



ADMISSION TO DOCTORAL STUDIES

Session September 2023

Field of doctoral studies: Silviculture

Doctoral supervisor: CS I dr. ing. Ovidiu-Nicolae BADEA

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Structural and auxological description of typical forest stands in the south and south-east of Romania in the climate change context.*

Contents / Main aspects to be considered - *to be adapted/ completed/ deleted*

The south and south-east area of Romania, defined by the flat plain as the main landform, is significantly affected by the climate change. Forest areas, although deficient in weight, are a recognized method of counteracting the effects of climatic extremes.

The typical forests of the forest-steppe area consist mainly of the xerophytic oak species (*Q. pedunculiflora* and *Q. pubescens*). Therefore, studying the state of these forest stands, in which the two oak species are predominant, could illustrate the way in which they react to the negative action of the climatic factors.

The topic proposes, from the point of view of the stand structure and auxologically, the analysis of the typical forest stands in the area of the forest steppe and its near boundary regions with the aim of identification of silvicultural management measures in order to enhance the local climate and to their adjustment to the climate change. The research area is that of steppe and forest steppe.

By conducting this research the typical forest stands are to be identified and permanent observation plots will be constituted at stand level for determining the structural and auxological traits of the forest stand.

Through this study the existent research hypotheses will be tested and the up to present obtained results shall be developed, with a focus on those referring to the forest stand state and the climate stress resilient forest stands.

Based on the obtained results, this research investigates, in addition to the forest stand analysis from the study area which is under the accentuating process of the climate change, a reconsideration of the actual boundaries of the altitudinal fito-climatic belts from the low lands (steppe, forest steppe and forest plain) and the improvement of the silvicultural solutions for species choosing process in order to establish the regeneration species composition for artificial regeneration of the forest stands situated in the interference zones of steppe – forest steppe and forest steppe – forest plain.

Furthermore, the expected results will contribute to increasing, improving and developing of the level of knowledge for perfecting the integrated forest management system for a silviculture that is sustainable, climate-smart and adapted to the present societal challenges (climate change, well-being, social inclusion, etc.).

Recommended bibliography:

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- ❖ García-Duro, J.; Ciceu, A.; Chivulescu, S.; Badea, O.; Tanase, M.A.; Aponte, C. Shifts in Forest Species Composition and Abundance under Climate Change Scenarios in Southern Carpathian Romanian Temperate Forests. *Forests* 2021;
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- ❖ Feurdean, A., Grindean, R., Florescu, G., Tanțău, I., Niedermeyer, E. M., Diaconu, A.-C., Hutchinson, S. M., Nielsen, A. B., Sava, T., Panait, A., Braun, M., and Hickler, T.: The transformation of the forest steppe in the lower Danube Plain of southeastern Europe: 6000 years of vegetation and land use dynamics, *Biogeosciences*, 18, 1081–1103, <https://doi.org/10.5194/bg-18-1081-2021>;

Prerequisites / Remarks: *to be adapted/ completed/ deleted*

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TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 2: *The Beech's (Fagus sylvatica) tolerance to drought. A dendroecological approach*

Contents / Main aspects to be considered:

The study of climate change effects of is one of the most important research directions in the field of environment sciences, with major impact on the biological and socio-economic systems (IPCC, 2013). Changes in local temperature and precipitation have the potential to affect the European forest and have led to large ecological shifts on millennial timescales. Tree vitality is one of the most important indicators of forest condition in the context of climate changes (Dobbertin, 2005). European beech (*Fagus sylvatica*) is one of the most important tree species in Europe (from an ecological, economic, and cultural point of view), but it is drought-susceptible in Central and Eastern Europe (Thiel et al., 2014) where climatic models (IPCC, 2013) suggest increasing frequency and intensity of droughts, and for that reason it needs special attention in the context of these changing conditions. European beech growth strength is negatively influenced by current climate change (Peuke et al., 2002), as a result of its sensitivity to the lack of soil humidity (Ellenberg, 2009) and exposure to long periods of drought (Fotelli et al., 2009). A recent decline in beech productivity induced by water availability has been registered, both in optimal conditions (Charru et al., 2010; Dittmar et al., 2003; Lebourgeois et al., 2005) and in marginal population (Jump et al., 2006; Piovesan et al., 2008). On the contrary, in the Balkan Peninsula (in the vicinity of our study area), results showed a growth increase over the last decades, which affects tree ring width chronologies sensitivity to climate (Tegel et al., 2014). New studies developed in the South and South-Eastern part of its distribution range reveal that *F. sylvatica* loses competition in favour to more drought resistant species in mixed broadleaved forests (Fotelli et al., 2009). Although European beech is considered a resistant species, pre-longed drought periods may increase the susceptibility to pathogenic agents (Jung, 2009). The **main aim** of this thesis is to quantify the vulnerability and adaptability capacity of beech forests to extreme climatic events.

The following aspects will be assessed: Environmental classification of eastern limit beech forests; Dendrochronological network design for beech at Eastern limit of their distribution in Europe; The dendroecological and dendroclimatological bioregions for beech; Assessment of species levels of tolerance to drought for beech.

Recommended bibliography:

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