

## **THE MECHANISATION OF CANOPY MANAGEMENT: A “SUSTAINABLE” CHOICE?**

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A quick Internet search with the terms “sustainable viticulture” will enlist a multitude of definitions which, however, seem to converge towards a shared concept: grape growing can be sustained if desired grape composition is achieved at a remunerative yield level, at the lowest production cost and along with management practices respectful of human health and environment. Within such context, a wonder is how can vineyard mechanization and sustainability be associated?

Albeit sounding as a paradox, a sustainable yet well balanced vineyard should first minimize the demand for corrective mechanical interventions. Shoot trimming and leaf removal are pertinent examples. If shoot trimming has to be performed several times throughout the season to control canopy size, this is usually a sign of excessive vine vigor which quite frequently implies inappropriate vineyard choices (i.e. insufficient vertical spread of the canopy, too close in-the-row vine spacing). As for leaf removal the trigger is somewhat the same (excessive foliage density at the cluster level around veraison).

For standard operations such as winter pruning, the contribution of machinery to sustainability should go beyond the expected reduction in the hand labor requirement. Again, two specific examples might help. The first shows how long-term mechanical pruning trials (Poni et al., 2004) usually allow to identify the highest yield beyond which a worsening in grape composition starts to occur. Overall, such combination would represent the ideal “matching point” for vineyard sustainability. A second interesting application deals with early mechanical leaf removal (Intrieri et al., 2008, Poni et al., 2006) primarily aimed at reducing fruit set. Positive carryover effects of such technique are looser clusters less susceptible to rot and improved grape composition which, in reds, is mostly due to an increased relative skin mass growth and, more in general, in the defoliated vines, to a higher final leaf-to fruit ratio. This latter apparently surprising yet quite consistent result is because the yield constraint due to the removal of source leaves at flowering is often more than proportional to the source limitation inherent to the defoliation itself.

Future achievements in sustainability of an even increasingly mechanized vineyard will result from further machine improvement as well as more knowledgeable applications in precision viticulture. An appropriate example is given from new generation mechanical harvesters able to provide “on going” harvest and separation of grape lots as a function of maturity indices. Yet, even more ambitious goals are pursued. One is bound to the spreading of environmental monitoring procedures based on a wireless data transmission able to furnish, in basically real time and at high spatial resolution, very detailed climate patterns at both meso and micro-climate scales. End-products are warning systems (WS) which are forecasted to be enlarged beyond the traditional application field of pest assessment. The link between WS and machine use in the vineyard is rather straightforward: a recent contribution from Caffi et al. (2009) has shown that the number of sprays against downy mildew can be reduced by about 50% when a warning systems to predict infections from weather forecast was applied vs. a traditional grower schedule. The hypothesis is that the same short message sent to grower’s mobile phone alarming for the need (or no need) of spraying could also be sent, for example, as a warning for the actual need (or no need) of performing a mechanical leaf removal based on the real time status of leaf density and/or degree of cluster exposure.