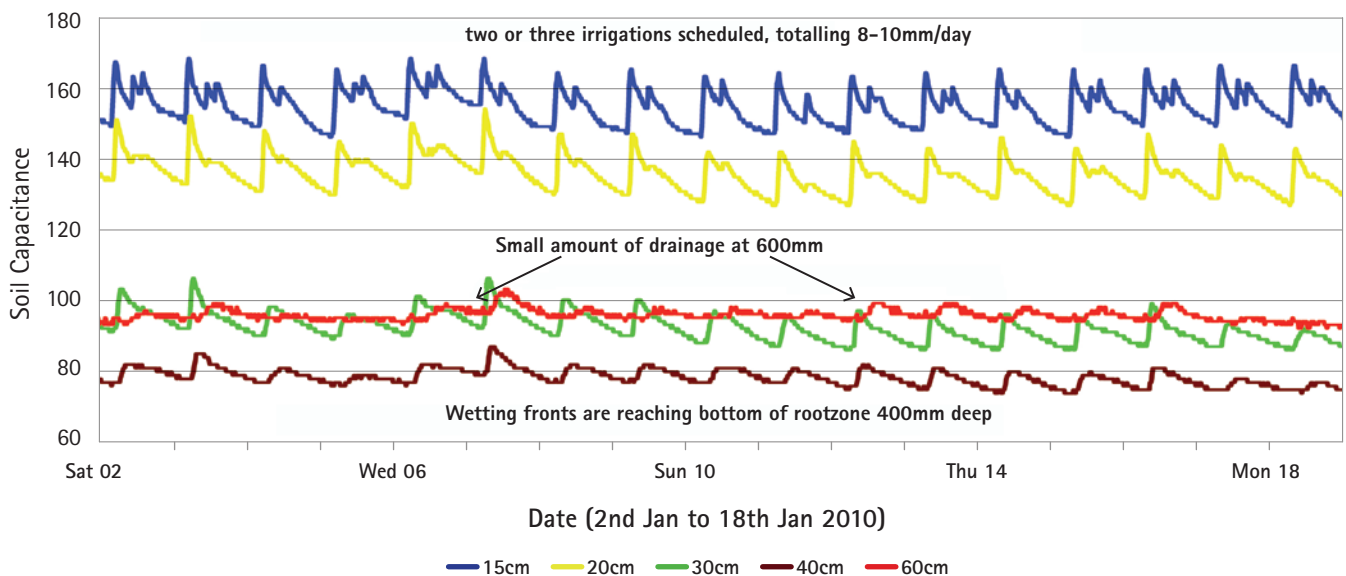
Irrigation schedule – 2009–2010 season

Irrigations commenced during some dry periods in August and early September to sustain the trees during harvest and early flowering. Regular daily irrigations did not commence until late September.

Flowering/harvest (September): 97mm of rainfall was recorded during September with a majority recorded in the first half of the month. Approx 6mm of irrigation per day was scheduled from the 16th September. Moisture stress was avoided during the flowering period. Orchard pruning commenced.

Irrigation schedule continued over...

Capacitance Graph – Avocado



Continued over...

Water Use Study Carabooda, Western Australia



This project is supported by Perth Region NRM, through funding from the Australian Government's Caring for our Country.

Flowering (October): Irrigations were scheduled to replace 100-120% (1.0-1.2 crop factor) of daily evaporation. Moisture stress was avoided with this schedule. The number of irrigations per day ranged from one to three, depending on weather conditions. October is a critical time as rootzone salinity may increase if irrigations are not sufficient.

Leaf Flush (November): Evaporation ranged from 3.8mm per day to 9.9mm, making it difficult to schedule irrigations. A crop factor of 1.0 was used during November delivering approx 6-8mm of irrigation per day. No rainfall was recorded.

Root Flush (December): A crop factor of 1.0 was used during December. Irrigations were scheduled to deliver 4mm at night and 2-4mm during the day. No rainfall was recorded for December.

Root Flush/Leaf Flush Start (January): 276mm of evaporation was recorded for the month and 288mm of irrigation was applied equalling a 1.1 crop factor. Pruning/thinning of larger trees continued in January. Wetting fronts highlighted on the soil moisture monitoring equipment were reaching 400mm deep. Two to three irrigations scheduled per day.

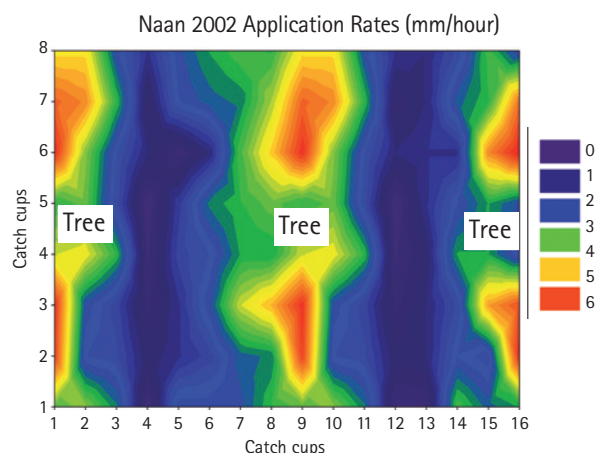
Leaf Flush (February): Mild temperatures, at an average of 28°C were recorded at the Department of Agriculture and Food's, Wanneroo weather station (located in Carabooda). Evaporation averaged 7mm per day. Irrigations were scheduled to replace 110-120% of evaporative losses.

Leaf Flush (March): 194mm of evaporation recorded for March. 66mm of rain fell in one day. Of the 66mm of rainfall, 33.1mm was captured in a lysimeter 400mm below ground level. 50% of the rain that fell on the orchard was effective to a depth of 400mm. The lysimeter is located in an area of the orchard that is under full canopy and has not been thinned or pruned. A crop factor of 1.1 was sufficient for the month.

Root Flush (April): Average maximum soil temperature during April was 25°C, taken from the Wanneroo weather station. Approximately 29 hours of irrigation applied. Irrigations scheduled for 23 days out of 30 during April. 4-6mm of irrigation per day applied with a 1.0-1.2 crop factor.

Root Flush (May): A total of 105mm of water was applied to the orchard, with 60mm coming from irrigation and 45mm via rainfall. May is another critical time for rootzone salinity. If rainfall is not sufficient to lower rootzone salinity levels then irrigations may be necessary.

Dormancy (June): Nine irrigation days scheduled delivering a total of 36mm. Rainfall was sufficient to maintain the trees/crop during this time.



Water Use Results

Evaporation (mm)	Rainfall (mm)	Effective Rainfall (50%)	Irrigation Applied (mm)	Irrigation + Effective Rainfall (mm)
1866	650	325	1770	2095

There was a small difference of 55mm in total water applied when sprinkler flow (95L/hour) was compared to mm of irrigation applied with a 4mm/hour application rate.

Canopy management and pruning unproductive tree limbs will increase effective rainfall % and will reduce the reliance on irrigation during May and September. Disadvantages may include increased evaporation from the orchard floor, increased weed growth and possible sun damage to sun exposed fruit.

Production Results

Due to the biennial bearing of Avocado trees in the region, several years of production results have been included as comparison.

Year	Monitoring area (t/ha)	Orchard Average (t/ha)
2006	21.6	17.5
2007	8.8	10.2
2008	21.5	19
2009	17.5	17.8
2010	4.2	6.2

Irrigation Tips

- On sandy soils, once daily evaporation reaches 6mm/day and above for extended periods then you should schedule daily irrigations.
- If you irrigate at night on sandy soils, be mindful that trees in some irrigation stations may not have enough available soil moisture during the later hours of the day (due to tree uptake and drainage) and supplementary irrigations may be necessary. For example: Block 1 is irrigated at 1am and block 7 is irrigated at 6am. Block 1 may have considerably less available soil moisture at 3pm in the afternoon than block 7 and a second irrigation should be scheduled for block 1.
- Install soil moisture monitoring equipment. The use of basic soil moisture monitoring equipment (tensiometers, gypsum blocks) will assist with scheduling (when and how much irrigation to apply), keeping available water in the rootzone and to schedule leaching irrigations if water quality is an issue.



Perth Region NRM Inc.

80 Great Northern Highway (Corner Bishop Road)
MIDDLE SWAN WA 6056

Tel: (08) 9374 3333 Fax: (08) 9374 0685

Email: enquiries@perthregionnrm.com

www.perthregionnrm.com