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Development of Ecosystem Stability as a Tool for Managing Agricultural Areas in the Republic of Kazakhstan: Problems and Opportunities for Their Resolution

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Abstract:

Agricultural areas are extremely challenging as an object of administrative influence. The problems existing in agricultural areas cannot be overcome without research, the results of which can help managers to make effective decisions. The study aims to analyze the development of ecosystem stability as an instrument for managing agricultural territories in the Republic of Kazakhstan. Through the methods of focus groups and expert survey, the study identifies the key directions of activity to improve ecosystem stability as a tool for managing agricultural territories in Kazakhstan. The authors conclude that the problems of agricultural territory management require direct intervention of the state through the application of various instruments promoting the stability of the ecosystem of agricultural lands. Several directions of work are recommended to be developed to overcome the identified problems. First, the application of the ecosystem approach to the development of stability of agricultural land in Kazakhstan must focus on strengthening the system of innovative development and the management of effective integration of rural areas. The second recommendation suggests the improvement of land and water use based on the ecological-landscape approach. The third direction is the improvement of the quality of life in agricultural territories through better provision of public goods and basic services to the rural population. Furthermore, the regulatory influence of the state should extend not only to the economic sphere, but also to the adjacent spheres of human activity and the use of natural resources.

Keywords: ecosystem approach; ecological-landscape planning; quality of life; management of effective integration of rural areas.

JEL Classification: O18; O13; Q57; R11.

Introduction

The high pace of modern life generates new problems, activates the methodological search, and forms new paradigms for the study of management processes. In our view, one of the promising directions of research is the topic of ensuring the stability of modern economic systems (ecosystems). The importance and relevance of the study of the stability of ecosystems in the aspect of their development owe to the noticeable understatement of the process of ecosystem management (Sekerin *et al.* 2018, 160). One of the primary functions of the economy in every country is the provision of its stable functioning (Lagodiienko *et al.* 2022, 1215). The stability of ecosystems ensures the economic security of the country (Zedgenizova *et al.* 2021, 157), the effective operation of economic sectors (Alzouby and Jebril 2022, 1189), and the competitiveness of national enterprises in both foreign and domestic markets (Mikhalev 2010). The concept of ecosystem stability is acquiring particular importance, as it is becoming a defining factor in current conditions. Today, in our opinion, the role and importance of ecosystem stability factors are rising.

Prerequisites for the management of the development of stability of the ecosystem of agricultural territories in Kazakhstan are the following pain points. The level of registered unemployment in rural areas is 1.8 times higher than in urban settlements. Wages in the agricultural sector are only 73.4% of the average in the economy (Baidybekova *et al.* 2022, 112). 73.9% of rural households consider themselves poor. The share of equipped housing, in particular, that with water supply, hot water, and sewerage, is quite small. The problems of preschool education, quality education, and leisure activities for rural residents remain unresolved (Akimbekova and Akimbekova 2022, 170). The social movement for solving rural problems and the system of agricultural counseling are almost nonexistent (Kurmanova *et al.* 2021, 169). The condition of roads in rural areas is unsatisfactory, and many villages lack high-speed Internet connection (Abeldina and Ozeranskaia 2018, 24).

In light of the above, we believe it necessary for Kazakhstan to develop and implement a state policy for the sustainable development of agricultural land based on the ecosystem approach.

1. Literature Review

Today's science offers three main approaches to the concept of ecosystem stability.

The first one involves the term "steady state" (a stable state, a state of fixed stability), which reflects the conditions of the ecosystem's dynamic equilibrium. Thus, the adherents of this approach (Porokhin *et al.* 2014, 816; Spangenberg 2005, 47) refer to the concept of a steady state and equilibrium when studying ecosystem stability. However, it has to be noted that the concept of stability characterizes the process associated with equilibrium but is not identical to it.

The second approach to the assessment of ecosystem stability proceeds from the concept of sustainable development. This strategy for the development of society follows the priorities of the future and can be defined as a strategy for the survival and continued development of civilization (and the country) while preserving the environment. The proponents of this approach (Faramazian and Kolomyts 2017, 201; Tallis *et al.* 2010, 340) define sustainable development as one under which the economic, environmental, and social goals are balanced and integrated, and the pace of economic growth does not exceed the rate of reproduction of natural resources, the main indicator of such development being the improvement of the quality of life (Doroshenko and Shelomtseva 2017, 212).

The followers of the third approach (Kalyugina *et al.* 2021; Wood 1994, 6) associate the concept of sustainable ecosystem development with the concept of economic growth and believe the essence of ecosystem stability to lie in the maximization of economic growth with minimal deviation of the economic system from the state of equilibrium (Elkina and Kosianenko 2017, 60). This approach equates the concepts of development and growth, although the latter provides only for an increase in the quantitative rather than qualitative characteristics of the ecosystem (Iudina *et al.* 2022, 7).

The practice of implementing the concepts of sustainable development allows to highlight the following primary approaches to the management of ecosystem stability.

1. The ecosystem approach considers the stability of an ecosystem as a combination of interrelated and interdependent components ensuring balanced development through the establishment of optimal quantitative relations between ecosystem elements and the formation of stable structural links between them (Ushvitskii *et al.* 2021, 142). The management of ecosystem stability thus consists in ensuring the most coordinated interaction of all elements and the preservation of ecosystem integrity under changeable conditions of the environment.

2. The situational approach aims to identify the patterns in which the stability of an ecosystem in space and time is formed, as well as to develop a set of managerial actions to ensure a dynamic equilibrium in a particular period of time in a specific market situation. In this, the stability of an ecosystem is viewed as a

temporary phenomenon achieved in constant interaction with the environment. The accumulated quantitative parameters in the process of evolution change the qualitative characteristics of the ecosystem, resulting in a violation of the internal consistency of its elements (Ramenskaia 2020, 16). Thus, the collapse of the achieved equilibrium is succeeded by the emergence of new stable proportions, thereby ensuring the ecosystem's transition to a qualitatively new level of development.

3. The integration approach regards ecosystem stability as a body of economic systems at the micro, meso, and macro levels. The integration approach is an approach to the study of socio-economic processes from the perspective of considering the modern ecosystem, which presents a set of economic systems of different levels: states, regions, industries, enterprises, and so on. Modern ecosystems are complex multilevel, multifactor, multicriteria open systems, which have specific properties: integrity, purposefulness, predictability, and self-organization (Soloveva 2019, 84).

Summarizing the outlined approaches, we can conclude that the management of ecosystem stability presupposes the implementation of a set of managerial actions aimed at the formation of a dynamic structure that can function consistently in time and successfully in terms of achieving the set strategic goals under the constantly interacting factors of the external environment while maintaining integrity and equilibrium. The management of ecosystem stability, in our view, consists in using organizational, economic, and social management methods to ensure the stability of an ecosystem.

Researchers believe (Binder *et al.* 2010, 171) that the current policies of developed countries in managing agricultural land in the context of developing the stability of rural ecosystems rely on the ecosystem approach. The latter involves the provision of favorable living conditions and the quality of life for the rural population (Mustafayeva *et al.* 2019, 161; Vinichenko *et al.* 2021, 103), lowering unemployment rates, and improving the competitiveness of the economy in these territories (Kolomyts and Stepanets 2019, 347).

At the international level, the ecosystem approach to managing agricultural territories is adopted as a strategy of integrated management of lands and resources, which promotes their preservation and sustainable and fair use (Torre 2015, 641). Thus, the ecosystem approach is represented by relatively new modes of thinking about managing natural, human, and economic resources (Nugmanov *et al.* 2022, 268).

According to ZH.K. Shakenova and N.L. Ozeranskaia (2022), the ecosystem approach applied to agricultural land would be a strategy for the integrated management of land, water, and biological resources (Beknazarov *et al.* 2020, 209) that promotes their conservation and sustainable use in an equitable manner. The ecosystem approach also recognizes people with their cultural diversity as an integral part of ecosystems (Liakhova and Poliakova 2022).

Researchers argue that the ecosystem approach to the policy of developing agricultural territories should be practiced with consideration of the following areas: development of transport and information and communication infrastructure (Tazhibaeva and Sabenova 2021, 96); ensuring the production of public services (Abdykalieva *et al.* 2021, 171); support and preservation of the natural potential of territories (Ozeranskaia and Moskovskaia 2015, 90); ensuring the effective functioning of rural entrepreneurship (including the development and financing of small and medium businesses) (Drokin and Zhuravlev 2021).

The goal of the present study is to explore the development of ecosystem stability as a tool for managing agricultural territories in the Republic of Kazakhstan.

Research objectives:

- to define the components of the ecosystem approach to managing the development of agricultural territories in the Republic of Kazakhstan;
- to identify the primary areas of management activities when implementing the ecosystem approach;
- to analyze the content of the core areas of management activities for the development of agricultural territories of the Republic of Kazakhstan.

2. Methods

The study was conducted in three stages between March and June 2022.

At the first stage, scientific literature on the explored problem was analyzed. The second stage involved conducting a focus group and an online expert survey to obtain expert opinions on the questions of interest. At the third stage of the study, the information obtained from experts was processed and an expert ranking was compiled with subsequent determination of the weights of expert opinions.

The study thus employed the following set of research methods:

- analysis of scientific literature (Dokholyan *et al.* 2022, 597) on the problem of agricultural territory development and the use of various approaches in the management of the development of agricultural land;

- a two-level expert study with the first level being a focused interview (the focus group method) (Vinichenko *et al.* 2021, 103) and the second being an expert survey (Kozhamzharova *et al.* 2022, 427) based on a semi-structured interview conducted via an online questionnaire. The results of the expert study were used to determine the primary directions of managerial activities in the implementation of the ecosystem approach to the development of agricultural territories in the Republic of Kazakhstan.

The focus group included eight respondents, all of them employees of the Agriculture Department of the akimat of one region in Kazakhstan. In the course of an audio-recorded group discussion that lasted for an hour and a half, we determined the respondents' opinions on the ecosystem approach to managing agricultural territories and identified the main directions of management activities in the implementation of this approach to managing the development of the stability of agricultural land ecosystems.

The online survey of experts was taken by 58 experts, who were employees of the Agriculture Departments (divisions) of agriculture of the akimats of five regions in Kazakhstan. In the online survey via email, the experts were asked to express their opinion on the directions of management activity determined in the focused interview by each component of the ecosystem approach in managing the development of agricultural territories of the Republic of Kazakhstan, and then rank them. All participants in the survey were informed about the purpose of the survey and the intention to publish its results in a summarized form.

The consistency of expert opinions was tested via Kendall's coefficient of concordance (W). The concordance coefficient was calculated using the SPSS software product.

The information obtained from the expert ranking was then processed to determine the weights of expert opinions.

3. Results

Proceeding from the analysis of scientific literature, we focus on the ecosystem approach in the management of the development of rural territories.

Table 1. Areas of administrative efforts to develop the stability of the ecosystem of agricultural territories

No.	Direction of effort	Performance indicator	Rank	Weight
Reinforcement of the system of innovative development of agriculture				
1	Development of alternative economic activities	Improvement of human capital, the rise of production of both new and traditional types of products within the given territory	7	0.07
2	Development of vertical links between processing enterprises and small producers		3	0.16
3	Improvement of the dissemination of knowledge and information		8	0.04
Improvement of land and water use based on ecological-landscape planning				
4	Adaptation of the organization and methods of land use with regard to their ecological-landscape and agro-ecological diversity	Replacement of unstable agro-landscapes exposed to negative factors by ecologically stable optimal agro-landscapes imitating the functions of the biosphere	4	0.12
5	Organization of land use and protection as the basis for improving environmental and industrial efficiency		2	0.18
6	Provision of optimal composition and proportion of land, the use of arable land only in the system of crop rotations, subject to the organization of their territory		9	0.03
Improvement of the quality of life in rural areas through better provision of public goods and basic services to the rural population				
7	Improvement of the transport and engineering infrastructure	The number of new services or expansion of the existing list of services aimed at improving the lives of people in rural areas	1	0.22
8	Improvement of the information and educational and social infrastructure		6	0.08
9	Improvement of the environmental infrastructure		5	0.10

Note: the value of the concordance coefficient W = 0.78 ($p < 0.01$), indicating the consistency of expert opinions

According to the results of the focus group, at the core of this approach lies a synergy of the following primary components:

1. strengthening of the system of innovative development of agriculture;
2. improvement of land and water use on the basis of ecological-landscape planning;

3. improvement of the quality of life in rural areas through better provision of public goods and basic services to the rural population.

Based on the results of the focus group discussion, the main directions of management activities to strengthen human capital and the system of innovative development of agriculture in the Republic of Kazakhstan, improve land use based on ecological-landscape planning, and improve the quality of life were identified (Table 1).

Analysis of the expert ranking shows that the greatest weight from among the directions of administrative work to improve the stability of the ecosystem of agricultural territories is assigned to the improvement of the transport and engineering infrastructure (0.22), which is associated with improved quality of life in rural areas by virtue of better provision of public goods and basic services to the rural population. Next in order of significance comes the organization of land use and protection as a basis for improving environmental and industrial efficiency (0.18), which is linked with the improvement of land and water use based on ecological-landscape planning, and the development of vertical links between processing enterprises and small producers (0.16) associated with the strengthening of the system of innovative development of agriculture.

4. Discussion

As evidenced by the results of the study (Table 1), with the strengthening of the system of innovative development of agriculture, comes the need to develop alternative economic activities, as well as to improve the dissemination of knowledge and information (especially about the experience of other countries (Chandrasekharan and Jiji 2019, 1070) in order to integrate smallholders (farmers) (Lanyon *et al.* 2017, 210) into the food industry) and to develop vertical links between processors and small producers by reducing the regulatory barriers to integration within the supply chain.

The most critical in this context is the development of vertical links between processors and small producers and between the suppliers of logistics and other resources and small producers. These vertical links are promoted by the reduction of administrative barriers (Pisenko and Botvinnik 2020, 251) to integration in the supply chain, which goes in line with research findings (Tazhibaeva and Sabenova 2021, 96). These processes lead to the formation of efficient agro-food, logistical, and resource value chains. Consequently, the experts argue for the need to promote the reduction of regulatory barriers at the legislative level. In this case, state support for projects to create additional processing and production facilities would be of exceptional importance for the development of rural areas (Drokin and Zhuravlev 2021).

In the management of projects for the development of alternative economic activities, according to the experts, the state should give priority to supporting projects that: a) are new to the agricultural industry; b) form a value-added chain that increases the income of individual workers, farms, and rural communities, followed by the opportunity to invest in the development of infrastructure facilities; c) are innovative and focus on reaching global quality standards; d) are labor-intensive, which will create new jobs, ensure decent wages for workers, and allow the population to stay in the countryside; e) are environmentally safe.

However, the experts doubt that such projects will yield significant economic returns solely through the accelerated development of folk crafts, various trades, and ecological (green) and rural tourism (even if the respective clusters are created in rural areas). Instead, the experts believe that it is necessary to move high-tech activities to rural areas. Naturally, projects in alternative types of economic activity that provide a large number of new jobs are quite difficult to realize in rural areas, since the workforce is geographically dispersed. Hence the experts have quite high expectations for the cluster form of organizing economic activity, which is a modern version of the dispersed manufactory but compares favorably with the latter in terms of innovation, forms of cooperation among participants, and productivity. Examples of such clusters are the so-called industrial districts in Italy (about 200), which also cover rural areas (Torre 2015, 641).

Arguing the need to improve land use through ecological-landscape planning, the experts note that the organization of agricultural land use (allocation of crop and pasture rotation fields (Janteliyev *et al.* 2022, 59; Laiskhanov *et al.* 2021, 169), roads, production centers (Skrypnikov *et al.* 2021, 2077)) has to especially carefully account for the interrelationship of morphological parts of the landscape and their water-protective and ground-protective environmental significance. According to ZH.K. Shakenova and N.L. Ozeranskaia (2022), this should become a basis for the establishment of land use types, as well as for the identification of environmentally homogenous plots and their matching with the properties of crop genotypes (Ulyanov *et al.* 2021, 1202) and uniform technologies of their cultivation (Nugmanov *et al.* 2022, 268).

The experts also suggest that the best land plots should be prioritized for the cultivation of crops. At the same time, as demonstrated by research (Liakhova and Poliakova 2022), it is advisable to try to prioritize the use of lands marked by the formation of a stable vegetation cover – the creation of cultural field and pasture

anthropogenic landscapes (Nasiyev *et al.* 2022, 50), as well as the maximum preservation of natural plant diversity (Dutbayev *et al.* 2021, 33). For instance, it is critical to preserve forest plantations on watersheds and the slopes of river valleys and ravines regardless of the value of these lands for other types of agricultural use.

The ecosystem approach to landscape organization of the territories of agricultural enterprises has to provide that the conditions and technologies of crop cultivation in farming are balanced not in one and the same way across the territory of the enterprise, but instead in the context of the identified relatively independent landscape ecosystems. Only this approach allows for specific management of the given conditions (Kolomyts and Stepanets 2019, 347). At the same time, as the results of research (Ozeranskaia and Moskovskaia 2015, 90) show, the ecological-landscape method of land management takes into account the landscape differentiation of the territory with the allocation of ecological-landscape zones (types, subtypes, species) and shapes the organization of the territory by certain parts of the agrolandscape.

The advantages of ecological-landscape planning as compared to the usual methods of agricultural land management lie in a better correspondence of the organization of the territory to the requirements of economic development and nature management. The latter include integrity, comprehensiveness of tasks and activities for the organization of land use and protection, ensuring consistency of interests through the balance of natural and economic resources, long-term preservation of the system-forming elements of the territorial arrangement, multi-variant nature of models, designs, and design solutions, etc. (Elkina and Kosianenko 2017, 60).

Speaking about the need to improve the quality of life in rural areas, the experts point out the need to improve the engineering, information and social, and environmental infrastructures. We, however, believe it necessary to draw attention to the educational aspect as well (Zorina *et al.* 2022, 137).

Improvement of the energy infrastructure requires special attention to the implementation of projects to improve the energy supply, street lighting, and the like. The improvement of the housing and utilities infrastructure (Kornilova *et al.* 2021a, 1798) will, at best, be facilitated by the implementation of projects to equip apartments with water supply, sewerage, and hot water supply (*Bezdudnaya et al.* 2022, 76). The basis of the information and educational infrastructure is formed by agricultural advisory services and individual advisors or experts who provide services (consultations, etc.) to business entities operating in rural areas, the rural population, as well as to local governments and executive authorities. These services, particularly those provided to business entities, can act as valuable tools for stimulating the development and dissemination of innovations in rural areas (Ushvitskii *et al.* 2021, 142). Unfortunately, Kazakhstan has not yet created a network of advisory services in rural areas (Kornilova *et al.* 2021b, 214). When creating such a network and setting the directions of its work, it is advisable to consider the relevant experience of the consulting structure “Extension” (USA) (Tallis *et al.* 2010, 340).

Regarding the components of social infrastructure (education, healthcare, culture, physical culture and sports, trade and catering, and consumer services), in most rural settlements, they are either underdeveloped or in a period of decline. The most developed in rural areas currently are the objects of trade, most of which are privately owned (Beknazarov *et al.* 2020, 209). Educational and medical institutions continue to function only because of subventions from the state budget received by local government bodies (Akimbekova and Akimbekova 2022, 170).

As for the improvement of environmental infrastructure, the experts argue that the problem is the most acute in the villages and towns near major cities, where there are landfills for household waste (Navasardova *et al.* 2021, 1826). According to the experts, all of these settlements require the reconstruction of environmental infrastructure objects and the introduction of new ones, particularly waste processing plants.

Thus, the study demonstrates that in light of the new regionalism paradigm (Binder *et al.* 2010, 171), the main emphasis is placed by the experts on the activation of the endogenous potential of rural areas with the support of the state.

Conclusion

Agricultural territories are incredibly challenging as an object of administrative influence. Overcoming the problems of agricultural territories requires direct involvement of the state through the implementation of the ecosystem approach in managing the development of their stability.

The results obtained outline the priority directions of administration in the implementation of the ecosystem approach to developing the stability of agricultural territories in Kazakhstan. In particular, these directions include strengthening the system of innovative development of agriculture, improvement of land and water use based on ecological-landscape planning, and improvement of the quality of life in rural areas through better provision of public goods and basic services to the rural population. Furthermore, the regulatory activities of the state should

cover not only the economic sphere but also the adjacent spheres of human activity and the use of natural resources.

A prospective direction of further research could be the analysis of the most advanced experience of developed countries in promoting the stability of agricultural areas.

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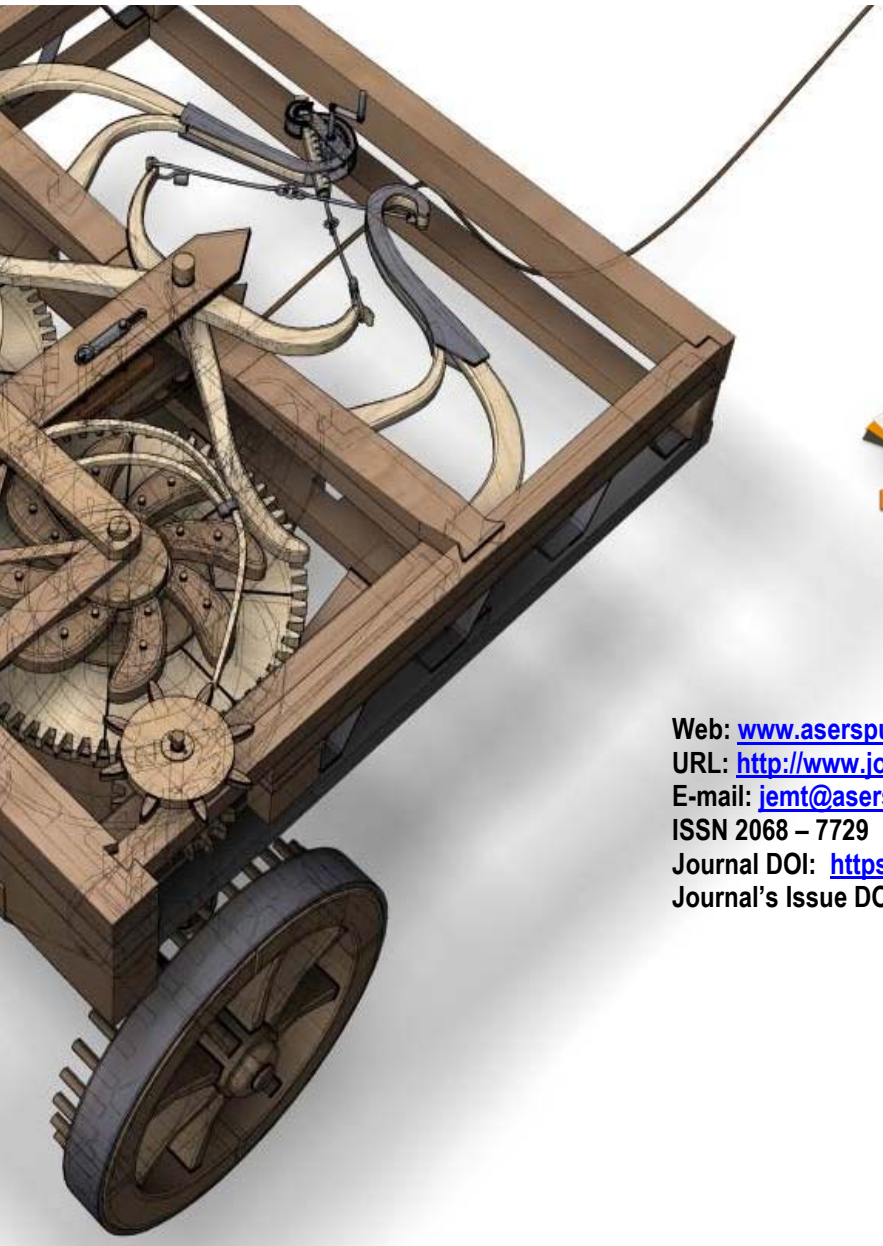

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