



Wine Grape – Verdelho

Water Use Study Swan Valley, Western Australia



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

Irrigation System & Vineyard Details

Sittella Winery is situated in Herne Hill on the banks of the Swan River. Sittella grow several varieties of wine grapes, including warm season Verdelho. The Verdelho block is irrigated with pressure compensated 20mm dripline (1 line per row) with an average in-field flow of 3.84 L/hour and a dripper spacing of 1.0m. The dripline is operating at a pressure of 240kPa or 34psi. The Distribution uniformity for the dripline is 84.7% with a Coefficient of Uniformity of 91% over the block. The dripline is suspended on a wire approximately 0.2m above the ground to aid with vineyard maintenance. Each vine has access to water from 1.5 drippers.

The vines are spaced 1.5m apart and 3.0m between the rows. 1.34 hectares of Verdelho is grown in the vineyard consisting of 2977 vines. The Verdelho (Nairn Clone) vines were planted in 1993 on Schwarzmann rootstock. The vines are cane pruned with 4 stems per vine.

Soil Water Properties

The soil in the Verdelho block has a field texture of a Sandy Loam to Clayey Sand. The texture can be directly related to available water (AW) and readily available water (RAW) in the soil profile. The soil AW is approx. 115mm/m and soil RAW is approx. 65mm/m (65L per cubic meter of soil). The wetted area of the dripline is 0.5m wide either side of the dripper and forms a continuous wetted strip along the dripline. With the vines spaced at 1.5m and a 1m wide wetted strip, a rootzone of 0.6m deep and 65mm/m RAW, the amount of water that can be held in the rootzone equals 59L. Calculation: $(1.5m \times 1m) \times (0.6m \times 65mm/m)$



Soil Moisture Monitoring

Soil moisture probes have been installed in the Verdelho block at a depth of 15cm, 30cm and 60cm. Soil moisture is recorded in % moisture. Saturation for the soil is 17%, field capacity is 14% and minimum soil moisture (recorded during summer) is approximately 5.5–6.5%.

Depth	Max soil moisture (%)	Min soil moisture (%)	Range (%)
15cm	17	6.5	10.5
30cm	15	6.5	8.5
60cm	14	5.5	8.5

Irrigation schedule – 2009–2010 season

A Reduced Deficit Irrigation Schedule (RDI) was used to irrigate the vines during the growing season. RDI was used during the period between fruit set and veraison, to control vine growth and to influence grape/berry quality.

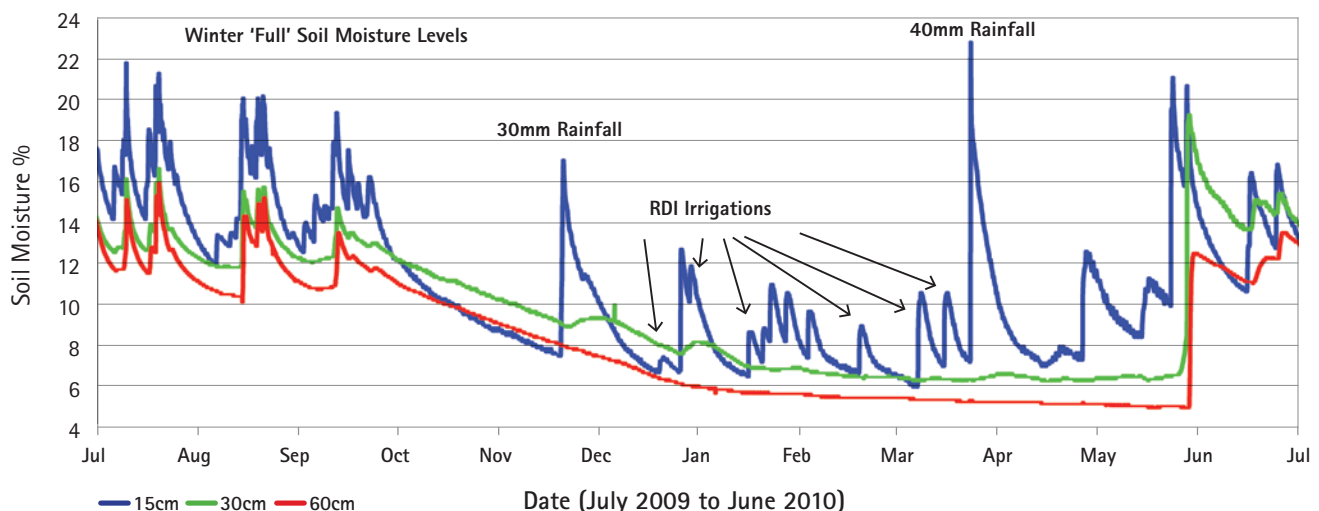
Budburst (early September) – Evaporation (Epan) averaged 3.2mm/day, 93mm of rain, soil moisture levels full, no irrigations were needed.

October – New shoots actively growing, 2-3 leaf nodes per shoot. Evaporation averaged 5.4mm/day. 6.8mm of rainfall was recorded for the month. Soil moisture levels within limits, no irrigations were scheduled.

Flowering and Fruit Set (November) – Average daily maximum temperature ranged from 20–35°C. Flowering commenced on the 5th November. The vines continued to draw on soil water reserves during early November. 30mm of rain on the 18th and 19th November saturated the profile at 15cm but this wetting front only reached 30cm where a small increase in soil moisture was noted. No Irrigations were scheduled for November. Note: Good soil moisture status during flowering is important to ensure good fruit set and yield.



Verdelho Soil Moisture Graph 2009–2010



Continued over...

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Fruit Set and Development (early December) – Hot and dry conditions were recorded in early December with an average of 10mm evaporation per day and maximum temperatures which ranged from 22–39°C. No rainfall was recorded. The Verdelho vines continued to draw water from soil reserves, no irrigations were scheduled. Soil reserves reduced to 7% at 15cm, 7.5% at 30cm and 5.5% at 60cm. Moderate water stress applied during this growth stage. Irrigations were scheduled to commence in late December.

Veraison (20th December) – Irrigations commenced on the 24th December which delivered 38.4L/vine followed by 14.4L/vine on the 27th December and soil moisture levels increased from 7% to 13% at 15cm deep. There was only a 0.5% change in soil moisture at 30cm from the two irrigations in December. Hot and dry weather conditions continued after veraison with temperatures averaging 31°C and 10mm evaporation/day. Three further irrigations of 14.4L/vine, 14.4L/vine and 16L/vine were applied before harvest to ensure balanced growth and sugar accumulation.

Harvest (22nd January) – Very hot temperatures of 42.9°C, 42.7°C and 41.1°C were recorded in the week before harvest. No rainfall was recorded in the period veraison to harvest.

Post harvest (Harvest to 25th April) – 57% of the total irrigation applied for the season was applied during the post harvest period. The crop load was significantly higher than previous years so greater emphasis was placed on post harvest irrigations. Irrigations during this time allow the vines to grow and store carbohydrates and nutrients for use in the next season's spring growth. A total of 128L/vine was applied in the post harvest period along with 40mm of rain recorded from 1 day in March. Irrigations ceased on the 25th April 2010.

Note: weather conditions sourced from Bureau of Meteorology weather station network with a combination of data from Mount Lawley and Perth Airport weather stations.

Water Use Results	Station runtime (mins)	Output L/dripper	L/vine (1.5 drippers/vine)	L/vine pre-harvest	L/vine post harvest	kL/hectare (2222 vines/ha)
2009 Vintage	1480	95	142	95	47	315
2010 Vintage	1410	90	135	58	77	300

Rainfall and Evaporation	Sept	Oct	Nov	Dec	Jan	Feb	March	April
Rainfall (mm)	93.8	6.8	38.2	0.0	0.0	0.0	40.2	25
Evaporation (mm/day)	3.2	5.4	7.3	10	11.1	9.2	7.6	4.4

Source: Bureau of Meteorology website (Perth Airport Weather Station)

Effective rainfall is difficult to estimate in a vineyard but rainfall events less than 5mm intensity are widely considered as non-effective to most crops. 204mm of rainfall was recorded from September to April. Rainfall during September was considered effective because soil moisture status was high. The following equation can be used to calculate effective rainfall.

Effective Rainfall = total rainfall for the growing period – (5mm x number of rainy days Oct–April)
 = 204mm – (5mm x 20 rainy days)
 = 104mm of effective rainfall (approx 50%)

Vintage Results

The Verdelho grapes were harvested at a Baume of 12.3 and 3.39pH which is physiologically ripe for warm season grapes and the style of wine produced. From the 1.34 hectares of Verdelho, 17,000kg was harvested which was slightly above average for the block. This is equivalent to 12,680kg/hectare or 5.7kg/vine.

On average in the Verdelho block, 600L of juice is pressed from 1000kg of grapes. This equates to 10,200L from 17,000kg of grapes harvested.

Irrigation Tips

• If long periods of extreme weather conditions (35°C+) are expected during fruit development to veraison and if soil moisture reserves are low then heat stress and leaf drop may occur. Leaf drop could expose the fruit to direct sunlight, increasing sun damage before harvest. Well watered

vines can recover quickly from periods of heat stress and fruit loss can be kept to a minimum. Well watered vines have a much cooler canopies and photosynthetic capabilities are significantly improved.

- Applying irrigations in the post harvest period is a balancing act. Vines will grow vigorously and will not concentrate energy into storage for the following year if irrigations are excessive. If irrigations are not sufficient in the post harvest period, then vine growth may be restricted during the following years bud burst. There can be a risk of yield reduction following successive seasons of poor post harvest irrigations (GWRDC, Water and Vine Factsheet 01).
- If you practice an RDI schedule, soil moisture monitoring equipment will allow you to gauge the depth of wetting fronts so you don't over irrigate during fruit set to veraison.
- The first irrigation for the season may be delayed if sub soil (40–50cm) moisture is within readily available limits (rootstock, variety and soil type dependant).



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