Author: ***Viorel NB Blujdea (PhD)***
Habilitation thesis title: ***Modeling forest management and wood products use from climate change mitigation perspective***
Domain: ***Forestry***

Summary

The first part of the thesis describes the scientific experience of the author in the field of physiology and forest ecophysiology, focusing on the foliar water tolerance and mineral nutrition on two species of mesoxerophitic oaks, *Q. cerris* and *Q. frainetto*. In this field I elaborated the doctoral thesis, as well. We scientifically demonstrated the hydric versatility of the *Q. cerris* against *Q. frainetto*, which explains its superior resilience under long drought conditions. We made determinations for the first time in the country and in Eastern Europe with an infrared analyser for CO2 foliar exchange. We generated biological response curves for active photosynthetic radiation, atmospheric vapor deficit, leaf temperature, and defined quantitatively short- and long-term water stress tolerance indicators by analysing water use efficiency (photosynthesis/transpiration, photosynthesis/stomatal conductance, photosynthesis/substomatic CO2 concentration). I have made determinations of the tissue hydration status by more precise methods, namely by establishing the tissue hydric potential (Scholander pressure chamber). When exposed to UVB (+25% vs. normal background), we demonstrated that RUBISCO is not directly affected, but only the transfer of electrons in photosynthesis is reduced, which finally reduces the efficiency of light absorption. A new methodological approach was achieved by establishing a protocol for the measurement of foliar photorespiration by the "post illumination CO2 burst" method with an "open path" system. I have also accumulated a rich experience in the field of mineral nutrition of mesoxerophytic oaks within the doctoral thesis which led to results on: 1) definition of the foliar content of total forms of macro and micronutrients (10 elements), 2) seasonal dynamics, 3) dynamics the foliar nutrient content in relation to the age of the stands (young, age corresponding to maximum growth and old age), 4) the determination of the nutrient use efficiency in relation to the biomass growth, 5) the correlation between the hydric status of the tissues and the nutrient content (easy soluble, slow soluble and the total form of the nutrient), 7) the internal translocation of nutrients among tree parts and the contribution of perennial structures to nutrient supply of the new structures in formation (leaves, branches) for the mesoxerophytic oaks. I also conducted research on carbon allocation and turnover for fine roots in forest tree species (oak, spruce).

The last part of the thesis describes the experience over the last decade and a half when I gave a practical sense to physiological and eco-physiological skills through technical and scientific support to climate change policies, more precisely to monitoring, reporting and verification of greenhouse gases in the processes associated with the United Nations Framework Convention on Climate Change (including the Kyoto Protocol and the Paris Agreement). The actual contribution is related to the field of land use, land use change and forestry sector, such as: the development of methodologies for estimating carbon stock change and other greenhouse gas emissions from forests and forest related land conversions as well as for other land uses (e.g. grazing lands); use of models to simulate carbon sequestration through afforestation, forest management and use of wood products activities; design of monitoring plans for C accumulation in C pools; support for the development of national greenhouse gas inventories for the land use and forestry sector; support in the development of national greenhouse gas inventories for the land use and forestry sector, scientific support in substantiating and implementing accounting rules for emission reductions in forestry sector and non-forest land management; identification of environmental, financial and social synergies associated with emission reduction measures. My contribution to the LULUCF sector is based on the scientific experience of tree alometry, modeling and adjusting the standing volume and growth curves depending on the various indepdendent parameters, and the allocation of carbon to biomass components at tree and stands level, as well as development and implementation of the accounting rules for land use and forestry sector.

Finally, the thesis describes the current knowledge weaknessess and data gaps that will form the basis for my future efforts, namely development of estimation methods and projections of biomass and carbon flows in forest ecosystems (including to and between dead organic matter pools) as well as ensuring a compromise amongst the many forms of wood in the economy: volume-energy-biomass-carbon, in order to ensure a right potential contribution of forestry sector to the neutral climate economy.

Date: 18.07.2019

Candidate,
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