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OPINION

on dissertation for obtaining the educational and scientific degree "Doctor" in: field of higher education 6. "Agrarian Sciences and Veterinary Medicine", professional field 6.1. "Plant Production", scientific specialty "Soil Science"

Author of dissertation: Krestena Valerieva Ilieva, full-time doctoral student at the Department of Silviculture at the University of Forestry, Sofia

Dissertation Topic: „Assessment of soil resources in the Botevgrad Valley", **Reviewer:** Assoc. Prof. Dr. Vera Zamfirova Petrova, in professional field 6.1 Plant Breeding, scientific specialty Land Reclamation (incl. soil erosion and its control), Department of Plant Protection, Faculty of Agronomy at the Forestry University-Sofia.

(academic position, research degree, first name, surname and family name, higher education institution/research organization; field of higher education, professional field, research specialty)
appointed as a member of the scientific jury by Order No. RD- ZPS-667 /24.11.2025 of the Rector of the UF.

1. Relevance of the problem.

The relevance of the topic of the dissertation is indisputable and is related to the need for an in-depth study of soil resources and their condition under the conditions of modern land use. The accumulation of new scientific data on the properties and spatial distribution of soils is essential for the sustainable management of agricultural land and the rational use of natural resources.

The Botevgrad Basin represents an area with diverse natural conditions and different soil types, which necessitates detailed studies of their morphological, physical, and chemical characteristics. In this context, the development of a scientifically grounded assessment of soil resources in the region constitutes a relevant and significant scientific task.

2. Degree of knowledge of the state of the problem and creative interpretation of the literature review.

The dissertation presents a comprehensive literature review, which covers a significant number of scientific publications - 172 literary sources, including Bulgarian and foreign authors. This shows a thorough knowledge of scientific research in the field of soil science and soil resources. The literature review is well structured and shows the ability for critical analysis and synthesis of scientific information.

3. Aim, objectives, hypotheses and research methods. Relevance of the chosen research methodology to the stated aim and objectives of the dissertation.

The main objective of the dissertation is to improve the information base on the condition of soil resources in the Botevgrad Basin through field investigations, laboratory analyses, and the creation of a database and soil maps in a GIS format.

In order to achieve this objective, several specific tasks have been formulated, including: collecting and digitizing existing information on the natural conditions of the region; identifying sites for soil sampling using GPS coordinates; conducting field investigations and morphological description of soil profiles; performing laboratory analyses of key physical and

chemical parameters; carrying out a microbiological assessment of soils; and classifying soils according to the World Reference Base for Soil Resources (WRB).

The selected methods—field investigations, laboratory analyses, statistical data processing, and the use of GIS technologies—are fully appropriate to the stated objectives and tasks and allow for obtaining reliable scientific results.

4. Visualization and presentation of the results.

The obtained results are presented clearly and systematically through tables, graphs, and soil maps. The data have been carefully processed and allow for tracking changes in the main soil characteristics.

The dissertation includes cartographic materials and satellite images of the studied area, which facilitate the visualization of the spatial distribution of soil types. The morphological descriptions of the soil profiles are detailed and well justified.

The visualization of the results significantly facilitates the understanding and analysis of the conducted research.

5. Discussion of results and literature used.

An assessment of erosion processes in the Botevgrad Basin has also been carried out, revealing a widespread occurrence of water erosion and a very high rainfall erosivity index. Cartographic materials are used to illustrate the spatial distribution of soil susceptibility to erosion, as well as the influence of slope gradients on the intensity of these processes.

A microbiological characterization of the soils has also been performed, indicating a dominant presence of bacteria, which highlights their high biogenicity. The enzymatic diversity and cellulase activity of soil microorganisms were analysed, and relationships were established between cellulase activity, humus content, and nutrient availability, as well as its inhibition at elevated concentrations of heavy metals in anthropogenically affected soils. In conclusion, it is noted that the soils have developed on contrasting lithological complexes, which determines differences in their mechanical composition and physicochemical properties, as well as the presence of well-developed humus horizons and moderate biological activity.

6. Contributions of the thesis.

The contributions are of a scientific and applied nature and consist of the following:

Scientific contributions

- New data on the morphological, physical and chemical properties of the soils in the Botevgrad Basin have been obtained.
- The spatial distribution of the main soil types and their variability have been established.
- Soils have been classified according to the World Soil Resources Reference Base (WRB).
- Dependencies between different soil indicators have been established through statistical analysis.

Scientific and applied contributions

- An integrated database of soil resources of the studied area has been created.
- Soil maps and cartographic materials have been prepared, which can be used in sustainable land use planning.
- The results obtained can serve as a basis for further scientific research and for the practical management of soil resources.

Applied contributions

- Recommendations have been proposed for improving soil fertility of agricultural and forestry lands, based on the identified deficiencies of the main nutrient elements from the NPK complex.

7. Assessment of the extent of the dissertator's personal involvement in the contributions.

From the materials presented, it can be concluded that the doctoral candidate has significant personal participation in all stages of the scientific research - data collection and analysis, conducting field studies, laboratory analyses, processing and interpretation of the results.

8. Critical comments and questions.

Some recommendations can be made regarding the dissertation:

• A more detailed discussion of the influence of different land-use forms on changes in soil properties could be provided.

• The analysis of the relationships between individual physical and chemical soil parameters could be further expanded.

• In future studies, it would be useful to monitor the dynamics of soil indicators over time.

The above remarks are of a recommendatory nature and do not diminish the scientific value of the dissertation.

9. Published articles and citations.

Five scientific articles have been published on the topic of the dissertation, which present the main results of the research conducted. The publications are related to the topic of the dissertation and reflect the scientific achievements of the author.

10. Assessment of the publications on the dissertation: number, nature of the publications in which they are printed. Reflections in science - use and citation by other authors.

The publications on the dissertation work have been published in specialized scientific journals and meet the minimum national requirements for acquiring the educational and scientific degree "doctor".

Presented abstract reflects objectively the structure and content of the dissertation.

CONCLUSION:

On the basis of the different research methods learned and applied by the PhD student, the correctly derived experiments, the made generalizations and conclusions, I consider that the presented dissertation meets the requirements of the FRAADB and the Regulations of the University of Forestry for its application, which gives me the reason to evaluate it as POSITIVE.

I take the liberty of suggesting that the Honourable Scientific Jury also vote in the affirmative and award the educational to Krestena Valerieva Ilieva and scientific degree "Doctor" in the scientific specialty „Soil science".

Date: 16.03.2026 г.
Sofia

PREPARED THE OPINION: