

# Yield management and prediction

Grapevine yield is central to determining the profitability and quality of winegrowing. Despite this fact, the industry is very poor at anticipating and managing yield. Scientific literature over the past 80 years has contained many research reports discussing the impact of weather conditions at flowering and during the initiation of bunches, and the role of over-wintering reserves on the subsequent development of the vine and the potential crop levels. While it must be accepted that in some seasons catastrophic events such as a frost or hailstorm may have an unpredictable influence on yield, a yield estimate should be possible using weather (which largely determines bunch number and weight) and cropping (which determines over-wintering reserves) records in the current and previous season. The Centre's yield management and prediction research programme seeks to understand factors influencing grapevine yield, with the aim of developing a robust yield prediction system that enables the industry to adapt vineyard practices to ensure consistent grape supply.

## Project: Yield modelling sauvignon blanc in Marlborough

### Background

Abraham Perold, the pioneer of modern South African viticulture, commented

in 1927 that “we can with fair accuracy, predict the size of a crop by taking into account the weather conditions (rain and heat) during the preceding twelve months and the size of the crop”. Despite this, the ability to anticipate potential yields and moderate crops to achieve a consistent crop level remains poor. Understanding the key factors determining potential yield, how this potential yield may be influenced by events during the season and then acting on this information is key to achieving consistency in yield from season to season.

Grapevines are perennial plants. The yield at the end of a particular season is the culmination of events that have occurred in at least the preceding 18 months and possibly longer, and is the product of a number of components:

- shoots per hectare
- inflorescences per shoot
- flowers per inflorescence
- fruit set
- berry weight

Shoots per hectare reflect the vineyard design (eg vine spacing, training, uniformity of bud break). Of these, only bud break and subsequent shoot development is likely to vary between seasons, probably reflecting the over-wintering carbohydrate and nutrient reserves in the vine, which in turn potentially reflect the cropping level in the

previous season.

National average yields of New Zealand sauvignon blanc have varied approximately twofold and chardonnay threefold between 1990 and 2004. The year-to-year differences suggest that much of this variation can be attributed to weather events occurring at critical times during the season. In some cases these may be catastrophic events, such as frosts in 2003, however, in other seasons; more subtle events are likely to be the cause.

### Key results from this year

The temperatures during the initiation of inflorescence primordia and flowering are of particular importance in a cool climate. As these events occur at approximately the same time of year (late spring), low temperatures at this time can reduce fruit set in the current and inflorescence initiation (and as a consequence bunch number per shoot) in the following season. Using a stepwise, multiple regression technique a model has been developed to predict yield from temperature data in December and January. This provides a preliminary estimate of yield 12 months before harvest date, with a risk analysis using historical flowering temperatures. The yield estimate is updated following flowering in the current season (approximately four months pre-harvest). While meteorological data can be used

to estimate future yields, any prediction needs to be taken with a degree of care as the variability in short-term catastrophic weather conditions (eg a frost or rainfall) may cause unpredicted responses.

### **Publications**

- Trought M. Fruit set – Possible implications on wine quality, 2005. Proceedings of Australian Society Viticulture Oenology workshop, Mildura, Australia.
- Trought M. 2006. Living on the edge: the opportunities and challenges of cool climate winegrowing in New Zealand. Key note paper, International Cool Climate Symposium on Viticulture and Oenology February 2006 Christchurch, New Zealand.
- Trought M. 2006. Grape crop estimation, experiences with forecasting sauvignon blanc yields in Marlborough New Zealand. American Society Enology and Viticulture, 57th Annual Meeting, July 2006 Sacramento, USA.

### **Key funding source**

- Marlborough Wine Research Centre

### **Key staff involved**

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