

REVIEW

of the official reviewer **Kateryna Serhiyivna Kyrylchuk**, PhD of Biological Sciences,
Associate Professor, Associate Professor of the Ecology and Botany Department of Sumy
National Agrarian University

for the PhD thesis **Yan Tengfei** «The features of agroforest ecosystems and their impact on the
environmental indicators of Chushandian reservoir's buffer strips»,
submitted for Doctor of Philosophy scientific degree
Field of knowledge: 20 – Agricultural Sciences and Food
Specialty 201 – Agronomy

Relevance of the dissertation topic. The course for the sustainable development includes, among other things, the search for ways for ecologization of agriculture, one of which is soil conservation. Recently, more and more attention has been paid to agroforest ecosystems as one of the options for organizing the production process with ecological and economic advantages. Adopted agroforest ecosystems in coastal buffer strips of reservoirs are considered promising. However, their active implementation requires a scientifically based understanding of their environmental efficiency and economic productivity. It should be noted that this issue has not been sufficiently studied to date. Therefore, the dissertation topic on the study of the features of agroforest ecosystems (primarily soil characteristics) and their impact on environmental quality indicators using the example of buffer strips of the Chushandian Reservoir (PRC) is definitely relevant from both a scientific and practical point of view.

Connection of the research with scientific topics. The dissertation research was conducted within the framework of the project of Scientific Research Plan of Training Techniques for Key Teachers of Xinyang Agriculture and Forestry University "Vegetation succession and soil physicochemical properties in the riparian zone of Chushandian Reservoir" (215003). Part of the research was carried out within the framework of the project of Xinyang Ecological Research Institute Open Fund "Soil carbon sequestration potential and microbial drive mechanism of the typical reservoir's buffer strips in Huai River Catchment".

Scientific novelty and theoretical significance of the dissertation. The author of the dissertation work conducted for the first time a comprehensive survey in order to generalize the state of development and the application potential of the existing agroforest ecosystems in the buffer zones of the Chushandian reservoir; the ecological effectiveness of such factors as soil properties, soil aggregate stability, changes in carbon stocks, vegetation biodiversity, and microbial community structure for adopted agroforest ecosystems in the reservoir buffer strips was investigated; the main factors affecting the ecological efficiency of adopted agroforest ecosystems in the specified research region were analyzed; the economic potential of these adopted agroforest ecosystems has been established for the first time; improved understanding of ecological efficiency for adopted agroforest ecosystems (at a fine scale relative to distance); the expediency of creating adopted agroforest ecosystems in the protective strips of the reservoir is substantiated; measures to increase economic productivity and preventive measures for organic farming in adopted agroforest ecosystems in the buffer zones of the reservoir are recommended.

Practical significance of the dissertation results. The author of the dissertation provides strong evidence of the feasibility of adopted agroforest ecosystems in the buffer strips of the Chushandian reservoir. The author proved that adopted agroforest ecosystems in the buffer zone of the reservoir have an advantage in increasing plant biodiversity and maintaining species populations. The author has found that adopted agroforest ecosystems in the buffer strips of a reservoir can maintain soil vitality and improve the quality of coastal habitat. Thus, adopted agroforest ecosystems in the buffer strips of the reservoir showed a higher content of nitrate nitrogen, carbon and nitrogen of microbial biomass, as well as dissolved organic carbon than soils of other land use types. The study results also indicated that adopted agroforest ecosystems

in the reservoir buffer strips have a low ability to adsorb and retain phosphorus, and the analysis of soil bulk density and water capacity demonstrates an increase in soil water in filtration capacity. The author has found that adopted agroforest ecosystems in the reservoir buffer strips can support higher soil microbial activity by increasing microbial diversity, maintaining a stable microbial community structure, and enhancing the metabolic activity of microbes. The paper presents the results of a study confirming the improvement of the soil carbon stock potential and the ability of the soils of the reservoir buffer strips to maintain a stable structure. It is shown that adopted agroforest ecosystems of the reservoir buffer strips can maintain a stable economic income in the context of the significant potential for increasing yields and economic productivity due to the benefits of their use. The author of the paper has provided recommendations to the region's leadership. The author recommends that farmers pay attention to strengthening the management of the drive areas to improve soil quality and maintain land productivity, and notes the importance of transitioning to organic farming.

The main results obtained personally by the author. The author of the dissertation substantiates the feasibility of using agroforest ecosystems in the buffer strips of the Chushandian reservoir from the standpoint of environmental and economic benefits. Based on the analysis of vegetation, a detailed study of various soil characteristics – its structure, stability of soil aggregates, microbial communities, content of nutrients and other indicators, the author of the work concludes that adopted agroforest ecosystems in the buffer strips of the reservoir have a significant potential to maintain natural biodiversity and improve the living conditions of biota (ecological efficiency) on the one hand, and on the other hand, to increase the productivity of agricultural plants, primarily by improving the quality of water and soil. Taking into account the ecological efficiency of adopted agroforest ecosystems, the author indicates management measures and preventive measures for adopted agroforest ecosystems in the coastal zone of the Chushandian reservoir.

It is worth noting that a plagiarism analysis for the presence of text borrowings (Strike plagiarism program) was carried out. The reviewers concluded that Yan Tengfei's dissertation work "The features of agroforest ecosystems and their impact on the environmental indicators of Chushandian reservoir's buffer strips" is the result of independent research of the PhD candidate and does not contain elements of plagiarism and borrowing following the resolution of the CMU dated 12.01.2022 No. 44 p. 9. Ideas, results, and texts of other authors used in the research paper have references to the corresponding sources.

Number of scientific publications. The main items of the thesis are presented in 16 scientific works: 3 articles in professional publications of Ukraine; 2 in the international scientometric citation databases Scopus and WoS; 11 abstracts of reports at international scientific and practical conferences and symposia.

Remarks and wishes regarding the content. There are no fundamental flaws or comments in the content and design of the dissertation. However, despite the positive assessment Yan Tengfei's dissertation work, there are some remarks and comments:

1. In the Table 2.1 it would be more correct to indicate "Dominate species" instead of "Dominate vegetation", because the table contains information on the species growing the research plots.

2. The calculation formulas used to work with the data to obtain the results should be placed in Chapter 2 Methodology.

3. In the subchapter 3.2 Results, which presents the results of the flora study of the experimental sites, it would be desirable to present them in the form of tables for better perception of information.

4. There are also some typographical errors in the work (in particular, on p. 63, as well as in Appendix B, the name of the family is indicated *Mbelliferae* instead of *Umbelliferae*; in the

Ukrainian version of the abstract – on p. 4 «цільність» instead «щільність», it is also desirable to use the expression «мікробне угруповання» instead of «мікробне співтовариство»).

5. In the subchapter 2.2. Field investigation, when describing the flora of the studied plots, it would be more correct instead of: "The main vegetation was *Veronica didyma* Tenore, *Conyza canadensis* (L.) Cronq., and *Alternanthera philoxeroides* (Mart.) Griseb. "to write "The dominant flora species of this vegetation type were ...". Similarly, it would be necessary to describe plots 2 and 3 with different types of land-use.

6. In the process of studying of the flora of the experimental areas, it would be desirable to conduct not only a systematic analysis of it, but also a geographical and ecological one, which would provide more information on the assessment of plant diversity of Chushandian reservoir buffer strips at different stages of succession changes and to some extent predict its further dynamics.

7. In the Chapter 2 Methodology, it would be desirable to indicate which methods were used to collect floristic material for the assessment of plant diversity. Probably, these were geobotanical research methods.

8. When assessing the yields and economic benefits of agroforest ecosystems and monoculture (Table 7.1), the author of the dissertation took into account only the yields of tea and chestnut. However, for tea, for example, important indicators are the content of sugars, tea polyphenols, etc., which would also be important to compare for agroforest ecosystems and monoculture.

9. The work includes a significant number of diagrams and tables, but it would be desirable if they had more descriptive information (for example, Figure 3.1, Table 4.1).

Correspondence of the dissertation to the specialty and profile of the academic council. Dissertation by Yan Tengfei on the topic: «The features of agroforest ecosystems and their impact on the environmental indicators of Chushandian reservoir's buffer strips», which was submitted for defence to the specialized academic council for obtaining the degree of Doctor of Philosophy in the field of knowledge 20 – Agricultural sciences and food in the specialty 201 – Agronomy in terms of its relevance, scientific and theoretical level, main results of validity, main provisions and results published in professional publications, and novelty of the setting and practical significance meets the requirements of the order of the Ministry of Education and Science of Ukraine No. 40 dated January 12, 2017 “On approval of requirements for registration dissertation” and the Degree of the Cabinet of Ministers of Ukraine dated January 12, 2022 No.44 “On approval of the Procedure for awarding the degree of ‘Doctor of Philosophy and cancellation of the decision of the one-time specialized academic council of the higher educational institution, scientific institution on awarding the degree of “Doctor of Philosophy” with amendments made according to the Resolution of the Cabinet of Ministers No. 341 dated March 03, 2022. The content of the dissertation corresponds to the passport of the specialty. The PhD candidate. **Yan Tengfei** deserves to be awarded the scientific degree of Doctor of Philosophy in specialty 201 – Agronomy.

Official Reviewer:

PhD of Biological Sciences, Associate Professor,
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Botany Department
of Sumy National Agrarian University

Kateryna KYRYLCHUK

