# .- Vineyard Variability: Traditional and Precision Approaches

## Proff. Matteo Gatti

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

Students will acquire fundamental knowledge as it concerns vineyard variability depending on plant material, environmental factors, and human activities. In parallel, different scales of variability will be described. The main techniques of integrated management systems, vineyard zoning and precision technologies will be presented.

Expected learning outcomes: By the end of the course students will be able to: i) identify the level of expression of different drivers of variability at the between- and within-field scale; ii) know innovative methods for describing vineyard variability; iii) know the most recent technical solutions for managing vineyards under precision farming protocols. Students will be able to identify optimal vigour depending on commercial target, perform ground-truthing of a vigour map as well as to assess the opportunity to introduce variable rate technologies in vineyard management. Based on their background on agronomy and viticulture, students will acquire essential skills to perform site-specific management by setting set up prescription maps for variable rate applications (ie. fertilization, irrigation, harvest).

***COURSE CONTENT***

*Lectures*

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| Topics | CFU |
| Factors affecting vine growth, yield and fruit quality. Scales of variability: regional, within-field, within-plant, within-fruit. Origin of vineyard variability and the concept of “terroir”.  | 1.5 |
| Traditional approaches to vineyard variability: site selection and zoning. Description of specific wine- growing districts in Old and New World viticulture countries. | 1.0 |
| Precision farming as a new approach to vineyard variability. Definition of precision viticulture. Drivers of vineyard variability. Spatial and temporal variation in vine vigor, grape yield and fruit composition.  | 0.5 |
| Monitoring variability. Remote sensing platforms and different resolutions. Proximal sensing tools for monitoring of soil, canopy, yield and fruit composition. Vegetation indices. Vigor maps and their ground- truthing. Sampling methods. Optimal vigour. | 1.5 |
| Prescription maps and target management within vineyards. Variable-rate applications and technologies: fertilization, irrigation, leaf-removal, selective harvesting. Canopy protection in precision agriculture. | 1.5 |
| Tutorials |  |
| Seminars, field visit, and practical exercises. | 1.0 |

***READING LIST***

Reading materials will be hand out during the course. Documents and teaching materials will be shared using the Blackboard platform.

***TEACHING METHOD***

The teaching method will embrace the following activities:

1) Indoor class where main course topics will be covered along with several applied examples. Interactions between instructor and students will be promoted by stimulating discussion of specific case studies.

2) Indoor practical activities and exercises related to setting up of prescription maps. Technical seminars.

3) Field visits for a better appreciation of how vineyard variability is considered in several contexts as based on different cultural and environmental constraints, and commercial targets.

***ASSESSMENT METHODS AND CRITERIA***

The final examination will be oral. Students will receive three general questions aiming to verify knowledge and links between subjects. Each question will be valued a maximum score of 10/30 each. Final score will be the sum of the three different question scores and will be expressed on a 0–30 scale. Indicator of success : Score ≥18/30.

Students will be expected to prove a) skills on precision agriculture applied to perennial tree crops in terms of theoretical knowledge as well as in terms of capability to use them in specific operational contexts toward improved economic and environmental sustainability of orchard and vineyard management; b) language clarity; c) ability to make connections between different topics.

***NOTES AND PREREQUISITES***

Basic knowledge on geomatics, sensors and automation principles as well as on agronomy and fruit tree crops is recommended for better understanding of the course contents. Time schedule and location for students’ colloquia : everyday after class at the Department of Sustainable Crop Production (DI.PRO.VE.S.) – Section of Fruit Culture and Viticulture (office 313)