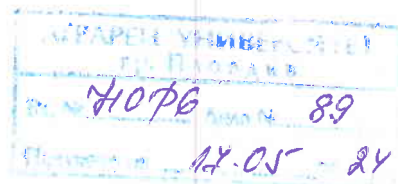


## OPINION



of the dissertation thesis for awarding the educational and scientific degree "Doctor",  
in the field of higher education 5. Technical sciences,  
professional field 5.13. General engineering, doctoral program Mechanization and  
electrification of crop production.

**Author of the dissertation:** *M.Sc. Eng. Iliyan Bozhidarov Bozhkov, doctoral student of independent training at the "Agricultural Mechanization" department at the Agricultural University, Plovdiv*

Dissertation topic: „Stepless adjustment of the sowing rate for the Saxonia A200 row drill”

**Jury member:** Assoc. Prof. Atanas Zdravkov Atanasov, Ph.D. University of Ruse "Angel Kanchev", scientific specialty "Mechanization and Electrification of Plant Breeding". This statement was prepared based on order No. RD-16-366/ 12.03.2024 issued by the rector of AU-Plovdiv.

### **I. Relevance of the problem developed in the dissertation.**

Sowing is one of the fundamental technological processes in agriculture, on which the further development of plants and their yields depend. Sowing the seeds at an optimal rate and at a suitable depth is essential for good filling and evenness of the sowing. The correct selection of suitable sowing devices, depending on the type of seeds sown, the type and agrotechnical condition of the soil, is a prerequisite for achieving the desired quality. The study of the flow of the sown seeds in planters for crops with a "fused surface", the determination of the functional relationship between the individual working parameters of the planter, as well as the stepless regulation and maintenance of the sowing rate under variable working conditions to achieve the desired sowing quality is relevant and significant problem.

### **II. Purpose, tasks and methods of research (hypotheses of the dissertation work)**

From the in-depth literary analysis, the purpose and tasks of the dissertation research are outlined. The objective shows in-depth knowledge of the research problem. The tasks that are set in the dissertation are in correspondence with the set goal and have been successfully completed. The description of the object and research methods is accurate and detailed, underlines the merit of the dissertation work.

### **III. Transparency and presentation of the obtained results**

The dissertation work is presented in four chapters on 114 pages with included appendices. The obtained results are presented in a good style, are correctly interpreted and correspond to the tasks set. A large part of the obtained results are presented graphically and tabularly. The reliability of the material on which the doctoral student draws his conclusions is based on a properly selected research approach and a well-constructed experimental methodology. In processing the obtained data, the doctoral student skillfully used modern methods of mathematical statistics.

#### **IV. Discussion of results and references**

In developing his dissertation, the doctoral student used 112 literary sources, of which 81 are in Cyrillic, 18 in Latin, and the rest are presented as links to Internet pages. It makes a good impression that a significant part of these sources are from foreign authors, mainly Russian, which defines the doctoral student as one of the specialists in the country on the researched problem. The predominant part of the literary sources that are in Cyrillic are from ten years ago, and although some of these publications are related to methodological issues, it would be good to cite more recent studies. The doctoral student has enriched his knowledge of what has been achieved so far in this field and is able to creatively interpret literary sources. All this allowed him to correctly formulate the purpose and tasks of the research. The achieved results of the doctoral student's research work have been discussed at various scientific forums, both in Bulgaria and abroad, which is evident from the doctoral student's scientific publications.

#### **V. Contributions of the Dissertation**

Contributions are personal achievements of the PhD student arising from his own research. I consider the following contributions to be scientifically fundamental:

1. The transmission function in a mechatronic system controlling and supporting the process of sowing seeds in the Saxonia A200 planter was theoretically determined. The variables in it are the sowing rate and the amount of seeds that are sown in 1 revolution of the sowing apparatus, which is directly dependent on their density and volume.

2. The functional relationship between seed density, transmission ratio and the amount of sown seeds was established. A mathematical model has been developed that is adequate and can be used to solve optimization and other research tasks.

I define all other contributions in the dissertation as scientific and applied contributions.

I believe that the results achieved in the dissertation have been approved and will be used and implemented in agricultural production.

#### **VI. Critical notes, questions and recommendations to the candidate**

In connection with the presented dissertation work, I have the following remarks and recommendations:

1. To check the abstract and the dissertation for spelling and terminological errors. For example, the term rpm is used instead of rotational frequency, etc.

2. I recommend that the literary source be cited in the caption for the figures and diagrams in chapter one of the dissertation, which are not the personal work of the doctoral student.

3. I recommend to improve the quality of fig.3.4 on page 74 of the thesis.

4. The list of literary sources in Latin is small. I recommend supplementing it with more literary sources in Latin.

Questions:

1. Has a seed drill with stepless regulation of the sowing rate been implemented in an agricultural holding in the country?

2. Have operational and energy studies been conducted in a real production environment?

## **VII. Published articles and citations**

Five publications are presented, all co-authored in two of which the PhD student is the first author. The publications on the dissertation work sufficiently reflect the main theoretical propositions, the contributions of the dissertation work and the obtained results. The main parts of the dissertation work have been published, thus the work has become available to the scientific community, both in Bulgaria and abroad.

## **CONCLUSION**

The dissertation submitted for my opinion has all the merits of a doctoral dissertation.

Based on the various research methods applied by the doctoral student, the experiments correctly carried out, the summaries and conclusions drawn, I believe that the presented dissertation meets the requirements of the ŽARSRB and the Regulations on the terms and conditions for acquiring scientific degrees and for holding academic positions at an Agricultural University - Plovdiv.

This gives me the reason to positively evaluate the dissertation work and propose to award the M.Sc. Eng. Ilian Bozhidarov Bozhkov, the educational and scientific degree "Doctor" in the field of higher education "Technical Sciences" professional direction 5.13 General engineering, scientific specialty "Mechanization and Electrification of Crop Production".

30.04.2024 г

**Jury member:**



(доц. д-р инж. Атанас Атанасов)