

REVIEW

of the Official Reviewer Elina Anatoliivna Zakharchenko, Candidate of Agricultural Sciences, Associate Professor of the Department of Agricultural Technology and Soil Science, for PhD Thesis Yan Tengfei «The features of agroforest ecosystems and their impact on the environmental indicators of Chushandian reservoir's buffer strips», submitted for a scientific degree of a Doctor of philosophy

Field of knowledge: 20 – Agricultural sciences and food

Specialty 201 – Agronomy

Relevance of the dissertation topic. It has been demonstrated in the thesis that adopted agroforest ecosystems in buffer strips optimize the riparian zone's ecological and economic benefits. This is a crucial step toward the establishment of future sustainable agriculture and mitigating climate change. Due to its intricate ecological element architecture and strict criteria for production staff, it is still very controversial. It's also important that Yan Tengfei noted that no study had thoroughly monitored and analyzed the economic productivity of adopted agroforest ecosystems in the buffer strips surrounding the Chushandian reservoir, as well as the environmental performance (including plant species and populations, soil ecology, soil geochemical process, microbial community, etc.). This makes the research findings of that PhD research especially pertinent. The purpose of this study is to explore the fine-scale distribution characteristics and shifting patterns of environmental indicators for adopted agroforest ecosystems in the reservoir's buffer strips, as well as to elucidate the ecological benefits and economic potential of these ecosystems, offer important direction for improving knowledge of the ecological performance and management strategies of agroforest ecosystems that have been used in the buffer strips around the reservoir.

Connection with scientific programs, topics, plans. 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 thesis. This study used the buffer strips of the Chushandian reservoir as the research object, focusing on soil physicochemical properties, vegetation structure, soil aggregates, microbial community, yield, and economic productivity for adopted agroforest ecosystems in the reservoir's buffer strips at fine distance scales. After the reservoir was impoundment, the buffer strips of different land-use types around the shoreline were subject to different degrees of disturbance from flooding and the soil chemical processes were intense. The unique land-use pattern around the reservoir provides ideal research conditions for further study of the characteristics and environmental performance of adopted agroforest ecosystems in the reservoir's buffer strips.

The scientific novelty of the obtained results is the first-ever findings. High economic production can still be maintained by adopted agroforest ecosystems in the buffer strips around the reservoir. There is yet a great deal of room to grow yield and economic revenues in the case of bolstering scientific management and input. It was established that the buffer strips around the reservoir's adopted agroforest ecosystems can increase their capacity to sequester carbon, stop carbon loss, and improve their resilience to environmental shocks. Also the author demonstrated that the agroforest ecosystems that have been adopted in the buffer strips of reservoirs have a relatively stable microbial community composition and structure, which supports microbial metabolism. There was an improvement in: the buffer strips around the reservoir's adopted agroforest ecosystems have a low capacity to absorb and retain phosphorus, meaning farmers should exercise caution when using pesticides and fertilizers; adopted ecosystems of agroforests.

Practical significance of the thesis results. Yan Tengfei in his thesis gave some actual recommendations for farmers. He underlined that despite the fact that dynamic water level changes will lower the productivity and yield of adopted agroforest ecosystems in the buffer strips surrounding the reservoir, these ecosystems can nevertheless support comparatively greater economic revenues. It has a big potential to surpass the monoculture of economic incomes, particularly if you are ready to invest more time and energy in scientific management, like organic farming. Also adopting agroforest ecosystems in the buffer strips around the reservoir may greatly boost farmer's income if they actively investigate species allocation strategies with high economic value. Additionally, farmers need to consider should focus on implementing regional management, particularly bolstering the management of areas close to the water, as this can enhance the area's resistance to environmental disturbance.

In the buffer strips around the reservoir, adopted agroforest ecosystems can minimize the buffer width setting while preserving high vegetation richness. The author warns farmers should be paid attention to strengthening the management of near-water areas to improve soil quality and maintain land productivity. In addition, the use of phosphorus-containing compounds (fertilizers, pesticides et.,) should be strictly prohibited because and improving the application of biological control measures, as far as possible the use of organic farming.

The main results obtained personally by the author. The author of the dissertation proved that adopted agroforest ecosystems in the reservoir's buffer strips have stronger metabolic activity to maintain the functional stability of microbial community. It was set that the primary driving force influencing the composition of the microbial community in the buffer strips of the reservoir is content of total carbon. The yields and economic incomes of chestnut and tea from the farmers who adopted agroforest ecosystems in the reservoir's buffer strips by way of field inquiry were investigated. Through investigation, plant species in Chushandian reservoir's buffer strips were abundant and 58 species, 54 genera, and 29 families of vascular plants were identified.

Adopted agroforest ecosystems in the buffer strips around the reservoir exhibit clear benefits in terms of environmental performance and have strong operability. In the meanwhile, if restoration is based on grassland and abandoned farmland, the buffer strip width settings in the reservoir should be suitably raised (>20 m). In the buffer strips surrounding the reservoir, soil microbial activity serves as a valuable indication for tracking the nutritional status of various land-use types. Nevertheless, long-term monitoring of the coupling and decoupling mechanisms between soil physicochemical parameters and vegetation is required, given these results were based on brief preliminary investigations.

It is worth noting that a plagiarism analysis for the presence of text borrowings (Strike plagiarism program) was carried out. The reviewer 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 Cabinet of Ministers of Ukraine dated January 12, 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 results of the thesis are presented in 16 papers: 3 papers in the scientific professional journal of Ukraine, category B; 2 papers in the international scientometric citation databases Scopus and WoS (1 – Q1, 2 – Q3); 11 abstracts of reports at international scientific and practical conferences and symposia. The materials of the papers and abstracts of conferences reflect the main provisions and conclusions of the PhD thesis.

Discussion clauses, comments and wishes regarding the content. There are a few points worth discussing regarding the content of the dissertation:

1. From what depth the soil samples were taken - this is not indicated in section 2.
2. Formulas and features of statistical data analysis should have been placed in section 2, not in 3.1, 4.1, 5.1, 6.1.
3. In figure 6.9 it is hard to read a legend on the right.
4. Did we understand correctly that the samples were taken only in 2020? Each year is characterized by fluctuations in temperature and amount of precipitation, which affects the water level and, accordingly, the state of the microbiota and, in general, oxidation-reduction processes. Conclusions would be more appropriate, taking into account the instability of the water table.
5. The paper does not indicate in which year the yield of tea and chestnut was analyzed. This indicator also depends on the weather conditions of the year.

These remarks do not diminish the scientific value of the dissertation and some of them only reflect the reviewer's scientific position, which can also serve as a reason for discussion.

General conclusion. The dissertation work of Yan Tengfei intitled «The features of agroforest ecosystems and their impact on the environmental indicators of Chushandian reservoir's

buffer strips», which was submitted for defense 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 Decree 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 03.21.2022. 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:

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