

WANT TO CUT COSTS IN THE VINEYARD?

IT COULD BE AS SIMPLE AS REDUCING YOUR IRRIGATION

Growers of wine grapes can use a deficit irrigation strategy to reduce growth and some of the costs of canopy management and fruit thinning. This strategy can also change the style of wine produced, leading to more options for the wine maker.

With the recent lowering of grape prices and a yield cap put in place by most wineries it has become more important than ever to reduce vineyard costs. A relatively simple tool to help achieve this aim is to adopt a deficit irrigation strategy.

Background.

Deficit irrigation is nothing new in the South Island, traditionally this was a practice used by many growers during the early days of the Industry. But as the demand for Sauvignon Blanc ballooned, many growers moved away from this strategy as the aim shifted towards producing high crops of 15 tonnes plus per hectare. To achieve good quality and maintain the vine at this cropping level most growers avoided water stress at all costs, but it would come at higher costs of canopy management and irrigation and in some cases produced crops that were very hard to ripen with pretty average quality.

For red varieties the practice continued to be more popular and particularly suits Pinot Noir on a range of soils.

Typically many wineries in 2009 introduced a cap of around 12 tonnes per hectare for Sauvignon Blanc and for many growers this caused a very costly fruit thinning operation. Using nature to control vine growth by introducing a deficit irrigation strategy can certainly save some of these costs and also reduce the amount of trimming and leaf plucking required.

Fruition Horticulture (SI) Ltd provide irrigation scheduling services in Marlborough and Nelson and between 2003 and 2007 carried out a major research project (SFF 03/100& Extension) funded by SFF at Nautilus Estate, Renwick which explored in great detail the effects of different levels of deficit irrigation. The project report and its conclusions is available in its entirety at www.irrigationscheduling.co.nz and is referred to below.

Method.

To apply a controlled deficit irrigation strategy first the grower must decide what their goals are in terms of canopy size, timing and number of trims and leaf plucks, crop level and irrigation volume or hours available to that block.

Next the timing and level of deficit needs to be mapped out. It is generally accepted that it is not desirable to have any moisture stress during flowering as this can affect fruit set and subsequent yield significantly. However the research showed that a deficit during flowering has the biggest effect on shoot growth compared to a deficit post flowering. Those seeking significant growth control, may consider some level of deficit at this time but it should be carefully administered or too great a yield reduction may result. More typically the deficit is applied after flowering, through to harvest and to a degree that the grower has decided will best fulfill the pre-determined goals.

To be able to monitor the strategy some form of soil moisture monitoring or water availability measurements within the vine are required. These can then be mapped to show the level of deficit against the pre-determined strategy and create the monitoring system that subsequent irrigation scheduling is determined by.

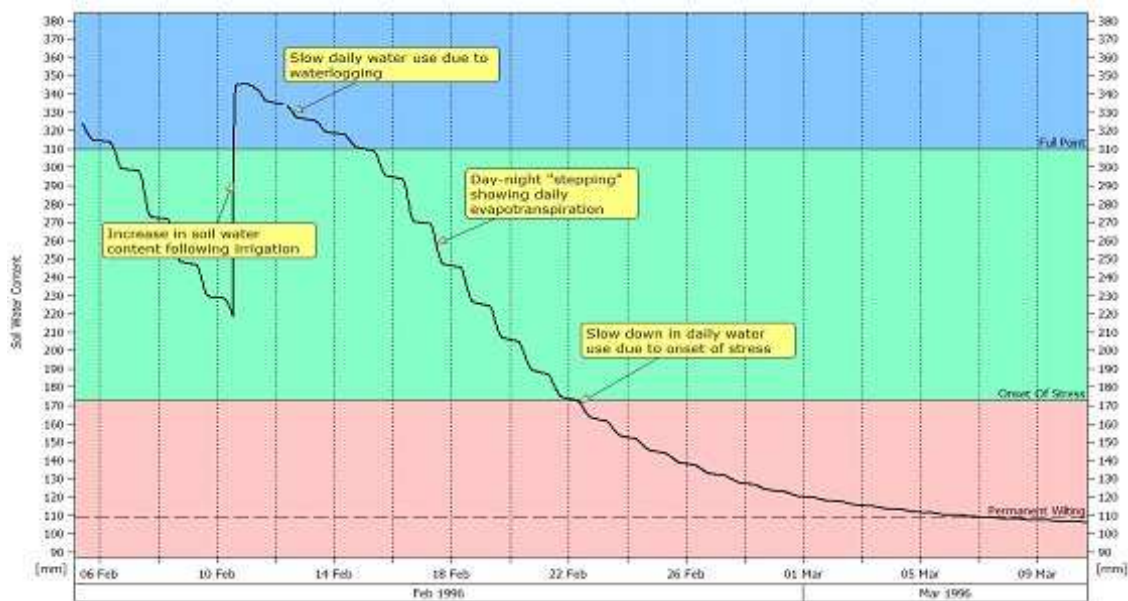
The level of deficit can be expressed as a percentage of the absolute EvapoTranspiration of the vine (where theoretically there is no limitation on soil moisture availability), e.g. 70 % ETc. In the SFF trial in general terms it was found that irrigation below 40 % ETc on a light, stony soil had overall too much of a negative affect on berry size and subsequent yield of Sauvignon Blanc.

Another useful measure is the amount of RAW (Readily Available Water) in the soil related to the deficit strategy applied. This is the amount of soil moisture between Field Capacity (Full point) and Refill (point at which vine starts to have to work hard to abstract water from the soil). A well used strategy in vines is to allow natural drying of the soil in a controlled manner from end of flowering down to the Refill point by veraison. Soil moisture is then maintained at Refill until harvest.

Tools

Soil Moisture: There are several technologies for measuring soil moisture on the market including Neutron moderation (Neutron Probe), Frequency Domain Reflectometry (e.g. EnviroSCAN Plus) and other basic indicators such as Gypsum blocks and Tensionmeters. A good analytical software program is a must to be able to get the most out of the data of any soil moisture device.

The following illustration using Sentek's Irrimax software shows a typical soil moisture curve where the plant removes water past the Onset of Stress (Refill) point to a level where it can no longer abstract any more water – Permanent Wilting Point. Typically vine deficit strategies will follow the Onset of Stress (Refill) Line from veraison to harvest



Water availability within the vine: Leaf water potential can be measured using a Pressure bomb or a leaf Porometer which measures stomatal conductance in leaves. These techniques have significant time and cost limitations.

Of course whatever device you are using irrigation scheduling still requires constant visual monitoring in the vineyard, indeed with a deficit strategy if anything a higher level of visual management is needed as water is being applied in a far more precise manner.

Stress symptoms

Using a deficit strategy will often lead to some level of stress in the vines, typically this will be most apparent between veraison and harvest when the developing crop is working the vine to its maximum. Growers can be concerned about such symptoms but the secret is to understand the progression of stress in vines to ensure that the deficit is not allowed to go too far. This in turn can be mapped against the soil moisture or leaf water potential readings to correlate the two together to help set a plan for future seasons.

After flowering, as the deficit level is allowed to increase, the first signs of stress will be shortening internodes and shorter tendrils followed by shoot growth stopping altogether and tendrils disappearing. If the level of deficit is large and long enough ultimately basal leaves will yellow, then brown and drop off. At this stage the effect on fruit size may become too severe with fruits shriveling and collapsing.



Sauvignon Blanc grapes showing moderate water stress symptoms

The main effect on the fruit is that the greater the deficit the smaller the individual berry size thus reducing overall yield. Using a deficit strategy to control fruit size needs to be approached very carefully as it can easily be overdone but reducing berry size can help reduce the amount of shoot and fruit thinning required.

The optimum level of deficit is site specific and will depend on many factors including the grower's and wine maker's goals, soil type and strata, topography and variety. RAW varies enormously between soil types and so the deficit level required in a clay soil will be completely different to that in a silt river gravel soil.

In general the level of deficit in Sauvignon Blanc should not be as severe as that applied to Pinot Noir because too much water stress can cause negative wine quality issues. Higher deficits in Sauvignon Blanc tend to give more tropical and ripe flavours compared to the greener and herbaceous flavours from well irrigated vines. Too high a deficit can lead to producing a wine more suited to blending than for individual production.

Summary

A deficit irrigation strategy can help save costs by reducing shoot and fruit thinning and canopy management costs. It may reduce irrigation use which will reduce your power bill. It can produce a wine style sought by some Winemakers or useful for blending. A deficit strategy must be carefully monitored as if allowed to go too far may cause negative yield and vine growth issues.

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July 2009