



## **Precision Viticulture : is it relevant to manage the vineyard according to the within field spatial variability of the environment ?**

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For more than 15 years, research projects are conducted in the precision viticulture (PV) area around the world. These research projects have provided new insights into the within-field variability in viticulture. Indeed, access to high spatial resolution data (remote sensing, embedded sensors, etc.) changes the knowledge we have of the fields in viticulture. In particular, the field which was until now considered as a homogeneous management unit, presents actually a high spatial variability in terms of yield, vigour and quality. This knowledge will lead (and is already causing) changes on how to manage the vineyard and the quality of the harvest at the within field scale.

From the experimental results obtained in various countries of the world, the goal of the presentation is to provide figures on:

- the spatial variability of the main parameters (yield, vigor, quality), and how this variability is organized spatially,
- the temporal stability of the observed spatial variability and the potential link with environmental parameters like soil, topography, soil water availability, etc.
- information sources available at a high spatial resolution conventionally used in precision agriculture likely to highlight this spatial variability (multi-spectral images, soil electrical conductivity, etc.) and the limitations that these information sources are likely to present in viticulture.

Several strategies are currently being developed to take into account the within field variability in viticulture. They are based on the development of specific equipments, sensors, actuators and site specific strategies with the aim of adapting the vineyard operations at the within-field level. These strategies will be presented briefly in two ways :

- Site specific operations (fertilization, pruning, thinning, irrigation, etc.) in order to counteract the effects of the environment and to obtain a final product with a controlled and consistent wine quality,
- Differential harvesting with the objective to take advantage of the observed spatial variability to produce different quality of wines. This latter approach tends to produce very different quality wines which will be blended to control the final quality and/or marketed differently.

These applications show that the environment and its spatial variability can be valued with the goal of controlling the final quality of the wine produced.

Technologies to characterize the spatial variability of vine fields are currently in rapid evolution. They will significantly impact production methods and management strategies of the vineyard. In its last part, the presentation will summarize the technologies likely to impact the knowledge and the vineyard management either at the field level, at the vineyard level or at the regional level. A brief overview of the needs in terms of information processing will be also performed. A reflection on the difficulties that might limit the adoption of precision viticulture technologies (PV) will be done. Indeed, although very informative, PV entails high costs of information acquisition and data processing. Cost is one of the major obstacles to the dissemination of these tools and services to the majority of wine producers. In this context, the pooling of investments is a choke point to make the VP accessible to the highest number of growers. Thus, to be adopted, the VP will necessarily satisfy the operational requirements at the field level, but also throughout the whole production area (at the regional level). This working scale raises new scientific questions to be addressed.