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Assessment of Economic Management of Land Resources to Enhance Food Security

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ABSTRACT: To achieve the goals of balanced development of the agricultural sector to ensure food security, there is a need to improve management processes in the sphere of agricultural land use. The aim of the article is to provide a rationale for the ecological-economic management of land resources based on agricultural zoning to improve the efficiency of agricultural enterprises. Research gaps include the need for detailed studies on localized ecological impacts and long-term outcomes of AZ-based land redistribution on soil health and agricultural productivity. Based on the analysis of documents (sources) and an expert survey, this study proposes a framework for ecological-economic management of agricultural land resources in Kazakhstan through agricultural zoning (AZ), aiming to optimize the allocation of grasslands, pastures, arable land, and water resources. Based on document analysis and expert surveys, an optimal land ratio of approximately 30% meadows/pastures, 20% arable land, and 20% water is recommended, aligned with practices in Western Europe and North America. The study suggests measures for sustainable land use, including transferring degraded lands to pasture, preferential taxation for ecologically clean production, and financial incentives for restoring and conserving land. These strategies aim to increase agricultural productivity, meet international quality standards, and support sustainable food security through enhanced land use planning and policy. Scientific novelty of the obtained results relates to the improvement of ecological-economic management of land resources at agricultural enterprises in the conditions of zoning, considering the potential of the agricultural zones of Kazakhstan.

Keywords: food security, land resources, ecological-economic management, land zoning, agricultural zoning.

I. INTRODUCTION

Ensuring food security in the context of innovative development of the agrarian sphere is an essential direction of the social and economic development of the state. Raising the efficiency of industrial activity of food producers, in turn, can serve as the main vector of sustainable development in rural areas and the state as a whole [1-4]. The agricultural sector constitutes a sustainable resource base for food industry enterprises and is key to a country's guaranteed food security.

The foundation of the food security of any country and its unique and strategically important national resource is the territories suitable for agriculture [5-7]. Therefore, rational and efficient management of land

resources should be a priority direction of state policy. In addition to achieving economic indicators, state policy should consider scientifically grounded production technologies, protection of the environment from negative impacts [8-10], measures to protect land resources [11-14], and the provision of environmentally safe food products to society [15-18]. This kind of land management will ensure compliance with most aspects of the food security component, which in turn will provide for the national security of the state. It is also worth explaining what we implement into the concept "food security". It is a critical component of national security and socio-economic development, ensuring that all individuals of the state have access to sufficient, safe, and nutritious food to lead active and healthy lives [19].

The article initially outlines the fundamentals of agricultural zoning, emphasizing the importance of rational land resource allocation to enhance agricultural efficiency. This foundation is followed by a detailed exploration of the various types of land zoning and their roles in managing natural and economic conditions, which enables the identification of optimal approaches for land use in specific areas. The study then focuses on an analysis of expert assessments, which helped to identify promising directions for the further development of agricultural territories. These directions relate to improving the efficiency of land resource management, optimizing land fund utilization, and enhancing the ecological condition of land.

II. RELATED WORK

We are convinced that the efficient organization of territories and management of agricultural enterprises' land resources needs to utilize economic methods.

Economic methods of management represent the methods of achieving economic objectives based on the implementation of the requirements of economic laws [20]. This type of management is carried out, on the one hand, by creating economic conditions that initiate a labor collective to achieve the best results of activity and, on the other hand, through economic regulation of the rational use and protection of land without administrative intervention measures [21].

V.M. Ianiuk and I.S. Gagina [22] assert that economic methods of production management are more flexible and respond faster to changes in public needs. N.G. Ovchinnikova [23] calls attention to the ecologically safe use of agricultural land in the implementation of land resources management.

The next important approach to improving the efficiency of land resources management, in our opinion, relates to the issues of land zoning, allocation of the units of natural agricultural zoning (AZ), the establishment of their boundaries and classification features, and the development of schemes of natural AZ. These issues are examined by M.D. Sutiagin [24], O.F. Torsunova [25], S.A. Lipski [26], and E.E. Kantarbayeva et al. [27].

As explained by S.I. Komarov and D.V. Antropov [28], land zoning is carried out in the framework of the ecological-economic management of an agricultural enterprise's land on the territory of an object that possesses a certain feature of zoning within an administrative-territorial unit under the system of land resource management and as part of ensuring the use of lands according to their intended purpose. We should as well clarify what we meant under ecological-economic management. Ecological economic management recognizes that to a great extent the environment provides for economic activities, promoting a sustainable interaction between human and natural systems [29]. Scientific research identifies a variety of land zoning types (Table 1).

Table 1. Types of land zoning.

No.	Type of zoning	Brief characteristic
1	ecological	considers the degree of transformation of the natural environment due to anthropogenic impact and the level of this impact; adverse natural-anthropogenic processes; ecological assessment of the territory; soil erodibility condition; intensity of erosion processes, their dynamics; soil contamination with pesticides, heavy metals, radionuclides, etc.; supply of soils with nutrients, microelements, etc.
2	cadastral	assumes the identification of land plots by assigning cadastral numbers to them
3	functional	stipulates the allocation of a residential zone, production (industrial) zone, and recreation (landscape and recreational) zone on the territory of settlements
4	valuation	used in determining the normative monetary valuation of land in settlements
5	industrial	scientifically grounded division of the territory into separate economic districts in accordance with their natural and economic conditions
6	ecological-economic zoning	affects the concentration of means of production, land, and labor resources to increase output in specialized enterprises and associations, i.e., the concentration of agricultural production

7	social	conducted on the territory of a particular administrative-territorial unit to identify homogeneous territories by social characteristics (age structure, gender, employment in the spheres of national economy, birth and death rates, the number and density of population, the level of public services, the social sphere, etc.)
8	natural agricultural	used to determine a scientifically substantiated accommodation of agricultural production, development of general schemes for the use of land resources, agricultural and farming systems, and land management schemes and projects

[1] Compiled based on [30-32].

In our understanding, AZ is industrial land zoning in the agrarian sector of the economy based on natural-climatic, economic, and environmental indicators [46,47], which includes homogeneous land areas with corresponding production potential and level of environmental-anthropogenic pressure, is characterized by a certain ratio of land, type of agricultural production and zone specialization, and labor productivity [48], and allows the government to determine the potential of production activities by agricultural enterprises. AZ should be defined as a mechanism of ecological-economic land resource management that identifies zones within administrative districts based on their classification by such parameters as the ratio of lands, erosion risk coefficient, loss of soil due to erosion, the presence of territories polluted by industrial waste, and climatic conditions of the territory. These characteristics define the efficiency of using the available land resources and the development of the zonal types of agricultural production and give the opportunity to account for the specialization of agricultural enterprises.

We recommend AZ be used to determine territories with predominant agricultural production and rural construction. Furthermore, AZ should be utilized in the further development of regional land use and protection schemes. We deem it appropriate to entrust the regional state administration with control over the observation of provisions on the implementation of land AZ on the territories of individual agricultural enterprises. The results of our study demonstrate that AZ combines natural agricultural, ecological-economic, ecological, and socioeconomic elements that affect the operation of agricultural enterprises, shows directions for managing their development, and assumes the identification of agricultural zones in the territory of administrative districts.

The borders of agricultural zones are established with consideration of the direction of the economic use of land in the agricultural sector. In accordance with the land use type belonging to the agricultural zone, an agricultural enterprise is given information about the zoned crops and crop rotation varieties most suitable for cultivation in its territory, the implementation of technological measures for the use and protection of land, and the level of impact of these measures on the productivity and efficiency of land use. Due to the classification parameters of elements in ecological zoning included in AZ, the cultivation of certain crops in the territory of the agricultural enterprise is restricted considering its local characteristics and optimal crop ratio in crop rotation [49]. Such economic characteristics in the organization of farms as specialization and the concentration and integration of production will, if used skillfully, contribute to the efficiency of land use by agricultural producers. The socioeconomic classification parameters within AZ will allow for defining the level of labor performance and carrying out the integration of labor by means of raising the qualification of residents through their training at the expense of enterprises due to their need for qualified personnel.

However, so far, there has been no research addressing the issues of ecological-economic land resource management based on land zoning to increase the efficiency of agricultural land use by agricultural enterprises. Therefore, there arises the need to identify a separate industry-specific type of land zoning for the purposes of agricultural land use. This brings us to AZ, which has applications for agricultural enterprises and is designed to establish the presence or absence of limitations in the use of a specific land plot. These limitations need to concern the spatial characteristics of the formation of agricultural enterprise types, the system of tillage, restrictions on the placement and cultivation of certain crops, crop rotation types, etc. In this light, the purpose of the study is to provide a rationale for the ecological-economic management of land resources based on AZ to improve the efficiency of agricultural enterprises.

III. MATERIAL AND METHOD

1. RESEARCH DESIGN

For the purpose of achieving the research goal, the study adopted a mixed quantitative-qualitative approach. The methodological framework included a comparative analysis of scientific literature and a survey method to prove the relevance of our findings.

2. RESEARCH FLOW

In the first stage of the study, from April 15 to May 15, 2023, we analyzed research papers on the problem under study. We selected the papers which are indexed in Scopus, WoS and Google Scholar bases. In Kazakhstan, economic development in agriculture is greatly influenced by natural and environmental conditions. Literature analysis was therefore needed to assess the land fund by natural zones.

By natural conditions, the territory of Kazakhstan (Land Code Art. 1 p. 3) is divided into ten zones: forest-steppe, steppe, dry-steppe, semi-desert, desert, foothill desert-steppe, subtropical desert, subtropical foothill desert, the Central Asian Mountain region, and the South Siberian Mountain region. In research papers we strived to identify which share of each zone is used for agricultural purposes. These data were included into the table.

Next, in the second stage, from May 16 to June 5 of 2023, we surveyed experts in the sphere of land resource management with a focus on agricultural lands. The sampling criteria were the experience which the experts have in the discussed field (minimum 10 years), and the presence of at least three scientific articles published in the peer-reviewed journals, indexed in Scopus, WoS and Google Scholar. The sample initially included 46 people, who were sent e-mails stating the purpose and program of the research. Of the experts to whom the letters were sent, 40 agreed to participate in the study.

A chi-square test on 40 expert responses (observed O=[12,10,8,10], expected E=[10,10,10,10]) yielded $\chi 2=0.8$. This is below the critical value (7.815 at $\alpha=0.05$), confirming that 40 experts are sufficient for reliable conclusions.

In the third stage, from March 6 to April 1, 2023, the experts who consented to participate in the study were interviewed by means of a survey questionnaire. The questionnaires were sent via e-mail and included the following open-ended research question: What are the main directions for the rational use of land resources by agricultural enterprises and for improving their efficiency?

IV. DATA ANALYSIS

For a more objective analysis of the results of the expert survey, the degree of consistency of expert opinions was tested with Kendall's concordance coefficient (W), which was calculated using the SPSS software product.

V. RESULTS

1. AZ OF LAND IN KAZAKHSTAN

Each of the agricultural zones has its own features and is distinguished by the sectoral structure of agriculture (Table 2).

Table 2. Distribution of the land fund by natural zones

No.	Agricultural zones	Total land, mln ha	%	Agricultural land, mln ha	%	Arable land, mln ha	%
1	Forest-steppe	0.8	0.3	0.5	0.2	0.2	0.9
2	Steppe	26.5	9.7	23.5	10.7	10.5	45.5
3	Dry steppe	62.4	22.9	57.7	24.9	7.5	32.5
4	Semi-desert	37.2	13.7	33.9	15.4	0.06	0.3
5	Desert	112.1	41.1	81.4	37.2	0.1	0.4
6	Foothill desert-steppe	12.3	4.5	10.2	4.7	1.7	7.4
7	Subtropical desert	4.4	1.6	3.8	1.7	0.04	0.2
8	Subtropical foothill desert	3.5	1.3	3.1	1.4	0.6	2.3
9	Central Asian Mountain region	10.1	3.7	7.1	3.2	0.4	1.7
10	South Siberian Mountain region	3.2	1.2	1.4	0.6	0.2	0.9
	In total	272.5	100	219.6	100	23.1	100

[1] Compiled based on [50].

The expert survey results show that the rational use of land should be ecologically safe, correspond to its intended purpose, ensure high efficiency of land use and protection, and be focused on protection from anthropogenic impact and the reproduction and increase of land productivity (Table 3).

Table 3. Primary directions for the rational use of land resources by agricultural enterprises and the improvement of their efficiency.

Primary measures groups		Methods of increasing efficiency
Environmental	ecological direction	- reducing anthropogenic overload on land resources; - increasing the production of environmentally friendly products; - reducing the impact of negative natural phenomena (regulation of river flows, bank reinforcement, elimination of landslides)
	technological direction	- protecting land from the negative consequences of production operations; - increasing soil fertility; - improving the structure of cultivated areas based on land zoning indicators; - expanding the use of repeated and stubble crops; - preventing the erosion, drainage, irrigation, and plastering of lands; - using up-to-date information on the qualitative condition of the natural resource base of the agricultural enterprise; - developing land management projects with a contour-ameliorative organization of territories; - selecting appropriate fertilizers for each crop in different crop rotations; - using balanced treatment of fields with pesticides; - reclamation damaged lands
Socioeconomic	social direction	- providing each farm with the necessary number of qualified specialists; - improving working and living conditions; - widespread use of progressive forms of production organization and labor remuneration
	economic direction	- increasing the efficiency of land resources utilization; - increasing the interest of landowners and land users in preserving and reproducing soil fertility; - investment; - deeper specialization and concentration of production based on inter-farm cooperation and agro-industrial integration; - rational use of production funds and labor resources
Organizational-economic	organizational direction	- rational balance of labor and material and technical resources; - establishing binding rules to regulate land use; - establishing standard procedures for administrative intervention in the organization of enterprises
	economic direction	- improving the production management system; - introducing progressive technologies; - developing and implementing recommendations on the organization and improvement of production operations

[1] compiled based on the expert survey; the concordance coefficient W = 0.69 ($p < 0.01$), indicating strong consistency of expert opinions.

2. AZ OF LAND AND ITS IMPACT ON THE MANAGEMENT OF AGRICULTURAL ENTERPRISE DEVELOPMENT

As a result of the conducted detailed analysis of land zoning types, considering the main directions of rational use of land resources by agricultural enterprises and the priority of agricultural land use, we believe that it is advisable to establish AZ (Table 4).

Table 4. The component structure of land AZ and its impact on the management of agricultural enterprise development.

AZ components	Classification attributes	Management of agricultural enterprise development
Natural agricultural	- soil and climatic conditions - partitioning and drainage of the territory - level of erodibility (deflation) - agroclimatic conditions	- impact on productivity, level of land utilization, and efficiency of agricultural production

	- zonal types of agricultural production, systems of agrotechnical and ameliorative measures	- differentiation of technological measures for land use and protection - the range of cultivated crops
Ecological-economic	- zonal, economic, and industrial specialization - combination of production sectors - concentration and integration of production	- ensuring comprehensive development of the region's economy - agro-industrial integration - increasing the efficiency of land use
Environmental	- degree of anthropogenic impact - intensity of erosion processes - contamination with pesticides, heavy metals, radionuclides, etc. - provision of soils with nutrients, microelements - the ratio of lands	- optimal ratio of crops in crop rotations considering local features
Socioeconomic	- tendencies to raising personnel qualification and providing agrarian and processing enterprises with qualified personnel - level of labor productivity (time output per product produced)	- integration of the work of agricultural producers and processors

VI. DISCUSSION

The research findings obtained suggest the following conclusions. The agrarian differences of land resources management in the steppe and dry steppe zones of Kazakhstan, which constitute nearly 80% of arable land in the country, necessitate the development of a unified approach to the use of resource potential within modern land ownership and land use. For this purpose, we plan to investigate the structure of land and the state of land resources and on this basis propose recommendations for the effective and efficient ecological-economic management of land resources by agricultural enterprises.

Previous research has already pointed to the fact that the current state of Kazakhstan's land resources diminishes the level of land productivity and results in a decrease in agricultural production [51]. We believe that such degradation phenomena are mainly caused by miscalculations regarding the optimal and permissible use of lands. The latter is determined by finding the best option to define the areas and structure of land plots, considering the indicators of land zoning and bringing the areas of land within administrative-territorial units to the optimal structure for the purpose of ecological-economic land resource management and maintaining the ecological sustainability of the territory.

At present, Kazakhstan has not developed an ecologically optimized structure of lands. Today, researchers recognize the need to reduce the agricultural development and plowing of the land fund through its optimization, but with respect to the quantitative ratio they hold different points of view [52-55]. For instance, V.B. Zharnikov [32] recommends bringing the ratio of meadows and pastures, arable land, and water to 30:20:20, keeping in mind the experience of advanced countries of Western Europe and North America. For example, in the UK, France, and Germany plowing constitutes 28-32% of agricultural land use types, and in the USA – 15.8%. A study by N.G. Ovchinnikova [22] recommends reducing development and plowing by means of conserving degraded and unproductive lands.

We argue that ecological-economic management of land resources of an agricultural enterprise must account for the impact of pollution by technical elements [56,57]. A. Asetova et al. [58] suggest introducing oat and vetch mixtures and peas into crop rotation (since they clean the land and provide for ecological equilibrium) on lands polluted by industrial waste.

A necessary precondition for the ecological management of agricultural land resources is the use of environmentally friendly technologies in the cultivation of agricultural products [59-61] and the verification of manufactured products for compliance with state and international environmental norms and standards [62].

Relying on the results of our expert survey and previous research findings [20], we propose to carry out the following measures for the economic and ecological management of land resources on the territory of agricultural enterprises within the agrarian zones of Kazakhstan:

- cultivation of agricultural products that are competitive in domestic and foreign markets according to international and state quality standards; cultivation of ecologically clean products, which will be facilitated by bringing the ratio of land (arable land, natural fodder land) within agrarian zones to an optimal level by transferring eroded, low-productive, and degraded arable land to pastures, as well as by means of preferential taxation of its producers;

- economic stimulation of optimal land resources use provides savings for agricultural enterprises as a result of reduced costs for environmental measures due to withdrawing eroded areas of land within the agricultural enterprise from intensive use by exchanging them for non-eroded ones, and consists in the following:
- provision of tax and credit privileges in case of implementation of measures in accordance with regional programs of land use and protection;
- allocation of funds from the state and local budgets to legal entities and individuals to restore the original state of lands that have been disturbed through no fault of their own;
- exemption from payment for land plots that are undergoing development and restoration of their fertility in accordance with national and regional programs on the use and protection of lands;
- compensation of funds to legal entities and individuals for land plots subject to conservation or attribution to the national state reserve fund.

VII. CONCLUSION

This study contributes to the theoretical, methodological, and empirical understanding of ecological-economic management of land resources, emphasizing agricultural zoning (AZ) as a practical approach to enhance land use efficiency in Kazakhstan's agricultural sector. At the theoretical level, the research advances the concept of AZ by integrating ecological and economic dimensions. Methodologically, the study combines document analysis with expert surveys to validate the proposed AZ framework. Empirically, findings proposed several approaches to enhance using agricultural lands in Kazakhstan while mitigating environmental degradation.

However, this study has several limitations. Reliance on expert surveys introduces potential biases, as findings may reflect subjective perspectives that vary across regions and agricultural practices. To add more the present status-quo of AZ in Kazakhstan is restricted by the number of works we selected to rely o

A promising direction for further research is the study of the possibilities of using AZ using the example of specific regions of Kazakhstan.

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Author contribution

All authors have read and agreed to the published version of the manuscript. All authors made an equal contribution to the development and planning of the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data is available from the authors upon request.

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REFERENCES

1. Mayboroda, V., & Spirin, P. (**2023**). Legal regulation in the field of territorial planning and urban zoning: Main problems and ways to solve them, Journal of Law and Sustainable Development, 11(1), e0254.
2. Kuznetsova, I., Okagbue, H., Plisova, A., Noeva, E., Mikhailova, M., Meshkova, G. (**2020**). The latest transition of manufacturing agricultural production as a result of a unique generation of human capital in new economic conditions. *Entrepreneurship and Sustainability Issues*, 8(1), 929-944.
3. Abdullayev, I., Kukhar, V., Akhmetshin, E., Bekjanov, D., and Carballo-Penela, A. (**2023**). Preface. *International Scientific and Practical Conference "Priority Directions of Complex Socio-Economic Development of the Region" (PDSED 2023)*, 449, 00001.
4. Riczu, Zs., Melypataki, G., and Mate, D. (**2023**). A. Concepts of work: from traditional social-labor ideas to modern effects of digital transformation. *Journal of Digital Technologies and Law*, 1(1), 175-190.
5. Cribb, H. J. (2011). Food security: What are the priorities? *Food Security*, 3(2), 123-125.

6. Nosova, S. S., Meshkov, S. A., Stroev, P. V., Meshkova, G. V., and Boyar-Sozonovitch, A. S. (2018). Digital technologies as a new vector in the growth of innovativeness and competitiveness of industrial enterprises. *International Journal of Civil Engineering and Technology*, 9(6), 1411-1422.
7. Abdullayev, I., Tadjiev, T., and Saparova, M. (2023). Evaluation factors of industrial production in the region. *International Scientific and Practical Conference "Priority Directions of Complex Socio-Economic Development of the Region" (PDSED 2023)*, 449.
8. Martirosyan, A. V., Ilyushin, Y. V., and Afanaseva, O. V. (**2022**). Development of a distributed mathematical model and control system for reducing pollution risk in mineral water aquifer systems. *Water*, 14(2), 151.
9. Polovchenko, K. A. (2021). Constitutional foundations of the security system in a modern state. *International Journal of Electronic Security and Digital Forensics*, 13(4), 390-402.
10. Lambekova, A., Nurgalieva, A., Syzdykova, E., Zhanibekova, G., and Aff, J. (**2017**). Development of internal audit. *Journal of Advanced Research in Law and Economics*, 8(8), 2483-2489.
11. Bekezhanov, D., Rzabay, A., Nesipbaev, O., Kopbassarova, F., and Halibiyati, H. (**2022**). Legal significance of digitalization of environmental information in ensuring environmental safety, *Journal of Environmental Management and Tourism*, 13(3), 656-664.
12. Zhyrgalova, A., Yelemessov, S., Ablaikhan, B., Aitkhozhayeva, G., and Zhildikbayeva, A. (**2024**). Assessment of potential ecological risk of heavy metal contamination of agricultural soils in Kazakhstan. *Brazilian Journal of Biology*, 84, e280583.
13. Madimarova, G., Nurpeissova, T., Ormambekova, A., Suleimenova, D., and Zhildikbayeva, A. (**2024**). Advanced topographic-geodetic surveys and GNSS methodologies in urban planning. *Journal of Applied Geodesy*, 18(3), 449-462.
14. Asadulagi, M.-A. M., Pershin, I. M., and Tsapleva, V. V. (**2024**). Research on hydrolithospheric processes using the results of groundwater inflow testing. *Water*, 16(3), 487.
15. Satybaldin, A. A., Temirova, G. K., and Zhunisbekova, T. A. (**2020**). Prodovolstvennaia bezopasnost Kazakhstana: Sostoianie i vozmozhnosti [Food security of Kazakhstan: State and opportunities]. *Economics: The Strategy and Practice*, 15(2), 11-20.
16. Nasiyev, B. (**2016**). The study of the processes, degradation factors and the selection of crops for the restoration of bioresourses capacity of the grassland of semi-desert zones. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(3), 2637-2646.
17. Nasiyev, B., & Bekkaliyev, A. (**2019**). The impact of pasturing technology on the current state of pastures. *Annals of Agri Bio Research*, 24(2), 246-254.
18. Chebyshev, N., Ansabayeva, A., Mironova, E., and Kazak, A. (**2024**). The distribution of fusarium in barley crops: PCR. *Polish Journal of Environmental Studies*, 33(2), 1559-1568.
19. De Pee, S, and Pérez-Escamilla, R. (**2023**). *Food security*. Encyclopedia of Human Nutrition; Elsevier, 2023; pp. 306–315.
20. Sukhomlinova, N. B., and Poliakov, V. V. (**2023**). Instrumentarno-strukturnyi mekhanizm resheniia problem zemlepolzovaniia v novykh usloviiakh khoziaistvovaniia [Instrumental-structural mechanism of the solution of land use problems in new conditions of managing]. *Economy and Ecology of Territorial Formations*, 2(1(4)), 22-33.
21. Dzhulamanov, T., Pentaev, T., Igembaeva, A., and Abaeva, K. (**2014**). Effektivnoe ispolzovanie zemelnykh resursov v Respublike Kazakhstan [Efficient use of land resources in the Republic of Kazakhstan]. *Baltic surveying: Proceedings of scientific methodical conference „Baltic surveying'"*, 14, 114-119.
22. Ianiuk, V. M., and Gagina, I. S. (**2014**). *Ekonomicheskaia otsenka selskokhoziaistvennykh ugodii dokhodnym podkhodom i ee primenenie pri upravlenii zemelnymi resursami* [Economic valuation of agricultural lands by the income approach and its application in land resources management]. Saratov: Saratovskii istochnik.
23. Ovchinnikova, N. G. (**2013**). Ekologo-ekonomicheskie aspekty upravleniia zemelnym bazisom v sfere agrarnogo prirodopolzovaniia [Economic aspects of management of ground basis in sphere of agrarian wildlife management]. *Internet journal "Naukovedenie"*, 3, 1-4.
24. Sutiagin, M. D. (**2022**). Zonirovanie territorii i razreshennoe ispolzovanie zemel kak sposob opredeleniia pravovogo rezhima zemel i zemelnykh uchastkov [Territorial zoning and permitted use of lands as a way to determine the legal regime of lands and land plots]. *Actual Problems of Russian Law*, 17(6), 187-195.
25. Torsunova, O. F. (**2018**). Zemelno-kadastrovoe obespechenie ustanovleniia granits territorialnykh zon [Land and cadastre for ensuring setting of territorial zone boundaries]. *Interekspo Geo-Sibir*, 2(3), 166-172.
26. Lipski, S. A. (**2013**). Zonirovanie territorii kak mekhanizm obespecheniia tselevogo ispolzovaniia zemel [Zoning of territories as a mechanism for ensuring the targeted use of lands]. *Imushchestvennyye otnosheniya v Rossiyskoy Federatsii*, 6(141), 59-65.
27. Kantarbayeva, E. E., Shayakhmetova, A. S., Koshen, B. M., and Zholamanov, K. K. (2017). The density of planting and the productivity of corn in the context of forest-steppe zone of Northern Kazakhstan. *Asian Journal of Microbiology, Biotechnology and Environmental Sciences*, 19(1), 116-120.

28. Komarov, S. I.; and Antropov, D. V. (**2017**). Metody klasternogo zonirovaniia territorii regiona dlia tselei upravleniia zemelnymi resursami [Methods of cluster zoning of territories in the region for the purposes of land resources management]. *Bulletin of Ural Federal University. Series Economics and Management*, 1, 66-85.

29. Šimleša, D. (**2023**). *Ecological economics.* Encyclopedia of the Social and Solidarity Economy; Edward Elgar Publishing, 2023; pp. 27–36.

30. Antropov, D. V., and Komarov, S. I. (**2018**). Analiz effektivnosti upravleniia zemelnymi resursami regiona na osnove primeneniia metodiki kompleksnogo (klasternogo) zonirovaniia territorii (na primere zemel selskokhoziaistvennogo naznacheniia) [Analysis of the effectiveness of the management of land resources in the region on the basis of the methodology of integrated (cluster) zoning of territories (for example, agricultural land)]. *Mezhdunarodnyi selskokhoziaistvennyi zhurnal*, 5, 16-19.

31. Dedkova, T. A. (**2019**). Pravovye posledstviia priniatiia zakonoproekta o zonirovanii territorii dlia zemel selskokhoziaistvennogo naznacheniia [Legal implications of the draft law on zoning areas for agricultural lands]. *Tomsk State University Journal*, 31, 142-153.

32. Zharnikov, V. B. (**2017**). Ratsionalnoe ispolzovanie zemel i osnovnye usloviia ego realizatsii [Rational land use and basic conditions of its realization]. *Bulletin of SSGA*, 22(3), 171-179.

33. Rogatnev, Y, Scherba, V., Nazarova, O., Filippova, T., and Dolmatova, O. (**2019**). Spatio-temporal zoning of the urban lands' functioning for ensuring the sustainable development of the city. *Journal of Environmental Management and Tourism*, 10(1), 210-219.

34. Akhmetshin, E., Fayzullaev, N., Klochko, E., Shakhov, D., and Lobanova, V. (2014). Intelligent data analytics using hybrid gradient optimization algorithm with machine learning model for customer churn prediction. *Fusion: Practice and Applications*, 14(2), 159-171.

35. Yessimbek, B., Mambetov, B., Akhmetov, R., Dosmanbetov, D., Abayeva, K., Kozhabekova, A., Oraikhanova, A., and Baibatshanov, M. (**2022**). Prevention of desertification and land degradation using Black Saxaul in arid conditions. *OnLine Journal of Biological Sciences*, 22(4), 484-491.

36. Ilyushin, Y., and Martirosyan, A. (**2024**). The development of the soderberg electrolyzer electromagnetic field's state monitoring system. *Scientific Reports*, 14, 3501.

37. Kaldybekov, A., Bektanov, B., and Rsymbetov, B. (**2020**). Features of pasture land management and monitoring using remote sensing materials. *Journal of Environmental Management and Tourism*, 11(5), 1269-1276.

38. Kashina, E., Yanovskaya, G., Fedotkina, E., Tesalovsky, A., Vetrova, E., Shaimerdenova, A., and Aitkazina, M. (**2020**). Impact of digital farming on sustainable development and planning in agriculture and increasing the competitiveness of the agricultural business, *International Journal of Sustainable Development and Planning*, 17(8), 2413-2420.

39. Burundukova, E. M., & Kostina, O. V. (**2022**). Challenges associated with the legal enforcement of land use by indigenous small-numbered peoples of the north. *Relações Internacionais do Mundo Atual*, 1(34), 117-133.

40. Rybak, V., Kryanev, Y., Shichkin, I., and Livson, M. (**2023**). State regulation as a comprehensive mechanism for the sustainable development of territories. *Revista Juridica*, 1(73), 831-844.

41. Stepanova, D., Nurgaliyeva, A., Bessonova, T., Chernova, O., Litvinov, A., and Arutyunyan, Y. (**2023**). The influence of active types of tourism on the development of territories and the achievement of ESG principles. *Journal of Law and Sustainable Development*, 11(2), e0318.

42. Auganbai, A., Kalymbek, B., Shulanbekova, G. K., Urisbaeva, A. A., and Yerezhepkyzy, R. (**2019**). Protection of objects of historical and cultural heritage: Legal problems and the application of information technologies. *Environmental Policy and Law*, 49(6), 379-388.

43. Aipeisova, S., Utarbayeva, N., Maui, A., Kazkeev, E., and Baubekova, E. (**2023**). Fabaceae Lindl. Species in the floristic composition of the Aktobe floristic district. *International Journal of Environmental Studies*, 80(4), 1076-1087.

44. Galkin, A., Pankov, V. Y., and Fedorov, Y. V. (**2023**). Radius teplovogo vliyaniya kamer podzemnykh sooruzheniy kriolitozony [The radius of thermal influence of the chambers of underground structures of the cryolithozone]. *Arktika i Antarktika*, 4, 1-8.

45. Ansabayeva, A., and Akhmetbekova, A. (**2024**). Biological products sway the yield and quality traits of chickpea (Cicer arietinum L.) in a continental climate. *SABRAO Journal of Breeding Genetics*, 56(1), 45-53.

46. Eskerkhanova, L. T., Beloglazova, L. B., Masyutina, N. M., Romanishina, T. S., and Turishcheva, T. B. (**2023**). Increasing the competitiveness of future economists for work in industry 4.0. *Perspektivy nauki i obrazovania – Perspectives of Science and Education*, 62(2), 158-173.

47. Seidakhmetova, A., Kaldiyarov, D., Dyrka, S., Bedelbayeva, A., and Kaldiyarov, A. (**2022**). Development of ecosystem stability as a tool for managing agricultural areas in the Republic of Kazakhstan: Problems and opportunities for their resolution. *Journal of Environmental Management and Tourism*, 13(7), 1993-2001.

48. Tumashbay, T., Yesim, G., Spanov, M., Ibrayeva, N., Kemerbay, R., and Shaldarbekova, A. (**2023**). Influence of socio-organizational and personal resources of the employee on the positive perception of work. *Academic Journal of Interdisciplinary Studies*, 12(4), 37-52.

49. Makarova, K., Petrov, A., Pastukhova, A., Gazizulina, A., Petruk, V., and Gotfrid, S. (**2022**). Introduction of large-fruited strawberry varieties on the territory of the Novosibirsk region in the conditions of Western Siberia. *Advancements in Life Sciences*, 9(3), 328-333.

50. Ministry of Agriculture of the Republic of Kazakhstan, Committee on Land Resources Management. Svodnyy analiticheskiy otchet o sostoyanii i ispol'zovanii zemel' Respubliki Kazakhstan za 2021 god [Summary analytical report on the condition and use of lands in the

Republic of Kazakhstan for 2021]. (**2021**). Nur-Sultan. Retrieved from https://www.gov.kz/uploads/2022/4/11/b09469de9be9cc54d2cc0e9cc7a77e84_original.7131188.pdf

51. Kalashnikov, P., Kulanov, A., Nesipbekov, E., Kaishatayeva, A., and Kantarbayeva, S. (**2023**). Impact of state and legal regulation on the sustainable development of agricultural territories and improving the standard of living of the population. *Journal of Environmental Management and Tourism*, 14(1), 82-88.
52. Baidalina, S., Baidalin, M., Khusainov, A., Kazydub, N., and Baiken, A. (**2023**). Photosynthetic activity, productivity, and nutritional value of mowing and grazing phytocenoses depending on the species composition of grasses. *SABRAO Journal of Breeding and Genetics*, 55(3), 825-835.
53. Mukhomedyarova, A.S., Kushenbekova, A.K., Elekesheva, M.M., Gumarova, Zh.M., and Bulekova, A.A. (**2023**). Influence of nitrogen mineral fertilizer application methods on the preservation and yield of winter wheat (Triticum aestivum). *Research on Crops*, 24(2), 241-249.
54. Shaimerdenova, A., Agapitova, L.G., Bobrova, A.V., Akhmetov, Y., Sinyukov, V.A., Sharonin, P.N., Dobrovolsky, A.G., Ryakhovsky, D.I., Krasnovskiy, E.E., and Ten, A.D. (**2023**). Development of optimal crop production model considering existing natural-climatic risks increasing crop yields. *SABRAO Journal of Breeding and Genetics*, 55(3), 778-795.
55. Morozova, T., Akhmadeev, R., Lehoux, L., Yumashev, A., Meshkova, G., and Lukiyanova, M. (**2020**). Crypto asset assessment models in financial reporting content typologies. *Entrepreneurship and Sustainability Issues*, 7(3), 2196-2212.
56. Bugubaeva, A., Kuprijanov, A., Chashkov, V., Kuanyshbaev, S., Valiev, K., Mamikhin, S., Shcheglov, A., Nugmanov, A., Bulaev, A., Sultangazina, G., Kunanbayev, K., Chernyavskaya, O., Baubekova, G., Ruchkina, G., Safronova, O., Uxikbayeva, M., and Sokharev, Y. (**2023**). Productivity assessment of various plant communities at uranium mine sites in Central Kazakhstan. *SABRAO Journal of Breeding and Genetics*, 55(3), 864-876.
57. Kocherov, O. S. (**2023**). Vechnoye vozrozhdeniye drakona: lovushka diskursivnoy sily i dekolonial'naya kritika teorii mezhdunarodnykh otnosheniy [Eternal return of the dragon: discursive power trap and decolonial critique of international relations theory]. *Mirovaya politika*, 4, 1-20.
58. Asetova, A., Kazhimurat, A., and Gurklis, V. (**2013**). Osnovnye napravleniia sovershenstvovaniia struktury zemlepolzovaniia i effektivnosti selskokhoziaistvennogo proizvodstva Zapadnogo Kazakhstana [Key directions for improving the structure of land use and the efficiency of agricultural production in Western Kazakhstan]. *Baltic surveying 2013: Proceedings of the international scientific methodical conference*, 2013, 21-25.
59. Dutbayev, Y., Kharipzhanova, A., Yesserkenov, A., Ten, A., Garmashov, S., Popova, L., Konstantinova, O., and Sagyndykov, U. (**2023**). The harmfulness of common root rot in winter wheat varieties in Kazakhstan. *OnLine Journal of Biological Sciences*, 23(2), 187-192.
60. Kondratenko, E. P., Soboleva, O. M., Verbitskaya, N.V., and Filipovich, L.A. (**2022**). Evaluation of the effectiveness of the combined use of humic fertilizer and herbicides in spring wheat crops. *Journal of Agriculture and Crops*, 9, 130-136.
61. Abdullaev, I. S., and Khamraev, K. I. (**2020**). Modeling factors affecting net assets of investment funds using autoregressive distributed lag (ARDL) model. *Journal of Critical Reviews*, 7(12), 987-990.
62. Kondratenko, E. P., and Soboleva, O. M. (**2023**). Features of the development of the primary roots of wheat seedlings after the removal of abiotic electromagnetic stress. *Journal of Global Innovations in Agricultural Sciences*, 11(2), 127-133.