



## OPINION

on a dissertation submitted for the award of the educational and scientific degree "Doctor" in: field of higher education 6. Agricultural Sciences and Veterinary Medicine, professional направление 6.1 "Crop Production", scientific specialty "Forage Production and Grassland Management".

**Author of the dissertation:** Georgi Kraev Stanchev

full-time PhD student at the Department of Crop Production, Agricultural University – Plovdiv

**Dissertation topic:** "Study on the Potential of Natural and Artificial Grasslands for CO<sub>2</sub> Sequestration".

**Reviewer:** Prof. Dr. Tanko Peev Kolev, Agricultural University – Plovdiv (retired), field of higher education 6. Agricultural Sciences and Veterinary Medicine, professional field 6.1 "Crop Production", scientific specialty "Crop Production", appointed as a member of the scientific jury by Order No. RD 16-475 of 02.04.2026 issued by the Rector of the Agricultural University.

### 1. Relevance of the problem

Grassland ecosystems play an important role both in maintaining biodiversity and ecosystems, and as a potential resource for carbon storage in the context of sustainable management of agricultural landscapes. They are considered an opportunity for capturing and storing CO<sub>2</sub>, which is a major greenhouse gas and a key factor in climate change. In the context of a changing climate, efforts to promote sustainable grassland management will be important for reducing emissions and mitigating the negative effects of global warming.

### 2. Aim, objectives, hypotheses and research methods

The aim of the dissertation is to study the capacity of natural and artificial grasslands for carbon sequestration.

To achieve this aim, the following tasks were carried out:

Study of carbon uptake and storage in natural grasslands.

Study of carbon uptake and storage in artificial grasslands.

Establishing the relationship between climate, species composition, and carbon accumulation in plants and soil.

Object of study: Four different sites characterized by specific features:

Site 1 – artificial grassland in the experimental field of AU Plovdiv

Site 2 – natural grassland near the village of Rozino, Plovdiv region

Site 3 – natural grassland in Beklemeto area, near Troyan

Site 4 – natural grassland near Devin

Determination of species composition: Braun-Blanquet method (1964).

Determination of soil organic carbon: Conducted in an accredited laboratory at the Agricultural University – Plovdiv using a standardized method (BDS ISO 14235:2002).

Determination of basal cover: Measured using a 50 × 50 cm grid. Four grids were placed in each site to assess density and uniformity. One square equals 1% of the

area. Unvegetated sections are summed and total cover is calculated using the formula:  $X = (25 - A) \times 4$  (Yancheva Hr., 1994).

Monitoring CO<sub>2</sub> flux dynamics: A chamber method was used to measure CO<sub>2</sub> concentration in a controlled volume per unit area.

Statistical analysis: Multiple regression method, examining the relationship between one dependent variable and two or more independent variables.

The methodological approach corresponds to the stated aim and objectives.

### **3. Presentation of results**

The dissertation includes 37 tables, 3 photographs, and 61 figures illustrating the experimental work and results. The data are organized according to the objectives and supported by statistical analyses.

### **4. Discussion of results and literature**

The results and their discussion cover 80 pages. The PhD student interprets the findings concisely and compares them with other authors.

A total of 288 references are used (278 in Latin script and 10 in Cyrillic).

Fifteen conclusions are drawn based on the results and comparisons.

### **5. Contributions of the dissertation**

#### **Scientific contributions:**

Development of a concept for spatial differentiation of agroclimatic conditions depending on altitude.

Enrichment of theoretical understanding of climate change impacts on grasslands.

Identification of patterns in spatial organization of grassland phytocoenoses.

proving the connection between biodiversity, structure, and ecosystem stability.

Clarification of the role of functional plant groups (grasses, legumes, forbs).

Expansion of knowledge on carbon cycling processes in grasslands.

Establishing relationships between climate factors and carbon exchange intensity.

Differentiation between high productivity and long-term carbon storage potential.

Further development of the concept of mountain grasslands as stable carbon reservoirs.

#### **Scientific-applied contributions:**

Agroclimatic assessment of regions at different altitudes.

Evaluation of drought risk in lowland areas.

Proposal of an approach for assessing ecological stability.

Quantitative assessment of CO<sub>2</sub> accumulation potential.

Analysis of seasonal dynamics of soil organic carbon.

proving the influence of climatic factors on photosynthesis and soil respiration.

Development of a regression model for carbon exchange.

Identification of phytocoenoses with high carbon storage potential.

Emphasis on biodiversity and sustainable management.

Application of results for climate adaptation strategies.

## **6. Critical remarks and questions**

Some references lack page numbers, and minor technical errors are present. Greater precision is recommended in future work.

These remarks do not diminish the value of the dissertation.

## **7. Publications and citations**

The PhD student has presented 3 published articles, 2 conference papers, and 1 youth forum publication.

The abstract accurately reflects the structure and content of the dissertation.

## **CONCLUSION**

Based on the applied research methods, correctly conducted experiments, and the conclusions drawn, I consider that the dissertation meets the requirements of the relevant legislation and regulations of the Agricultural University. Therefore, I give a positive evaluation.

I recommend that the Scientific Jury also vote positively and award Georgi Kraev Stanchev the educational and scientific degree "Doctor" in the specialty "Forage Production and Grassland Management".

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