



Linking scientific knowledge to management practices in Agroforestry: the pivotal role of higher education

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Agroforestry for the transition towards sustainability and bioeconomy
Abstract
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Abstract

In Italy silvo-pastoral management systems combining compound coppices and different grazers (e.g. ancient swine breed or goats) have been applied for centuries. They were managed for providing a set of multiple services and products such as fuelwood (small trees of the coppice), wood for furniture and construction (larger trees from the gamic regeneration) and livestock. According to the agroclimatic zone, a great diversity of historical silvo-pastoral systems are still the base for land conservation and the economic sustainability of large rural areas (Paris et al., 2019). Some examples are the semi extensive wood pasture grazed by cattle in the Alpine zone and the indigenous beef breeds of the Apennine silvo-pastoral systems. In the Mediterranean area, the dehesa-like agroforestry systems with scattered oak trees mixed with grasslands or intercropped with cereal and/or fodder crops, and grazed by livestock (mainly sheep and goat) are spread (Seddaiu et al., 2013). Silvoarable systems have also been integrated in the landscape over time with the typical association of trees, vines and arable crops, named promiscuous cultivation, as multifunctional agricultural system.

All these forms of managements, relying essentially on empirical experience, have showed, in the long term, to be relatively sustainable since the natural resources were not clearly depleted. However, the empirical approach cannot provide any prediction in case of change of the environmental or social conditions. Thus, a scientific-based approach is essential for predicting the effects of different agroforestry management systems on ecosystem functions and services. A recent study on the perception of agroforestry systems by local stakeholders in Italy highlighted the lack of information on specific agroforestry issues and management practices as the main limitation to the adoption and maintenance of agroforestry systems in Italy (Camilli et al., 2017). Scientific-based knowledge has been accumulated by scientists in many countries but it must be summarized and transferred to the farm managers. Higher education, especially at the Master level, is the pillar for connecting the scientific knowledge to technical dissemination through support to the farmers.

Here we present a new specialization planned by the University of Padova in **Agroforestry systems** within the MSc in Forest and Environmental Sciences from the Academic Year 2020-2021.

The specialization offers 5 different disciplines related to:

- 1) ECOPHYSIOLOGY AND MANAGEMENT OF AGROFORESTRY SYSTEMS;
- 2) AGROFORESTRY SYSTEMS AND SOIL PROPERTIES;
- 3) SILVO-PASTORAL SYSTEMS AND ECOSYSTEM SERVICES;
- 4) TREE PLANTATIONS;
- 5) EUROPEAN POLICIES AND MEASURES FOR SUPPORTING AGROFORESTRY.

During the MSc programme the students are encouraged to analyse the agroforestry systems by using an ecosystem view, that is taking in to account the system functionality, its complexity, the multiple interactions and the temporal dynamics. This approach is believed to be essential for correctly manage all natural or anthropogenic systems providing a multiple set of services and goods.

Thanks to the formal agreement with Veneto Region – Veneto Agricoltura, it will be possible to use experimental farms where to plan experiments, carry out measurements and test management practices directly in the field, that can be visited by the students and make practical activities (Figure 1).

Conclusion

There currently is large interest in alternative agricultural systems, capable to provide food and feed with low environmental impact. In this way the agroforestry system represent an environmental-friendly model, capable to combine high crop yield with additional advantages for climate change mitigation due to the presence of woody trees (carbon fixation; temperature mitigation; improved soil fertility, etc.). This requires to achieve deeper insight on functioning of this models and transfer information to the new generation. In this view, the new MSc programme represents an innovative educational stream in Italy.



Figure 1. Linear planting of poplar clone “MSA” (“maggior sostenibilità ambientale” – high environmental sustainability) in wheat fields at Sasse-Rami experimental farm of Veneto Agricoltura in Ceregno (Rovigo, NE Italy) (left). Linear planting of alternate poplar and oak along drainage ditches in soybean fields at Masi (Padova, NE Italy) (right).

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