VITICULTURE & ENOLOGY
UNIVERSITY OF CALIFORNIA DAVIS

Title: **"Grapevine dormant pruning weight prediction using remotely sensed data"**

By: Solomon Dobrowski, Susan Ustin and James Wolpert

In: Austr. J, Grape & Wine Res. 9:177-182, 2003

Funding by: American Vineyard Foundation.

In a previous paper the authors established a relationship between vineyard aerial images and vineyard **canopy densities**. In this paper the authors tried to see whether there is a similar relationship between aerial images and **pruning weights.** Pruning weights are a much easier-to-measure parameter than actual canopy density. If a relationship between the two could be established early in the current season, management decisions could perhaps be made in a much more timely fashion.

- To find out if this correlation was possible, the authors identified vines likely to have different pruning weights. Then they took aerial photos (which translated into Ratio Vegetation Indices) for two seasons in a row, 1998 and 1999. They also measured the actual pruning weights of those vines (kg/meter of canopy) for the same time period. Then they looked at the relationship between 1998 photos and the 1998 pruning weights. They used the relationship between the two, along with 1999 photos, to predict 1999 pruning weights.

- What they found was a linear and positive relationship for both 1998 and 1999. They observed that the higher the RVI index they derived from the photos, the higher the pruning weights they actually measured. This meant that the relationship found in the first year could be used to predict the canopy size the following year.

- This simple result bears enormous consequences in our advancement of precision viticulture. It means we can use aerial photos to discern which areas of the vineyard, -which rows, which parts of a row, even which individual vines- are likely to have higher pruning weights, which in turn are an expression of vine vigor. Furthermore, by comparing this information to localized yield results, we could have a feeling for vine balance fluctuations in each section of the vineyard. As we know, yield/pruning weight ratio is a common way to express vine balance.

- Towards the end of the article, the authors are cautious about possible sources of error. To ensure the accuracy of the data, they advise we take the following precautions:1) Use the same sensor every year; 2) take the photos at the same time of the year and the same time of the day - sun angle affects shadows and reflectance in the vineyard; 3) calibrate all images to a reference, so comparisons can be made across years, and 4) make the sample size and replications of your ground measurements large enough to ensure that your estimations are accurate.

- To confirm the importance of image calibration, the authors compared how well the 1999 pruning weights fitted calibrated image data, as compared to using non-calibrated image data. As expected, the non-calibrated data failed to successfully estimate pruning weights, whereas the calibrated data did a good job - despite a slight underestimation when canopy densities were high. So calibration is very important. Ideally, a "calibration to reflectance data" would be desired. But this is too technical and expensive, and a less sophisticated "image-to-image calibration", also called normalization, does an adequate job. The latter is the type of calibration most aerial imagery providers use today.

How could all of this be put to our advantage in vineyard management? The authors leave us with a practical example. 1) Say we detect, through the aerial photos, areas where pruning weights are expected to be low (<0.5 kg/m of canopy), which would likely mean insufficient vegetation to ripen the fruit. We could take immediate action with crop thinning, or N applications to boost growth. 2) Say, on the other hand, we detect areas where pruning weights will be too high (>1 kg/m of canopy), then leaf removal could be prescribed, or perhaps a more site-specific pruning strategy could be used.

Author: Bibiana Guerra, Editor: Kay Bogart. This summary series funded by J. Lohr Vineyards & Wines.