

## Change is in the air: future challenges for applied forest research

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Forests provide a wide range of benefits to people. Forest plantations on former agricultural land for commercial and restoration purposes may enhance ecosystem services, including biodiversity conservation and carbon sequestration. Incorporating these ecosystem services into resource management decisions is of paramount importance. Efforts towards the sustainable management of forest ecosystems for climate change mitigation give opportunities to establish a new relationship between researchers and forests. Growing and competing demands for food, biomass, timber, and environmental services is posing severe challenges to effective forest governance, considering the impact of global change. However, tree plantations can hardly match biological diversity and structural attributes of the original forest cover, which warrants for future sustainable mitigation through forest activities.

**Keywords:** Biodiversity conservation, Carbon sequestration, Climate change mitigation, Forest management.

Recently, we visited a colleague, senior scientist working with an institute of the Italian National Research Council committed to biometeorological research. After our business meeting, during which we discussed about a possible common project on the impact of climate changes on forest ecosystems in the Mediterranean region, our colleague invited us to follow him in the underground floors of the building, where he proudly showed us his treasure: a recently acquired oven for heating the Institute, fed by wooden pellets. He told us that the whole building is now heated with some hundreds euros a month, against the several thousands disbursed formerly, and added that he is now doing research to understand how the process can be applied and ameliorated in a carbon sequestration context. Times have changed and forest research should focus on collaborative climate change mitigation strategies drawn up in parallel with measures to

curb CO<sub>2</sub> emissions.

Planning both the study of natural processes of long-term forest succession and the realization of guided management of short-term forest restoration is a wise thought. In this sense, a forceful (global?) forestation programme with fast-growing short-lived species would favour projects designed to provide carbon compensation. However, long-term carbon sequestration is better promoted by old-growth forests, with higher density and slower turnover of woody tis-

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**Fig. 1** - Short rotation forestry of three-year-old poplar cultivated nearby Pisa, Tuscany (Italy).

sues. Plantations with fast-growing tree species on degraded lands can improve ecosystem services (including biological diversity conservation, climate change mitigation, and *terra firma* protection), whereas original forest succession is a dynamic process that can take centuries.

Restoring ecosystem services needs time and labour, which let us foresee for sustainable investments and knowledge communications. Efforts in regenerating forests should also re-establish new relationships between people and ecosystems. In tropical regions, for example, deforestation should be blocked to reduce carbon emissions. European countries should not go back to future forest over-logging for attaining biomass for energy. New forest plantation on former agricultural land combined with close-to-nature forest management and sustainable rural de-



**Fig. 2** - *Pinus pinaster* plantations in southwestern France (Les Landes de Gascogne near Bordeaux).





**Fig. 3** - The road to the Lonquimay Volcano (southern Chile) lined with marvellous Araucaria old-growth forests.

velopment would help our friend to heat his place while conserving forest ecosystems.

Global change incidence, as a matter of fact, is now broadly perceived (Obama helps...). What we should be doing now is

research aimed at managing the consequences of climate changes. Nevertheless, the interest of scientists is still unbalanced towards studying impacts of global change, or struggling with adaptation strategies of

forest ecosystems. Mitigation policy is in its infancy, at least in the perspective of forest researchers.

Global change is here and is the challenge for our efforts. Going back to our roots bey-

**Fig. 4** - Magellan's old-growth forest at the Navarino Island (antartic Chile).



and global warming. Eventually, we are forest scientists faithfully committed to manage the forest ecosystems of the World. In a sustainable way.

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### **Authors'Box**

Roberto Tognetti is a plant ecophysiological and forest ecologist whose research interests integrate measurements over several spatial scales to explain the links between vegetation and environment. He has undertaken measurements of leaf processes (photosyn-

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