



POSITION

on the materials, submitted for participation in a competition for holding the academic position of **Associate professor** in higher education area 6. *Agrarian sciences and Veterinary medicine*; professional field 6.5. Forestry; scientific specialty *Forest reclamation, forest protection and special uses in forests* for the needs of section Forestry and Forest Resources Management with the Forest Institute - BAS.

In the competition for Associate professor, advertised in State Gazette, iss. 56/23.06.2020 and on the website of the Forest Institute (FI) for the needs of section Forestry and forest resources management, participated the candidate principal assistant Svetozar Ivanov Madzhov, PhD Eng from FI - BAS.

Position author: Prof. Plamen Ganchev Kangelov, PhD Eng, professional field 5.1. Mechanical Engineering, from the University of Ruse "Angel Kanchev"

1. Brief biographical data.

Principal assistant Svetozar Ivanov Madzhov, PhD Eng was born on 04.10.1976. He finished the French High School in Sofia and in 2000 he graduated from the Forestry University with the qualification engineer - forester.

In 2006 he defended his PhD thesis on the topic *Research and optimization of the parameters of a distribution and management system for in-stock spare parts for TK – 80 tractor engines*.

Since 2016 he has been a principal assistant in the section *Forestry and Forest Resources Management* with the Forest Institute – BAS,

He works on design and construction of forest roads, studies the state of these roads and collaborates in developing a strategy for the improvement of the forest – road network, develops and implements norms for design of the road network.

2. Conformity of the candidate's documents and materials with the minimal requirements according to the Regulations for acquiring academic titles and obtaining academic positions of FI - BAS.

The documents submitted for participation in the competition for the academic position of Associate professor meet the requirements of the LDASRB, the Regulations for implementing it and the Regulations for terms and procedures for acquiring scientific degrees and holding academic positions in the Forest Institute with BAS.

The works of the candidate are in the scientific specialty *Forest reclamation, forest protection and special uses in forests* and concerns the following research and practical fields: Forest roads; Technology and mechanization of forestry; Reliability of Machinery and Inventory management.

The research developments submitted for reviewing meet the requirements and standards for academic publications in FI – BAS.

3. General description of the materials presented.

The candidate principal assistant Svetozar Madzhov, PhD participates in the competition for the academic position of Associate professor with 1 monograph and 47 publications, published

in prestigious journals in Bulgaria and abroad. He has presented scientific works No. 1 – 7, connected to the dissertation defended for the educational scientific degree Doctor and scientific works No. 8 – 11 – for the academic position Principal assistant at the FI with BAS.

The publications can be classified as follows:

- in foreign referenced journals – 8 (SCOPUS or Web of Science);
- in Bulgarian referenced journals – 3. (Other databases);
- in collections from scientific forums – 36 / in national ones – 1 and in international – 35/..

The candidate has published his scientific works in: Cyrillic/Bulgarian and Russian/–37, and in English – 9.

By number of co-authors the distribution is as follows:16 are stand-alone, 18 – with one co-author, 6 – with two co-authors and 4 – with three and more.

By position in the collective works the candidate is first in 8, second – in 13, third – in 4 and other – in 2.

Svetozar Madzhov, PhD has not presented division protocols for the shared participation in the collective works, so I assume his participation is equal to that of the remaining authors.

4. Main areas of the candidate's research and his most significant scientific and applied-scientific contributions.

The main scientific and applied-scientific contributions in the published works are thematically grouped in four main areas, namely: reliability of machines, forest roads; stock management and utilization of forest resources.

The contributions in the scientific production are built on the reliability of the conducted research, which has scientific, applied and methodological nature.

Scientific contributions:

- The laws for distribution of the resource of engine element for Komatsu SAA4D104E-1 have been established. The law of distribution of spare parts orders for excavator loaders Komatsu WB93R-5 has been established and the intensity of order flow for spare parts have been proven for the first time; the 80% gamma resource of the engine elements with a known and with an unknown law for distribution and concise (censored) samples has been determined (C 4.6, C 4.7, C 4.8).

- It has been proven that the reduced costs in the service sector can be achieved through optimization of the structure and parameters of the system for maintenance and repair of equipment with different mathematical methods and models. The numeric characteristics of the indicators for reliability of the machine's elements have been studied and established for efficient use of the machines (C 4.6, B 4.7, C 4.8).

- Two models for optimal management of the spare parts stock for even and uneven consumption (C 4.1) have been developed and a new model for considering and reporting the influence of the irregularity of forestry activities on the need for spare parts has been proposed. With the second model, a nomenclature model with assigned restriction for the value of stocks has been studied (C 4.2).

- New mathematical models for optimizing the stock of spare parts for regular and irregular use, needed for maintaining the operability of the machines have been proposed and approbated. The influence of the basic parameters of the models on the change of total costs and the volumes of supplies has been studied (C 4.1, C 4.2)

- A model for maintenance of forest roads has been proposed, based on the study of elements of technical condition and the change in this condition, and the reliability indexes and characteristics have been determined (D 5.1).

- A new mathematical model for investigating the tendency of the volume of load, using regression analysis, has been proposed. A stochastic model for optimizing the number of loaders

in the warehouse of the logistic scheme has been proposed, proving that the optimal number of loaders is between 3 and 4 (D 8.34, D 8.35).

Scientific and applied contributions

- The performance of a cutting machine Biber-70, in processing wood waste from the wood processing and furniture making industries into energy chips, as well as the main factors that determine it have been studied and justified. The change in the quality of chips, depending on the blade wear has been studied and determined. An optimal scheme for honing of the blades and new models of honing blades, considerably cheaper than the original have been proposed (C 4.9, C 4.10). Practical methods for operating the machine have been proposed as well (C 4.9, C 4.10).

- Systematization of the main operational coefficients of forest roads, necessary for determining the frequency and volume of repair and maintenance work on the road surface has been proposed, as well as methods for determining the periods between the individual repairs and the service life of the road surface (D 5.1, D 8.21, D 8.22, D 8.30).

- A new complex approach and methods for repair of different road elements and types of road surfaces of forest roads have been developed and proposed. The essence of the various types and scope of repair works has been justified and for the three types of repair current, interim and overhaul (D 5.1, D 8.20, D 8.30).

- The types of road work during the different seasons, depending on the atmospheric conditions, temperatures and precipitation, have been justified and systematized, and it has been proven that there are significant differences in the different seasons, which calls for different types and numbers of forest road recovery activities. It has been determined that the winter conditions are the harshest, which calls for a set of activities, called winter road repair and maintenance (D 5.1, D 8.13, D 8.14, D 8.23).

- The issues of providing transport and forwarding, as well as the volume of transit have been analysed and route have been optimized (D 5.1, D 8.29, D 8.31, D 8.32, D 8.34, D 8.35, D 8.36).

- It has been proven that a considerable reduction of costs in the machine maintenance sector can be achieved by optimizing the structure and parameters of the system for technical maintenance and repair by different methods, which guarantee their efficient implementation (D 8.18, D 8.19).

5. Most significant applied contributions, achievements and implementation activities.

Applied contributions

- The performance of various types of modern timber trucks - FENDT 412 Vario and LKT-82T, on the territory of some forestry units (D 8.2) has been studied and the performance outcome as a result of using the new specialised timber trucks has been analysed to clarify the nature of the problems, arising from their operation and maintenance.

- The performance of chained and wheeled specialised forestry tractors TDT-55 „Onezhets“ and TAF-658 in logging and timber export has been compared, and it was proved that the machines are profitable in the forest, irrespective of the lower daily performance of the chain tractors, when they operate at sites with a higher concentration of logging (D 8.3).

- Economic analysis of the performance of a specialised forest tractor TAB-658 has been conducted and it has been proven that its use is cost-effective on the condition that a year-round exploitation is ensured (D 8.9).

- Productivity and profitability have been studied in manual logging with chainsaws and machine logging with harvester Valmet 911 and forwarder Valmet 835 when applying emergency measures for logging in areas affected by drying of trees on the territory of Zemen State Forestry

Unit (D 8.5, D 8.6), and it has been proved that the machine logging is more cost-effective for emergency measures such as logging and peeling of wood, affected by diseases and insect pests.

- In the comparative study of the criteria for technical, technological and operational quality parameters of two models from the most common brands of chainsaws in logging in Bulgaria - Husqvarna 365 and Stihl MS 361, it has been determined that Husqvarna 365 demonstrates better indicators, demonstrating a significantly superior quality compared to the second petrol driven chainsaw(D 8.15).

- A new classification of the road repairs has been proposed. The parameters of damage of the road surface, the reasons that have caused this damage and its main characteristics have been studied. The need and the nature of the road maintenance and repair have been proven and three types of repair have been proposed - ongoing, interim and overhaul (D 5.1, D 8.8, D 8.10).

- A set of activities, implemented for winter road maintenance has been proposed in connection with their snow protection and dealing with road surface icing, as well as protection from avalanches in mountainous areas (C 4.4).

- A classification of road maintenance and repair works has been developed and the parameters of road surface damage have been studied, as well as the reasons that have caused it and the main characteristics. The need and the nature of the road maintenance have been proven and the types of forest road repair identified (C 4.3)

Methodological contributions

- The methodology for determining transport costs, including the costs of building and maintaining forest roads, logging and export of timber with different modes of transport has been further developed and an optimal version with the lowest costs has been chosen (D 8.12)

- The methodology for determining the optimal road scheme by the density and location of the forest road network has been improved. The technical and economic aspects of road coverage of forested territory have been reviewed and mathematical models for optimizing the density of the forest road network have been developed and tested (G 8.1, G 8.7, G 8.8, G 8.25, G 8.26, G 8.27).

- New methods for determining the location of the central and other storage houses, as well as methods for selecting a transport company to supply raw materials and others have been proposed (D 8.31, D 8.32).

6. Reflection of the candidate's scientific publications in references.

The total number of citations of Svetozar Madzhov's works is 68. Of them the citations in referenced journals (SCOPUS, Web of Science) – 1; and citations in non-referenced journals and proceedings from conferences and monographs– 67.

The publications in referenced and indexed international journals are from the last three years, which can explain the smaller number of citations in SCOPUS, Web of Science. Normally, the citations appear after 3 to 5 years.

7. Participation in research projects.

The candidate, Principal assistant Svetozar Madzhov, PhD has participated in 6 national research or education projects and in 6 international research or education projects, in two of which he has been a scientific supervisor, and in the other 10 – a participant with significant contributions.

8. Assessment of the applicant's personal contribution.

On the basis of the presented materials it can be concluded that they are the personal work of the candidate. The research publications presented clearly show that Principal assistant Svetozar Madzhov, PhD is an established scientist who works successfully both in a team and individually.

9. Critical notes and recommendations.

I have the following remarks and recommendations to the work presented by the candidate:

The conclusions of some research publications have a rather ascertaining character, without pointing out the novelties of the research conducted and interpreting the reasons for the dependencies obtained.

I recommend that the candidate for the Associate professor position - Principal assistant Svetozar Madzhov, PhD – should send his future publications to journals in English, indexed in Scopus and Web of Knowledge.

10. Personal impressions.

I do not know Principal assistant Svetozar Ivanov Madzhov, PhD personally. The publications and monograph presented for participation in the competition have contributions to both theory and practice.

11. Conclusion.

In view of all the above-mentioned, I propose Principal assistant Svetozar Madzhov, PhD to be elected Associate professor in professional field 6.5 Forestry; scientific specialty Forest reclamation, forest protection and special uses in forests for the needs of section Forestry and forest resources management with the Forest Institute - BAS.

23.10.2020

Member of Scientific panel:

Prof. Plamen Kangalov, PhD