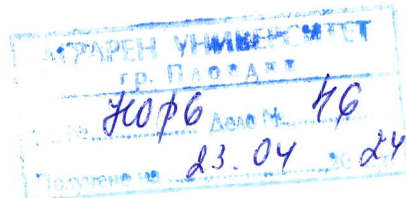


REVIEW



Regarding the competition for occupying the academic position of “Associate Professor” in the scientific specialty Mechanization and Electrification of Crop Production, announced in the State Gazette 7/23.01.2024, including the candidate Chief Asst. Prof. Eng. Ivan Angelov Nitkov, PhD.

Reviewer: Assoc. Prof. Eng. Ivan Braykov Ivanov, PhD, from the Agricultural University – Plovdiv, field of higher education 5. Technical Sciences, professional area 5.1 Machine Engineering, scientific specialty: Mechanization and Electrification of Crop Production, who is assigned a chairperson of the scientific jury according to Order № ПД-16-406/20.03.2024 of the Rector of the Agricultural University – Plovdiv (AU-Plovdiv).

1. General data of the candidate`s professional and specialized development.

Chief Asst. Prof. Ivan Mitkov is the only candidate participating in the present competition announced in the State Gazette 7/23.01.2024 and on AU website for the needs of the Faculty of Viticulture and Horticulture – Plovdiv.

Chief Asst. Prof. Ivan Mitkov was born in 1970 in the town of Parvomay. In 1995 he graduated from the Technical University – Gabrovo as a machine engineer obtaining a master`s degree in Technology of Metals and Metalworking Machinery. He has worked in the production industry as a technical assistant and a production manager in companies in Plovdiv. In 2012 he was enrolled as a full-time doctoral student in the Agricultural University – Plovdiv (AU-Plovdiv). He defended his doctoral thesis in the scientific specialty Mechanization and Electrification of Crop Production. In 2015 the candidate was appointed as a lecturer on the position of assistant professor in the Department of Agricultural Mechanization at AU-Plovdiv. In 2018 he won a competition and was awarded the title “Chief Assistant Professor” in the Department of Agricultural Mechanization, Faculty of Viticulture and Horticulture. Chief Asst. Prof. I. Mitkov has delivered lectured, laboratory classes and practices to bachelor and master students, he has also supervised graduates.

The candidate has completed additional courses – an English language course, a course for computer skills and work with office equipment, a course for specific work with machines and equipment.

2. General description of the submitted materials. Fulfillment of the requirements for occupying the academic position of Associate Professor.

With relation to the submitted report-declaration proving the fulfillment of the minimum national requirements of the Act on Development of the Academic Staff in R Bulgaria (ADASRB), and the Regulations for its implementation, Chief Asst. Prof. Ivan Mitkov presents the following pedagogical and scientific production:

1.1. Scientific works and publications on the nomenclature specialty - 31 pieces, including:

- Publications related to the dissertation work for awarding the educational and scientific degree of "Doctor" - 4 pieces that are not subject to the present review.
- Publications with an impact factor - 3 pieces, with a total IF - 0.848.
- Publications in peer-reviewed and refereed scientific journals - 14 pieces.
- Publications in non-refereed editions with scientific review - 12 pieces.

10 publications are in editions in Web of Science and 5 - in Scopus, as 2 of the scientific journals are with the indicator Q4 and IF - 0.3, and 1 journal - with indicator Q3 and SJR - 0.248.

- Publications in collections from scientific conferences, presented scientific reports at international forums - 12 pieces.
- Participation in scientific forums - conferences, symposia, congresses with reports - 17, of which 12 abroad and 5 in Bulgaria.

The candidate's personal participation is illustrated with 7 independent publications, being a first author in 15 publications. There are 25 publications in English language.

According to the individual indicators, the publications are distributed as follows: 10 by indicator B 4, 1 – by Γ 6, 4 - by Γ 7 and 12 – by Γ 8.

1.2. A book has been published based on a defended dissertation work - 1 piece.

1.3. Number of citations – 7 out of 5 publications from refereed and indexed scientific journals – 3 in Scopus and 4 in Web of Science; per 1 citation in a journal with Q3 and SJR-0.21 and in a journal with Q1 and SJR-1.32, all by indicators Δ 12.

1.4. The candidate's teaching experience until 01st March 2024 is 5 years and 5 months with 996 academic hours of average annual classes and extracurricular activities, of which 394 hours are lectures in technical disciplines at AU-Plovdiv.

1.5. He has participated in 2 institutional research projects.

1.6. Scientific supervision of successfully defended graduates – 18 diploma theses.

The significant amount of research, academic and pedagogical production characterizes the candidate as a thorough scientist, researcher and erudite lecturer.

For the preparation of the review a total of 27 scientific works, excluding the dissertation work, are subject to analysis and are accepted for review. For the final evaluation of the scientific production 10 scientific publications from group B4, 1 from group Γ 6 and 4 from group Γ 7 are considered (published in indexed scientific journals in world-renowned databases with scientific information on Scopus and Web of Science), 12 publications from group Γ 8 (published in non-refereed journals with scientific review or in edited collective volumes), 2 participations in university research projects. The candidate has also submitted a reference for 12 reports presented at international scientific conferences abroad and 5 in Bulgaria. He has a published book based on his dissertation work - group Γ 6.

As a summary, the candidate meets the minimum national requirements for the individual groups of indicators as follows: for group A1 - from 50 to 80.65 points; for group B4 from 100 to 125.57 points; for group Γ from 200 to 257.25 points; for group Δ from 50 to 70 points;

Summarized for all groups of indicators, the candidate collects 502.82 points (this number does not include the points from publications related to his dissertation work - 30.65) with minimum requirements for the academic position of ASSOCIATE PROFESSOR – 400 points.

3. Main directions in the candidate's scientific and research work. Skills and talent for performing research studies (project management, attracting external funding, etc.).

The candidate has directed the main research in his scientific activity in the fields of mechanization and automation in crop production, mechanized technologies in agriculture, improvement of the structures of agricultural machines, as well as in the new areas related to renewable energy sources (RES). The publications presented in the competition cover the following scientific fields:

- *In the field of creating and studying new working bodies for tilling machines.*

With relation to the management of the aggregate composition of different soils, designs of a tiller with a horizontal axis of rotation and two new working bodies, combining the kinematics of a tiller with a horizontal axis of rotation and horizontal displacement of the soil by a disk working body have been investigated. The quality of crushing the soil into fractions and mixing them with ameliorant has been established, according to the agro-technical requirements for the cultivation of a given crop. The newly created working bodies have been tested in production conditions. Adequate regression models have been derived, describing soil fragmentation into fractions, creating optimal conditions for growing crops. Publications from groups: B-10; Г-8.3; Г-8.7; Г-8.9.

- *In the field of developments related to agro-robots.*

Research studies have been conducted innovative for our country on the use of a robot in agriculture for thermal weeding. The agro-technical indicators for increasing the efficiency of an agricultural robot according to the TRIZ theory at work have been substantiated. The publications are from groups: B-3; B-4; B-6; Г-7.1; Г-7.3.

- *In the field of developments related to the construction of agro-machinery.*

A constructive layout of a working body of a planter for grass mixtures has been proposed, in order to improve the technical parameters of the seed box. The parameters and the quality of operation of a machine for breaking walnut fruits have been investigated, and the modes of operation with different fractions of the fruits have been established. Publications from groups: B-5; B-7; Г-7.2; Г-8.4,8,9,10,11,12.

- *Technological developments related to ultrasound.*

Research studies have been presented based on attempts to increase the germination of vegetable seeds by using ultrasound with a frequency of 43-45 kHz at different exposures in different environments. The influence of a bio-stimulator used in seed treatment by ultrasound has been investigated. Publications from groups: B-8; B-9.

- *Technological developments related to heating with biomass and RES.*

A multi-criteria analysis of hierarchical systems (Saaty's method) of fuels from different types of biomass was carried out in order to build an installation for thermal decomposition of biomass. The straw briquetting process has been researched and optimized. An innovative method for applying brown gas in cleaning Internal Combustion Engine from carbon deposits is proposed. A heating module was built

and studied, and the influence of main factors in determining the energy efficiency when using an HHO generator /for Brownian gas/ as a renewable energy for heating buildings has been established. Publications from groups: Г-7.4; Г-8.1; Г-8.2; Г-8.5; Г-8.6.

- *Technological developments for mechanizing the technologies in agriculture and the mathematical processing of results.*

Mechanized technologies have been designed and technical-economic evaluations have been made for growing grape varieties, for growing tomatoes, fruits and others. Publications from groups: B-1; B-2.

Part of the research studies and publications were financed by three research projects, respectively - 03-13; - 09-17; - 02-20, with the participation of Chief Asst. Prof. Ivan Mitkov.

The above mentioned is evident for the significant amount of research production, which characterizes the candidate as a searching and modern scientist, capable of responding to the challenges of dynamics and competition in modern reality.

4. Evaluation of the candidate's pedagogical preparation and work. His role in the training of young scientists.

The pedagogical work of Chief Asst. Prof. Ivan Mitkov is characterized with the following:

- From the submitted reference, it can be seen that in the last 5 years Chief Asst. Professor Mitkov has conducted and continues to conduct classes and extracurricular activities - lectures and seminar classes to undergraduate students in basic disciplines at AU-Plovdiv. It can be seen that the applicant's academic employment exceeds twice the required norm for the relevant position in AU-Plovdiv. This shows the good preparation, self-organization and teaching abilities of Chief Asst. Prof. Mitkov.

- He has supervised 18 graduates who successfully defended their diploma theses.

- A book has been published based on a defended dissertation work.

From the above mentioned it can be concluded that Chief Assistant Professor Ivan Mitkov is an established teacher at the Agricultural University - Plovdiv, he meets the requirements and specifics of the present competition for the scientific specialty "Mechanization and Electrification of Crop Production". Chief Assistant Professor Mitkov is aware of the modern tendencies in the educational process and applies them in the training of students in technical disciplines in the Department of Agricultural Mechanization.

5. Significance of the obtained scientific results, proved with citations, publications in prestigious journals, awards, membership in international and national scientific bodies, etc.

The scientific publications from group Д12 (5 pieces) have been cited 7 times in research works of other authors published in journals in Scopus and Web of Science with Q3 and SJR - 0.21, and with Q1 and SJR -1.32, as follows: N: N: 1,3,5 once and N: N: 2,4 twice, in Scopus-3 and in Web of Science - 4 with total IF-1,411.

It can be concluded that the main part of the candidate's research developments are popular among the scientific community at home and abroad.

6. Significance of the contributions for science and practice.

Based on the applied reference, the candidate's contributions can be grouped, evaluated and classified as follows:

Methodological contributions:

1. Research has been conducted on the methodology for determining the working dimensions of an agricultural robot, the main energy aspects have been substantiated, and guidelines have been given for the energy reserve of the robot to ensure the agrotechnical indicators. In connection with modern trends in agriculture, a microclimate monitoring methodology has been developed. Publications from groups: B-3; B-4; B-6; Г-1, Г-7.1; Г-7.3.

Scientific contributions:

1. Two new working bodies have been created and tested in production conditions, combining the kinematics of a tiller with a horizontal axis of rotation and horizontal displacement of the soil by a disk working body. Adequate regression models were derived, describing soil fragmentation into fractions creating optimal conditions for growing crops. Publications from groups: B-10; Г-8.3; Г-8.7; Г-8.9.

2. On the basis of the conducted field experiments, adequate regression models have been created for managing the grain size composition during surface tillage. Through optimization, the influence of the main parameters (the working speed, the deflection angle of the reflective cover and the frequency of rotation of the PTO of the tractor) on the degree of soil fragmentation has been established, which can be used in practice when pre-setting the working bodies in depending on the specific circumstances (soil type, humidity, predecessors, etc.).

Scientific and applied contributions:

1. The design of a soil tillage cutter with a horizontal axis of rotation has been studied and substantiated in terms of the quality of crushing the soil into fractions and mixing them with the ameliorant, according to the agro-technical requirements for the cultivation of a given crop. Publications from groups: B-10; Г-8.3; Г-8.7; Г-8.9.

2. On the basis of a multi-criteria analysis of hierarchical systems, an analysis of fuels from different types of biomass has been carried out in order to justify the construction of an installation for its thermal degradation. The straw briquetting process has been researched and optimized.

3. An innovative method for applying brown gas in cleaning the internal combustion engine from carbon deposits is proposed. A heating module was built and studied, and the influence of main factors in determining the energy efficiency when using an HHO generator /for Brownian gas/ as a renewable energy for heating buildings was established. Publications from groups: Г-7.4; Г-8.1; Г-8.2; Г-8.5; Г-8.6.

Applied contributions:

1. A constructive layout of a working body of a planter for grass mixtures has been proposed, in order to improve the technical parameters of the seed box. The parameters and the quality of operation of a machine for breaking walnut fruits have been investigated, and the modes of operation with different fractions of the fruits have been established. Publications from groups: B-5; B-7; Г-7.2; Г-8.4, 8, 9, 10, 11, 12.

2. Research has been presented based on attempts to increase the germination of vegetable seeds by using ultrasound with a frequency of 43-45 kHz at different exposures in different environments. The influence of a bio-stimulator used in seed treatment by ultrasound was investigated. Publications from groups: B-8; B-9.

3. Technical and economic evaluations were made for mechanized technologies for growing grape varieties, for growing tomatoes, fruits and others. Publications from groups: B-1; B-2. Mechanized technologies have been designed and technical-economic evaluations have been made for growing grape varieties, for growing tomatoes, fruits and others. Publications from groups: B-1; B-2.

Based on the analysis, I recognize the personal participation of the candidate in the presented contributions obtained from the scientific and research work. I classify them as scientific, scientific - applied and applied, which can be useful for science and practice. I believe that the quantitative indicators of the criteria for occupying the academic position of "ASSOCIATE PROFESSOR" have been met with a minimum of 400 points. The candidate has obtained 502.82 points in total (which do not include 30.65 points from publications related to his dissertation work). In favor of the candidate is the fact that, with requirements for citations of at least 10 points, he has obtained 70 points. (The publications have been submitted in 5 editions – 3 in Scopus and 4 in Web of Science with total IF-1,411, 7 from group D12).

7. Critical notes and recommendations.

I recommend Chief Asst. I. Prof. Mitkov the following:

- In his future research work to conduct studies in an area that would present him as a leading scientist in the field of agriculture and technologies.
- To develop or participate in the development of new topical textbooks and handbooks, as well as to update the taught syllabuses.

8. Reviewer's personal impressions and opinion.

I personally know Chief Asst. Prof. Ivan Angelov Mitkov, PhD, and his development in the scientific and teaching field since his admission as a doctoral student in the Department of Agricultural Mechanization at AU-Plovdiv. As the supervisor of the doctoral dissertation of Chief Assistant Professor Ivan Angelov Mitkov, I found his persistence and desire for research work. After becoming a lecturer, he was distinguished by precision and persistence in conducting classes. Since 2018 I have consciously let him develop on his own without influencing his scientific interests. I can say with satisfaction that he showed creativity, constructiveness and perfectionism in his work. I believe that the experience of his work in private companies as a manager leaves its mark in relations with colleagues and students. As the Dean of the Faculty of Viticulture and Horticulture I could observe the respect and trust of students shown to Chief Assistant Professor Ivan Mitkov. As a result of my personal impressions, the opinion of the students and colleagues from AU- Plovdiv, I believe that Chief Asst. Prof. Ivan Angelov Mitkov, PhD, is a well-established scientist and lecturer. I positively evaluate his scientific and teaching activities. I believe that he will justify the trust of the scientific jury and the Faculty Council of the Faculty of Viticulture and Horticulture with his election for the academic position of "Associate Professor" at AU-Plovdiv.

CONCLUSION

Taking into account the submitted documents and materials, and after analyzing the candidate's pedagogical, research and applied work, I consider that Chief Asst, Prof. Eng. Ivan Angelov Mitkov, PhD, meets the requirements of the Act on Development of the Academic Staff in R Bulgaria, the Regulations for its implementation, as well as the Regulations of AU-Plovdiv for its application.

I undoubtedly support the candidate in the present competition. Taking into account the obtained results in his pedagogical and research work, I consider that Chief Asst. Prof. I. Mitkov would be of benefit to the academic community of AU-Plovdiv and would contribute to the development of agricultural mechanization sector.

All the above mentioned gives me grounds to evaluate **POSITIVELY** the overall work and activities of **Chief Asst. Prof. Eng. Ivan Angelov Mitkov, PhD**.

I allow myself to propose the Honorable Scientific Jury to vote **POSITIVELY**, and the Faculty Council of the Faculty of Viticulture and Horticulture to elect **Chief Asst. Prof. Eng. Ivan Angelov Mitkov, PhD**, for the position of **Associate Professor** in professional area 5.13 General Engineering, scientific specialty: *Mechanization and Electrification of Crop Production*.

16th April 2024

the city of Plovdiv

Reviewer:

/Assoc. Prof. Eng. Ivan Braykov, PhD/