

## Forestry research to support the transition towards a bio-based economy

Piermaria Corona<sup>1\*</sup>

This special issue is dedicated to the celebration of the 92<sup>nd</sup> anniversary of the Forestry Research Centre of the Italian Agricultural Research Council. The Centre originated in 1922 as Royal Experimental Station of Silviculture, joined to the Chair of Silviculture of the Royal Institution for Upper Education in Forestry of Firenze (Italy). Aldo Pavari, eminent scientist and teacher at the University of Firenze, was the first director from 1922 up to his death in 1960. On the year 1967, the Experimental Station was reorganized as Experimental Institute for Silviculture with head offices in Arezzo and local branches in Firenze, Isernia and Cosenza. From 1972 to 1995 the position of director was held by Riccardo Morandini, who defined new goals and reformed both inner structure and research programme, renewing the experimental approach to forest sciences. Since 1999, the Experimental Institute for Silviculture has become the current Forestry Research Centre.

Forestry research is constantly revised as new questions arise or new techniques and tools become available. The vast expertise in this domain of Science builds upon the legacy of many years of experience, as shown e.g. just by the long history of the Annals of Silvicultural Research (Fabbio 2013). A well-grounded past is expedient to suitably understand the present and to creatively envision future scenarios.

In a world increasingly committed to reduce its carbon footprint, an emerging bio-based economy, in which renewable green resources such as forest biomass, rather than fossil fuels, are used to meet Society's needs for energy, chemicals and raw materials (e.g. Hannerz et al. 2014), is now becoming a reality. Both forestry research and innovation lay the foundations for a structural change from a fossil-based economy to a bio-based economy. This transition holds great potential for growth, and to significantly improve the quality of human life.

Under such a perspective, the aim of this special issue of the Annals of Silvicultural Research is to put together selected expertise and viewpoints of internationally renowned scientists in the field of forestry and bio-based economy to provide a multifaceted, updated reference of available forestry practices that contribute to the development of bio-economy, also considering their transferability to stakeholders.

Practical forestry has still many challenges ahead, the first one to increase wood yield while simultaneously minimizing input and environmental impacts. However, it can be argued that the very ma-

jor challenge is of theoretical nature in itself. Managing the forest resources in a world characterized by extreme complexity and radical uncertainty requires a portfolio of approaches, including short-term and long-term strategies to support socio-ecological systems to adapt to changes in climate, environment, economy and society (Wagner et al. 2014).

Adaptive forest management learns from system reactions to support its resilience, by shifting from approaches based on forecasting (i.e. the classical anticipatory management idea, *sensu* Kay and Regier 2000) to approaches based on monitoring, considering that optimization models have low ability to effectively support the management of natural renewable resources under ever changing environmental and socio-economic contexts (Corona and Scotti 1998). This implies straddling from a strictly ruled hierarchical forest planning to a systemic view of forest management (Ciancio and Nocentini 1997 and 2008). In other words, the overall goal is not to maintain an optimal condition of the resource (a concept that becomes meaningless under ever changing environmental and socio-economic contexts) but to develop an optimal management capacity. This is accomplished by: (i) trying to maintain ecological resilience so that forest ecosystems are able to react to stresses (whilst forestry faces internal/external changes, the forester's role is to look for technical solutions for adapting without losing integrity); (ii) generating flexibility in institutions and stakeholders' expectations, to allow for the management to be adaptive when external conditions change; (iii) maintaining a flexible view

<sup>1</sup> Consiglio per la Ricerca e la sperimentazione in Agricoltura, Forestry Research Centre (CRA-SEL), Arezzo, Italy

\* corresponding author: [piermaria.corona@entecra.it](mailto:piermaria.corona@entecra.it)

of participation (multi-stakeholder participation results in better management planning, and suggests that participatory methods are an effective way of capturing the information and perspectives necessary to manage socio-ecological systems).

Policy processes towards a bio-based economy should seek to produce decisions that are “evidence-based”. To this end, a key challenge is to introduce into forest research programs question-driven approaches able at identifying and assessing mechanisms that influence both the changes of socio-ecological systems (Corona et al. 2011) and their governance (Giessen and Buttoud 2014). Good question-setting must result in quantifiable objectives that offer unambiguous signposts for measuring progresses along the transition towards a bio-based economy and require a well-developed partnership among researchers, resource managers and policy-makers. Contextually, the use of scientific knowledge to support evidence-based decisions requires suitable communication of key findings: this special issue contributes to this end.

## Acknowledgments

The celebration of the 92<sup>nd</sup> anniversary from the foundation of the Forestry Research Centre was kindly sponsored and supported by the International Union of Forest Research Organizations (IUFRO 2.02.13, 4.02.06, 9.05.01, 9.05.04), the Italian Agricultural Research Council (CRA) and the Italian Ministry for Agricultural, Food and Forest Policies (MIPAAF).

## References

- Ciancio O., Nocentini S. 1997 - *The forest and man: the evolution of forestry thought from modern humanism to the culture of complexity; systemic silviculture and management on natural bases*. In: Ciancio O. (Ed), “The forest and man.” Accademia Italiana di Scienze Forestali, Firenze: 21-114.
- Ciancio O., Nocentini S. 2011 - *Biodiversity conservation and systemic silviculture: concepts and applications*. Plant Biosystems 145: 411-418.
- Corona P., Scotti R. 1998 - *Forest growth-and-yield modelling: questioning support for sustainable forest management*. Journal of Sustainable Forestry 7: 131-143.
- Corona P., Chirici G., McRoberts R.E., Winter S., Barbati A. 2011 - *Contribution of large-scale forest inventories to biodiversity assessment and monitoring*. Forest Ecology and Management 262: 2061-2069.
- Fabbio G. 2013 - *An eighty years long history*. Annals of Silvicultural Research 37 (1).
- Giessen L., Buttoud G. 2014 - *Defining and assessing forest governance*. Forest Policy and Economics 49: 1-3.
- Hannerz M., Nohrstedt H.-Ö., Roos A. 2014 - *Research for a bio-based economy in the forest sector - a Nordic example*. Scandinavian Journal of Forest Research 4: 299-300.
- Kay J., Regier H. 2000 - *Uncertainty, complexity and ecological integrity: insights from an ecosystem approach*. In: Crabbe P., Holland A., Ryszkowski L., Westra L. (Eds.), “Implementing ecological integrity: restoring regional and global environmental and human health.” NATO Science Series, Kluwer, Dordrecht: 121-156.
- Wagner S., Nocentini S., Huth F., Hoogstra-Klein M. 2014 - *Forest management approaches for coping with the uncertainty of climate change: trade-offs in service provisioning and adaptability*. Ecology and Society 19: 32-47.