

THE AGRONOMIC CHALLENGES OF SUSTAINABLE VITICULTURE

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Vineyard management regards plant manipulation and growing techniques, in the strictest sense, designed to act on environmental resources and especially on soil fertility. Interventions on the plant are related to winter pruning, canopy management and pest control. Growing techniques relate to soil management, fertilization and irrigation. The logic of integration between the various agricultural activities should be guided by the principles of sustainable viticulture, an objective which is to “produce high quality wine grapes through a process that can provide an adequate income (economic sustainability), minimizing the impact of technical cultivation on human health and environmental resources (environmental sustainability)”.

The principles of sustainable viticulture were long ago (1996) well summarized dall’IOBC / WPRS¹ in the following points:

- √ to promote production systems that respect the environment, are economically viable, and sustain the multiple functions of agriculture, namely its social, cultural and recreational aspects;
- √ to secure a sustainable production of healthy grapes of high quality and with a minimum occurrence of pesticide residues;
- √ to protect the farmers’ health when handling agro-chemicals;
- √ to promote and maintain a high biological diversity in the ecosystem of the vineyard and in surrounding areas;
- √ to give priority to the use of natural regulating mechanisms;
- √ to preserve and promote long-term soil fertility;
- √ to minimise pollution of water, soil and air.

With a view to producing grapes of high quality, the definition and regulation of balancing grapevine fruit yield and vine growth of the vineyard is central. This regulation requires the integrated use of all the techniques of cultivation, from winter pruning until the eventual thinning of bunches, adopted in different regional contexts the most appropriate agronomic techniques taking account of the specific vineyard and wine-making model in which one works, and specifically the wine variety grown and the enological objective pursued.

The adjustment of the balance grapevine fruit yield and vine growth for the constant production of high-quality grapes must be considered central to the following three rules (Howell, 2001):

- 1) for each combination of genotype x environment there is a technique to achieve optimum crop production proper and constant quality grapes;
- 2) the good growing practices should result from knowledge of the physiology of growth and development of the grapevine;
- 3) sustainable levels of high quality grapes associated with high productivity can be achieved only through respect of adequate fruit yield and vine growth of a suitable bunch thermal and radiation microclimate.

It should be noted that in general there is a strong convergence between the characteristics of the canopy that allow the latter objective, and the conditions allowing an efficient pest control both on

¹ International Organization for Biological and Integrated Control of Noxious Animals and Plants, West Palearctic Regional Section (IOBC/WPRS)

the efficiency in the distribution of pesticides on target organs (leaves and clusters) and in relation to the prevention of the development of plant diseases.

Italian vinicultural scenario, based on models of territory viticulture, with specific genetic conditions (grapes varieties), environmental (soil and climate), and wine-making purposes (type and style of wine) is therefore of great importance to define criteria for the management of the vineyard able to adapt to many contexts and at the same time to allow the maximum expression of quality.

From the agronomic point of view, therefore, the challenges for a sustainable viticulture are numerous and can be summarized as follows:

- √ to refine diagnostic models for the evaluation of environmental resources and limiting factors for the grape growing land suitability, to define the most appropriate vinicultural models;
- √ to develop vineyard planting systems respectful of soil horizons of the site able to contain any risk of erosion and landslides by efficient flows of ground and surface water;
- √ to adopt management techniques for the conservation of soil fertility and consistent with the vulnerability of the site to surface erosion and contamination of groundwater;
- √ to set the management techniques of the vineyard canopy in relation to the enological object and diseases control;
- √ to develop techniques of fertilization and possible irrigation consistent with the knowledge of grapevine physiology and aimed to increase the quality of grapes.

The methods of precision viticulture, able to monitor the variability of grapevine fruit yield and vine growth ratio in the vineyards, often as a result of soil variability, seem of great importance for the practical application of the principles of sustainable viticulture.