

8.2 Ecological, economic and zonal management of land resources

The development of land relations in Ukraine has led to changes in the management of land resources. The redistribution of land, as the primary national wealth of our state according to the Constitution of Ukraine [190], among economic entities, and the introduction of equal forms of land ownership have exacerbated the economic and ecological problems of agricultural land use. Ukraine's attainment of the status of a market economy country, accession to the World Trade Organization, and association with the European Union obligate Ukrainian agricultural producers to ensure effective competition, the production of environmentally friendly products, orientation towards the global market, and necessitate the improvement of economic management of land resources and the implementation of state measures for rational and efficient land use in the structure of agricultural enterprises. After all, land is a means of production in agriculture according to the Land Code of Ukraine [191].

At the end of the 19th and the beginning of the 20th century, the science of management, based on the works of Taylor F. [192], Gilbreth F., Gilbreth L., and Gantt G., emerged. The concept of scientific management became a turning point, leading to the recognition of management as a separate field of study.

The instability of the market capitalist economy and the necessity of state intervention in management were first demonstrated by Keynes J. [193].

Owen R. [194] significantly contributed to the development of scientific directions and ideas of humanizing production management by introducing unknown social-psychological management methods at that time.

Ricardo D. [195] paid considerable attention to management issues in the conditions of industrialization – the distribution of the value of goods among different classes of society, coordination, and organization of production control in enterprises. He developed a complete theory of forms of land rent. He was a supporter of the concept of economic liberalism, which does not allow any state intervention in the economy and implies free activity.

Smith A. [196] offered his view on the role of the state in management by analyzing the duties of the state and the individual. He believed that the state should ensure the security of life and property, resolve disputes, guarantee compliance with rules, and perform other functions that individuals cannot accomplish independently or do so inefficiently.

Certain influence on the object and subject of management is exerted through management functions, which are the basis of this science. The functions of management were first formulated by Fayol H. [197]. They are presented as follows: planning – forecasting – scientific prediction of the development of the national economy, the results of this development, social and other consequences; organization – improving the organizational structure of management and developing scientifically grounded methods of its work and functions aimed at achieving the main goals of social production development; command – purposeful influence on the staff of an enterprise, organization, or institution; coordination – finding the "golden mean" among all participants in production relations; control – monitoring compliance with orders and other rules regulated by production requirements [197].

Considerable attention was paid to land resource management in Ukraine by modern domestic scientists.

Research on the organization of territory and land resource management of agricultural enterprises using land management methods for the implementation of the Food Program and the development of agriculture was conducted by such scientists as Verveiko A.P. [198] and Gorokhov G.I. [199].

The classification of management methods based on the content and mechanism (method) of influence on land resources was proposed by Gorlachuk V.V. [200], Vyun V.G. [200, 201], Peschanska I.M. [201], and Sokhnych A.Ya. [200, 201]. Administrative methods belong to the first group, while economic and socio-psychological methods belong to the second group.

Economic management methods represent ways to achieve economic goals based on the implementation of the requirements of economic laws. They are carried out by creating economic conditions that initiate the labor collective to achieve better

results in its activities, on the one hand, and economic regulation of rational use and protection of land without administrative measures, as noted by Tretiak A.M. [202] and Dorosh O.S. [202].

Martin A.G. [203] in his research proved that economic management methods in production are more flexible and respond faster to changes in social needs.

Dobriak D.S. [204] drew attention to the environmentally friendly use of agricultural land in land resource management.

The issues of land zoning, the allocation of units of natural-agricultural zoning, the establishment of their boundaries, classification features, and the development of schemes of natural-agricultural zoning of the territory of Ukraine were studied by such scientists as O.P. Kanash [205, 206], H.K. Loik [207], B.S. Nosko [208], S.O. Osypchuk [206, 207], B.M. Chepkov [208], and others.

Researchers have separately examined issues of land resource management with detailing in terms of economic, ecological, technical, technological, legal, and other components. Other scholars have separately studied the implementation of natural-agricultural and other types of zoning on the territory of Ukraine.

For the first time, authors have proposed considering questions of eco-economic management of land resources in a complex, relying on data and indicators of land zoning with the aim of increasing the efficiency of agricultural land use by agricultural enterprises.

Management, as a distinct field, examines the system where management functions are carried out. Within the management system, there are distinguishing controlling and controlled systems, as well as objects and subjects of management.

The controlling system (subject) performs management functions (Fig. 1), while the controlled system serves as its object. Communication channels must exist between the controlling and controlled systems. Information about the state of the controlled system is transmitted to the controlling system through these communication channels, while controlling information is sent in the opposite direction [202].

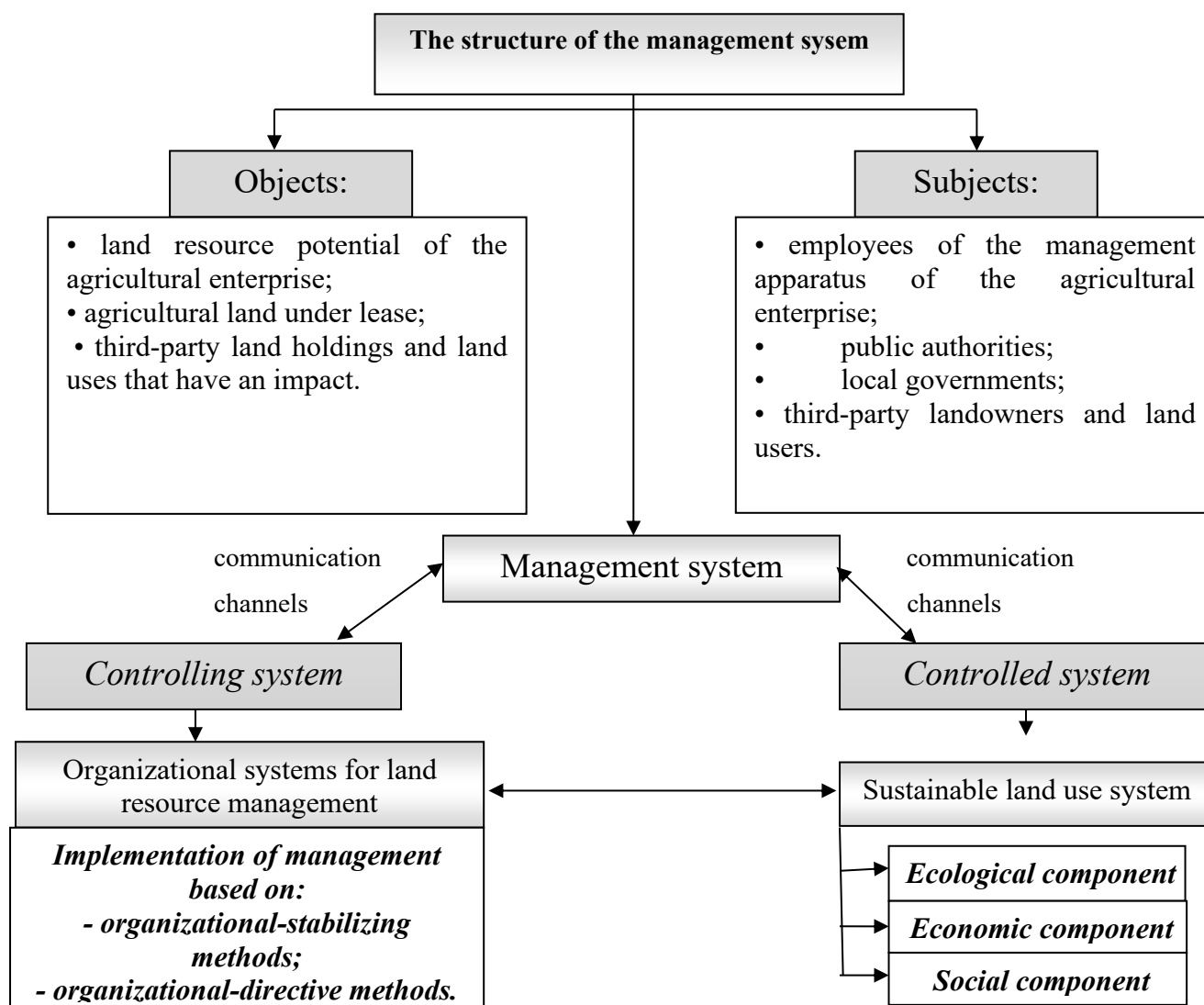


Figure 1. Logical scheme of management structure *

* Note: Developed by the authors based on their own research and sources [202, 204]

Ecological management methods represent approaches to achieving environmental goals, the main purpose of which is the rational use of land by agricultural enterprises, reduction of anthropogenic impact on land resources, and promotion of improvement in ecological indicators of land resources.

Economic justification of land resource management aims at the efficient utilization of resource potential, economic incentivization of rational land use and conservation, and is pursued in two directions: management of land resources, which is implemented and monitored by executive authorities and local self-government bodies in accordance with the law; market conditions, determined by demand and supply.

Land management methods are a combination of ecological, legal, social, economic, and other methods, through which restrictions on land use, land conservation regulations are established [202].

By carrying out land management, the state makes managerial decisions regarding the organization of measures for land improvement and conservation, establishment and regulation of land use legal regimes, economic incentivization of rational land use [202].

Land zoning is carried out within the context of eco-economic management of land resources of agricultural enterprises within the territory of an object, where the indication or manifestation of zoning characteristics within the boundaries of an administrative-territorial unit is identified, under the influence of the land resource management system ensuring land use according to their intended purpose. Land zoning should establish the presence or absence of restrictions on the use of a specifically identified land plot, taking into account its location within a certain zone; restrictions on the rights of landowners and land users. These restrictions should relate to spatial characteristics, the formation of the type of agricultural enterprise, soil cultivation systems, restrictions on the placement and cultivation of certain agricultural crops, crop rotation types, and so on.

Land zoning is the establishment, allocation, and grouping of homogeneous territories and land masses according to defined properties established according to the assigned task, land category, existing restrictions on land resource use, and type of land use.

Land zoning is carried out within the territory of the council, where the interests of territorial communities and executive authorities are coordinated.

Types of zoning such as ecological, cadastral, functional, assessment, economic, social, socio-economic, natural-economic, natural-agricultural, etc., are distinguished.

The procedure of cadastral zoning involves the identification of land plots and assigning cadastral numbers to them.

Assessment zoning is applied in determining the normative monetary valuation of land in settlements.

Functional zoning entails the allocation of residential (housing), industrial (production), and recreational (landscape-recreational) zones within the territory of settlements.

Social zoning is conducted within a certain administrative-territorial unit to delineate homogeneous territories based on social characteristics (age structure, gender, employment in various sectors of the economy, birth and death rates, population quantity and density, provision of household and social services, etc.).

Rational placement of productive forces is impossible without economic zoning, resulting in a scientifically substantiated division of the country's territory into separate large economic regions according to their natural and economic conditions.

The development of the agricultural sector significantly depends on natural and ecological conditions. In Ukraine, six natural-economic zones have formed: Polissya, Forest-Steppe, Northern and Central Steppe, Southern Steppe, foothill and mountain regions of Crimea, and foothill and mountain regions of the Carpathians. Each zone has its own peculiarities and differs in the sectoral structure of agriculture.

Natural-economic land zoning influences the concentration of production means, land, and labor resources to increase output in specialized enterprises and associations - concentrating agricultural production.

Ecological zoning takes into account the degree of transformation of the natural environment due to anthropogenic influence, the level of this influence, adverse natural-anthropogenic processes, ecological assessment of the territory, soil erosion status, intensity of erosion processes, their dynamics, soil contamination with pesticides, heavy metals, radionuclides, etc. It also considers soil nutrition, microelements, etc.

To provide more accurate recommendations to agricultural producers, the territory is divided based on the intensity of use into three ecological-technological groups (ETGs). Such division helps to differentiate the use of agricultural lands, transition from rectangular to contour organization of the territory, and provides information on the optimal crop rotation ratio and continuous cropping depending on the potential risk of erosion processes, intensive and biological farming.

The basis of agricultural land zoning is natural-agricultural zoning – the division of Ukraine's territory and individual regions taking into account natural conditions and agrobiological requirements of agricultural crops.

Natural-agricultural zoning is applied in determining the scientifically justified placement of agricultural production, developing master plans for the use of land resources, agricultural and land management systems, land improvement schemes, etc.

The scheme of natural-agricultural zoning of Ukraine was developed step by step from the highest taxonomic units – natural-agricultural zones and mountain areas, to the lowest taxa – provinces, districts, including sub-districts, and agricultural districts. Natural conditions and land use characteristics were considered, primarily agricultural lands.

As a result of scientific research carried out in several stages, Ukraine's territory was divided into 5 natural-agricultural zones and 2 mountain areas, 19 natural-agricultural provinces, 33 natural-agricultural districts, including 1 sub-district, and 222 natural-agricultural regions. Each natural-agricultural taxon has developed an ecological-economic characteristic based on indicators presented in Table 1.

Table 1.

Indicators of the ecological and economic characteristics of natural-agricultural taxa*

№	The name of the indicator	The main elements characterizing the indicator
1	Climate (average multi-year indicators)	a) Distribution of precipitation by months and annually; b) Minimum and maximum annual precipitation amounts; c) Average annual air temperature; d) Sum of active temperatures (above +10°C); e) Hydrothermal coefficient according to Selyaninov (HTC); f) Duration of the growing season; g) Reserves of productive soil moisture at the beginning of the growing season; h) Number of days with droughts.
2	Geomorphology, relief, and hydrology	a) Territory belonging to specific geomorphological regions and their characteristic features; b) Main types of relief, their proportions, relief fragmentation, and surface drainage; c) Surface waters (river network);

Continuation of table 1

		d) Groundwater (depth of occurrence according to relief elements and mineralization).
3	Soil cover	a) Areas and specific weight of agricultural soil groups; b) Main properties and indicators of soils (humus content, profile depth; content of clay and silt; acidity - pH, etc.); c) Area and specific weight of degraded and low-productive lands within arable lands; d) Area and specific weight of particularly valuable lands.
4	Qualitative characterization of agricultural lands	a) Mechanical composition; б) Salinity; в) Solonetzic complexes; г) Acidity; г) Waterlogging; д) Peatiness; е) Stoniness (skeleton); е) Deflation; ж) Erodability.
5	Suitability of soils for cultivation of main agricultural crops	a) Scores of individual assessment of arable lands for placement of agricultural crops; б) Economic assessment of the efficiency of cultivating main agricultural crops.
6	Ratio of land use	a) Total land area; б) Total agricultural land area; в) Forest cover (area, specific weight); г) Optimization of land use structure.

** Note: The tabular data was compiled by the authors based on sources [206, 207, 208, 211]*

As a result of a detailed analysis of land zoning types it is advisable to establish agricultural zoning (Figure 2).

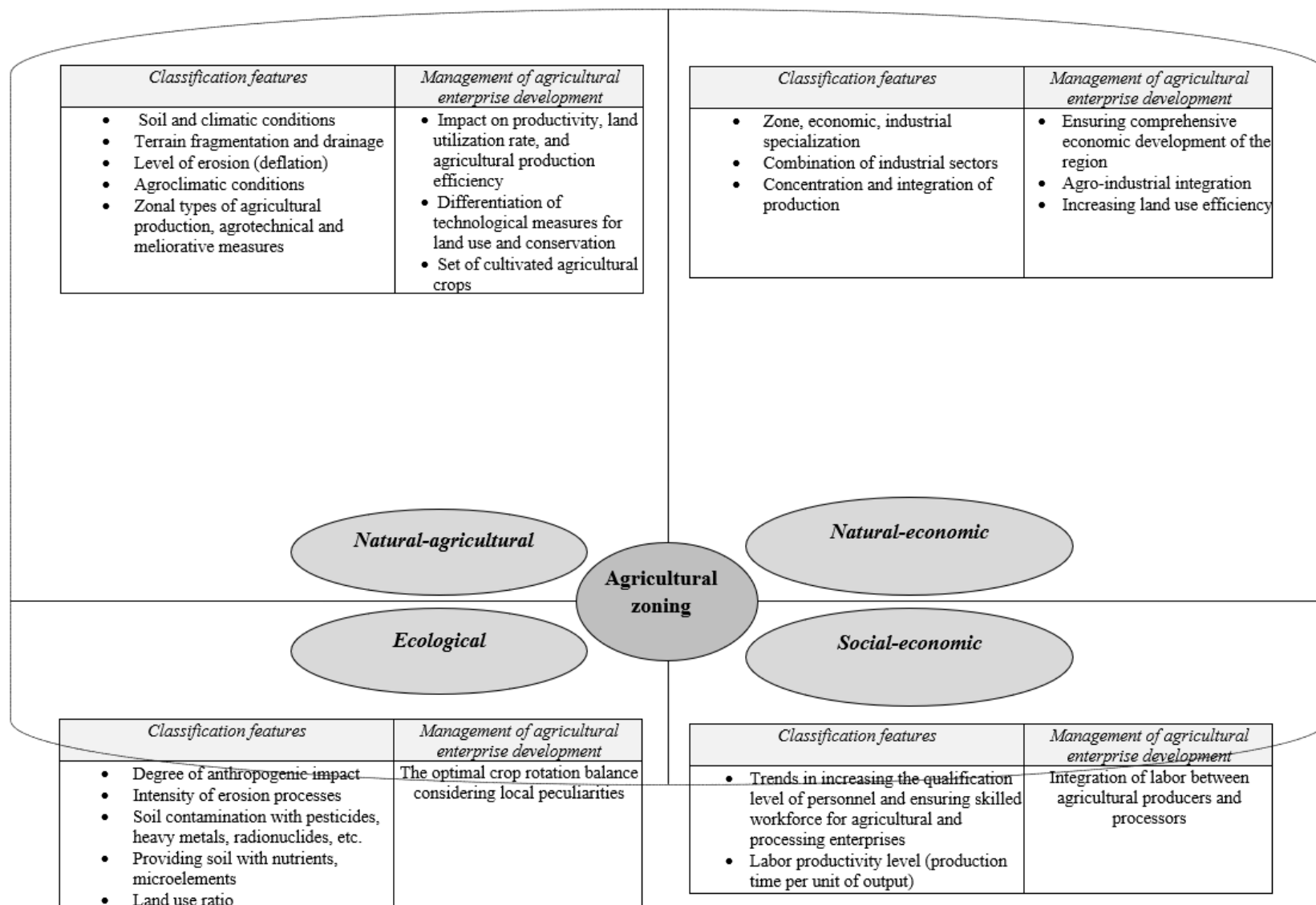


Figure 2. Component structure of agricultural land zoning and its impact on the management of agricultural enterprise development *

* Note: Developed by the author

In our opinion, agricultural zoning is a sectoral zoning of lands in the agricultural sector of the economy, based on natural-climatic, economic, and ecological indicators. It includes homogeneous land masses with corresponding production potential, levels of ecological-anthropogenic load, characterized by a certain ratio of land use, type of agricultural production, zonal specialization, labor efficiency level, and allows state authorities to identify potential production opportunities of agricultural enterprises.

The project of the Law of Ukraine "On Land Zoning," in accordance with the provisions of the Law of Ukraine "On the General Plan for the Planning of the Territory of Ukraine," proposes to include agricultural zoning, which we recommend subordinating in terms of defining territories mainly for agro-industrial production and rural development. Further developments in the regional land use and protection schemes should include agricultural zoning. Oversight of the implementation of provisions regarding the introduction of agricultural land zoning within the territory of individual agricultural enterprises is proposed to be entrusted to regional state administrations.

Agricultural zoning combines elements of natural-agricultural, natural-economic, ecological, and socio-economic character that influence the activities of agricultural enterprises, providing directions for their development management, and foreseeing the delineation of agricultural zones within the territory of administrative regions.

The boundaries of agricultural zones are formed taking into account the direction of economic land use in the agricultural sector. According to the land use belonging to the agricultural zone, agricultural enterprises are provided with information regarding zoned crops and crop rotations most suitable for cultivation on their territory, implementation of technological measures for land use and protection, the level of impact of these measures on the productivity and efficiency of land use by the enterprise. Considering the classification features of elements of ecological zoning that are part of agricultural zoning, restrictions are imposed on the cultivation of certain crops on the territory of agricultural enterprises, taking into account their local peculiarities and the optimal balance of crops in crop rotations.

Such economic indicators in farm organization as specialization, concentration, and integration of production, when applied skillfully, will contribute to increased land use efficiency of agricultural producers. Socio-economic classification features of agricultural zoning will allow determining labor productivity levels and integrating labor by raising the qualification level of the population through training provided by enterprises to ensure a skilled workforce.

Agricultural zoning should be defined as a mechanism of eco-economic land resource management, within which zones are delineated within administrative regions characterized by such classification features as land use ratio, erosion hazard coefficient, soil erosion, presence of areas contaminated with industrial waste, relative homogeneity of soil-climatic conditions of the territory, which affect the efficiency of using available land resources and the development of zonal types of agricultural production, taking into account the specialization of agricultural enterprises.

The agricultural differences in land resource management between the forest-steppe and steppe zones of Ukraine require the creation of a unified approach to the utilization of resource potential within modern land ownership and land use. For this purpose, it is envisaged to study the structure of land use and the state of land resources, based on which recommendations for effective and rational eco-economic land resource management within agricultural enterprises are proposed.

The current state of land resources (eroded arable land constitutes 81% of the total arable land area), processes negatively affecting land productivity levels (annually losing 740 million tons of fertile soil due to water and wind erosion, containing about 24 million tons of humus; erosion processes reduce the humus content in slightly eroded soils by 5-10%, moderately eroded by 25 – 30%, highly eroded by 35-40% compared to their full-profile analogs) lead to a decline in agricultural production. For example, the yield of grain crops in Ukraine in 1923 –1934 was 66 quintals/hectare, while today, taking into account the achievements of modern scientific and technical progress, it is approximately 50 quintals/ hectare. In our opinion, degradation phenomena are primarily caused by calculations regarding the optimal and permissible land use, which is determined by finding the best option for determining the areas and

structure of land use, taking into account land zoning indicators and bringing the areas of land use of administrative-territorial units to an optimal structure for the purpose of eco-economic land resource management and support of environmental stability of the territory [217].

Currently, an ecologically optimized land use structure for Ukraine has not been developed, although a hundred years ago Dokuchaev V.V. [218] proposed including the development of norms determining the relative area of meadows, arable land, forests, and water bodies among the most important measures for regulating the ecological balance in the steppe territories.

Today, various researchers converge on one point – recognizing the need to reduce agricultural development and land plowing through its optimization. However, they adhere to different viewpoints regarding the quantitative ratio.

Kozlov N.V. and Palapa N.V. [219] recommend bringing the ratio of forest:meadows and pastures:arable land:water to a level of 30:30:20:20, taking into account the experience of advanced countries in Western Europe and North America, where the plowed area is, for example, in England, France, Germany – 28 – 32%, in the USA – 15.8%.

Bavrovska N.M. and Martin A.G. [220] propose reducing the development and plowing of land in Ukraine through the conservation of degraded and low-productivity lands.

Sozinov O.O. [221] suggests evaluating the ecological state of agrolandscapes based on the ratio of arable land:natural fodder lands (meadows and pastures):forests at a ratio of 1:1.6:3.6.

Scientists Goyke E. and Ryborski I. [222] determine the ecological stability of agrolandscapes using coefficients: for forests – 1.0, pastures – 0.58, meadows – 0.62, arable land – 0.14.

In our opinion, these research findings cannot be used in optimizing land use in Ukraine because the coefficient for arable land of 0.14 was derived from studies of dissected landscapes of podzolic, mountain-podzolic, and heavily washed soils in Slovakia and for arable lands of Ukraine formed on full-profile chernozems of plain

plateaus, which is unacceptable.

In scientific research, Byallovich Yu.P. [223] establishes the optimal forest cover for the Forest-Steppe zone of Ukraine at 18%, and for the Steppe zone – 9%.

With the aim of researching and determining the optimal composition of land use for eco-economic land resource management, considering the indicators of agricultural land zoning, Sumy and Kharkiv regions were selected. These regions belong to powerful agricultural regions and have advantageous locations in relation to agricultural product markets.

Sumy and Kharkiv regions constitute the northeastern economic region of our country and are located within two natural-agricultural zones.

The boundary between the Polissia and Forest-Steppe natural-agricultural zones runs through the northwestern part of Sumy region (Fig. 3).

The following natural-agricultural districts are attributed to the Forest-Steppe zone: Hlukhivsky (03), Burynsky (04), Nedryhaylivsky (05), Lypovodyno-Bilopilsky (06), Trostianetsky (07), and Okhtyrsky (08).

Today, Sumy region is among the top ten most environmentally friendly regions of Ukraine. Clean areas are predominantly located in the northern part of Sumy region, while the rest of the territory is classified as moderately polluted. The most polluted areas by industrial waste emissions in Sumy region are the city of Sumy and Sumy district, as well as the lands surrounding the cities of Okhtyrka, Shostka, Konotop, and Romny.

In addition to natural-agricultural zoning, ecological zoning has been studied in Sumy region along two main directions: soil erosion across administrative districts, measured in tons per hectare per year, and pollution of territory by industrial waste.

As a result of the conducted research in the regions of the province, the following areas were identified: districts with increased soil erosion hazard (A), including Krasnopilsky, Trostyansky, Lypovodyolynsky, Okhtyrsky, Sumsky, Nedrigaylivsky districts of Sumy region, and districts with reduced soil erosion hazard (B) – the majority of Sumy region.

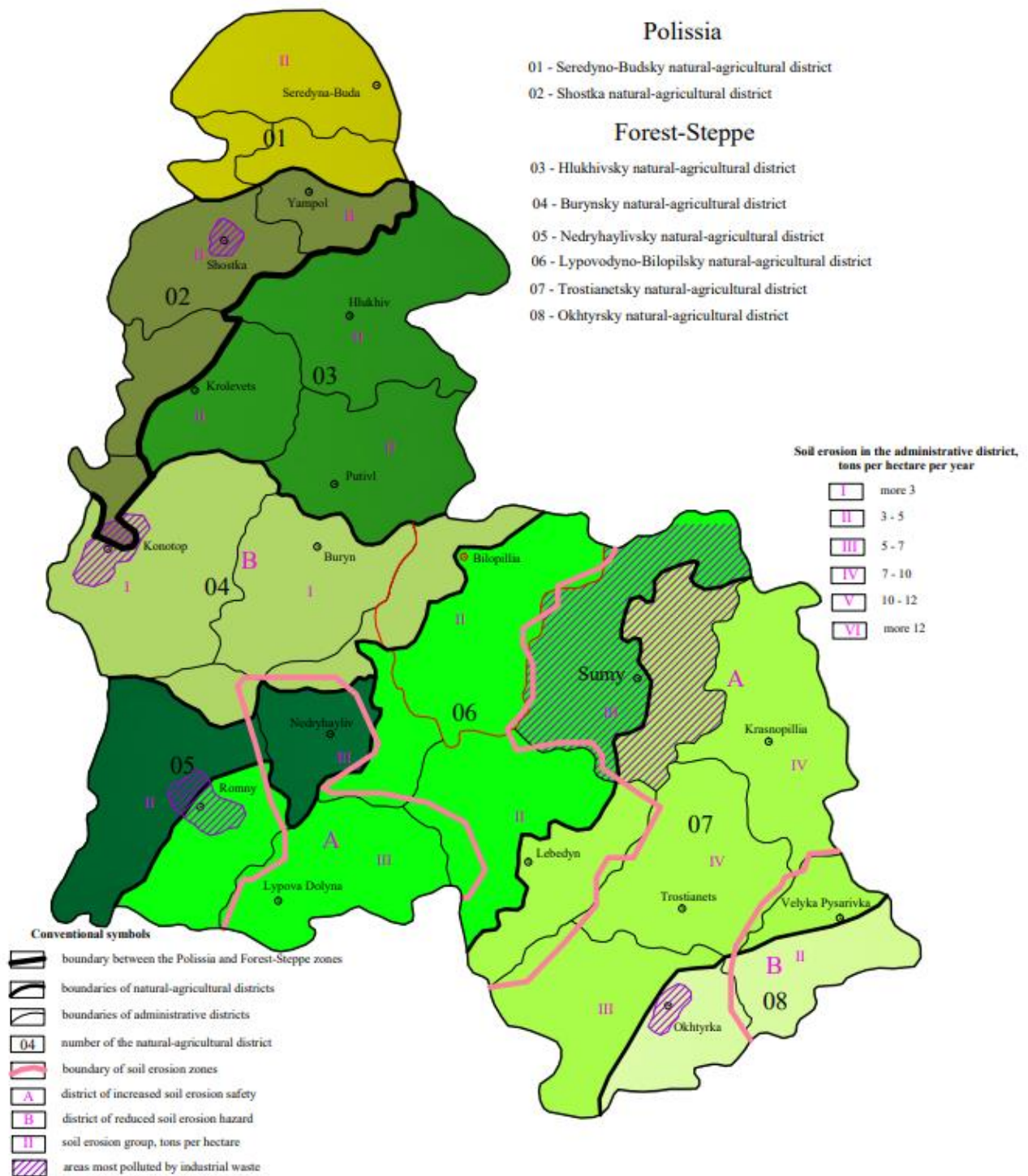


Figure 3. Diagram of agricultural land zoning and ecological zoning of Sumy region *

* Note: Developed by the author

The border between the forest-steppe and steppe zones divides the territory of the Kharkiv region almost in half (Fig. 4).

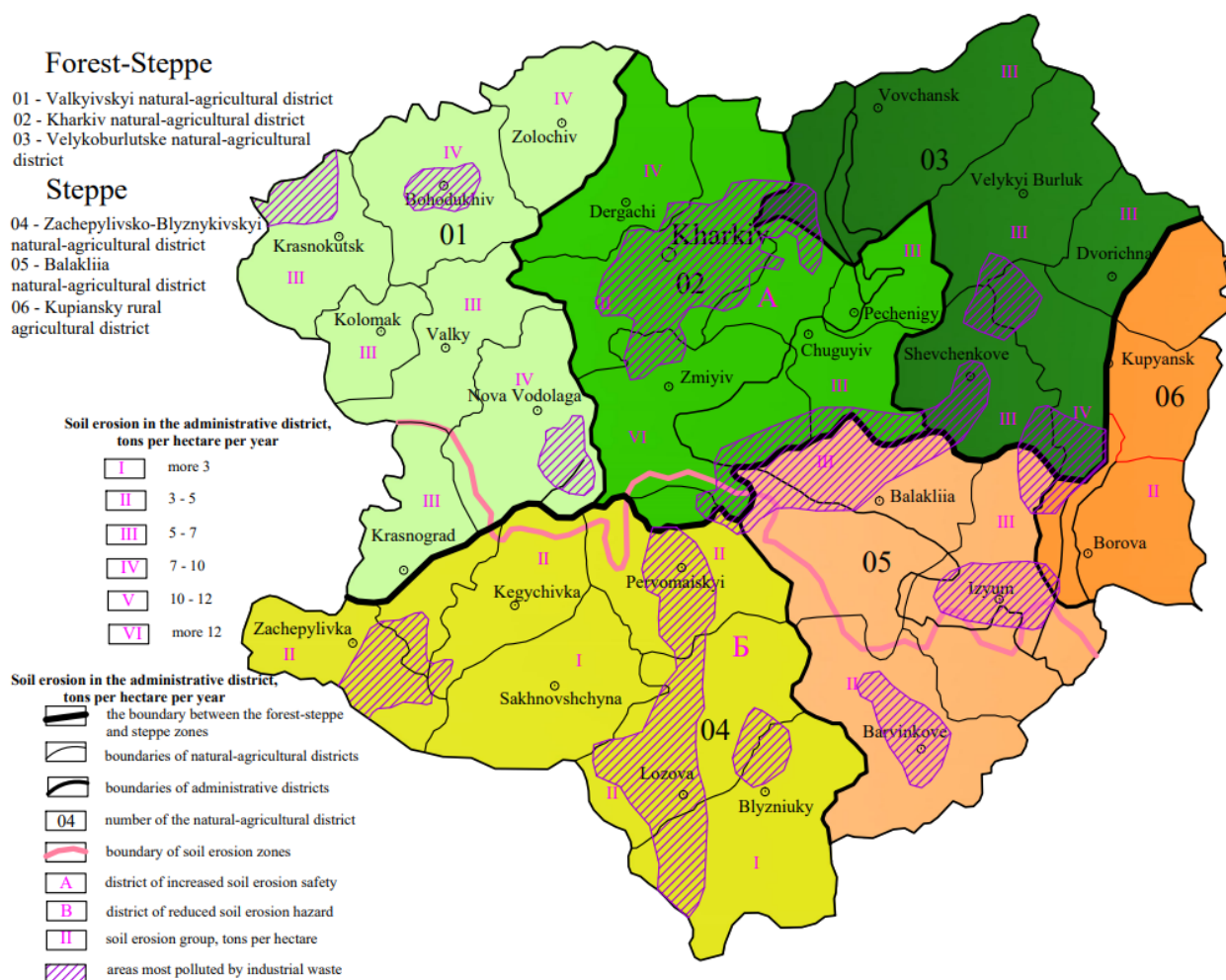


Figure 4. Scheme of agricultural zoning of lands and ecological zoning of Kharkiv region*

* Note: Developed by the author

In the Steppe zone are the Zachepylivsko-Blyzniukivskiy (04), Balakliyskyi (05), and Kupianskyi (06) natural-agricultural districts. As a result of the conducted research in the territory of Kharkiv region, areas of increased soil erosion hazard (A) were identified, including the Krasnokutskiy, Kolomatskyi, Valky, Novovodolazkyi, Zolochivskiy, Derhachivskiy, Zmiyivskiy, Chuhuivskiy, Pechenizkyi, Balakliyskyi, Izyumskiy, Vovchanskyi, Velykoburlutskiy, Dvorichanskyi, Kupianskyi, Shevchenkovskiy, and Boryvskiy districts, as well as areas of decreased soil erosion hazard (B). Kharkiv region belongs to a moderately polluted region. In the territory of Kharkiv region, polluted areas are located around the cities of Kharkiv, Bohodukhiv, Izyum, Barvinkove, Lozova, and Pervomaivskiy. Also, pollution affects the lands in the

northwestern part of Krasnokutskyi district, in the southeastern part of Novovodolazkyi district, to the northwest of the city of Balaklia, to the south and north of the village of Shevchenkove, in the western and eastern parts of Kupianskyi district, to the north of the village of Blyzniuky, and to the east of the village of Zachepylivka. Pollution is localized and associated with the activities of industrial enterprises, thermal power plants, and gas extraction.

Sumy and Kharkiv regions are also areas heavily contaminated with explosive hazards, mines, and missile debris as a result of Russian terrorist actions against the independent and democratic state of Ukraine.

In ecological-economic management of land resources of agricultural enterprises, it is mandatory to consider the impact of contamination with technical elements. For lands polluted with industrial waste, crop rotation of barley, oats, and peas is introduced (they cleanse the land and contribute to ecological balance).

The researched regions have a significant agricultural potential (they host highly developed scientific research institutions and educational establishments, with agricultural land occupying about 80% of the land fund).

Degraded, unproductive, and contaminated lands in Sumy region cover an area of 58.2 thousand hectares, while in Kharkiv region it is 57.1 thousand hectares. Nationwide, the total is 2339.2 thousand hectares.

According to the State Forest Resources Agency of Ukraine [224], the optimal forest cover for Sumy region is 20.00%, for Kharkiv region it is 15.00%, and nationwide it is 20.00%. In Sumy region, it is proposed to increase forest cover to 461.2 thousand hectares. In Kharkiv region, the optimal forest cover is set at 15.0%.

Current legislation in Ukraine provides for the establishment of a two-kilometer zone along the border with Russia and Belarus. Before the start of the full-scale war in 2022, these territories were occupied by agricultural land and partially by settlements. As of 2025, it is impossible to engage in agriculture or inhabit these territories due to constant terrorist shelling of the civilian population. Therefore, in my opinion, after the end of the war, it is advisable to clear these territories of explosive objects and reforest

them, which will increase forest cover to the optimal level and contribute to the ecological restoration of the area.

Important measures to optimize land use structure in both the researched regions and Ukraine as a whole should include withdrawing eroded and contaminated lands from cultivation, afforestation, or transformation into other land use types. This will help reduce the level of land degradation to an environmentally optimal level, establish the optimal ratio of land use types and recommended forest cover, and increase soil fertility.

Using the example of the researched areas - the territories of Sumy and Kharkiv regions - the boundaries of agricultural zones have been determined based on selected classification features of agricultural zoning, which influence the management of agricultural enterprises' development.

To define the boundaries of agricultural zones in the regions, it is necessary to take into account indicators such as soil-climatic and agroclimatic conditions, zonal types of agricultural production, zonal, production, and economic specialization, concentration and integration of production, intensity of erosion processes, soil pollution with industrial waste, ratio of land use, trends in increasing the qualification level of the population and providing agricultural and processing enterprises with qualified personnel, labor productivity level, and others.

An essential condition for ecological land management of agricultural enterprises is the application of environmentally safe technologies in crop production and checking the produced goods for compliance with state and international environmental standards.

The cultivation of environmentally friendly agricultural products by agricultural enterprises will be facilitated by adjusting the ratio of land use (arable land, natural fodder lands, forests, and other forested areas) within the agricultural zones to the optimal level by converting eroded, low-productive, and degraded arable land into hayfields and pastures, afforestation of lands, liming of acidic soils, and gypsum application to saline soils (Table 2).

Table 2.

The areas of conversion of arable land into natural fodder lands and forests, liming and gypsum application on the territory of agricultural zones of Sumy and Kharkiv regions, thousand hectares*

Agricultural zones	Land reclamation	Afforestation	Liming	Gypsum application
Sumy Region				
I	1,4	2,4	127,2	-
II	24,4	3,0	185,0	43,2
III	31,8	1,1	79,1	-
IV	0,7	0,13	8,7	3,2
Kharkiv Region				
I	1,4	22,5	18,2	-
II	0,1	1,4	51,4	-
III	1,2	21,1	12,4	-

* Note: calculated by the author

The actual and optimal ratio of land use within the agricultural zones of Sumy and Kharkiv regions is calculated (Table 3).

Table 3.

The actual and optimal ratio of land use within the agricultural zones of Sumy and Kharkiv regions*

Agricultural zones	The ratio of land use (arable land: natural fodder lands : forests and other forested areas)	
	Actual	Optimal
1	2	3
Sumy Region		
I	1 : 0,64 : 0,89	1 : 0,67 : 0,94
II	1 : 0,34 : 0,13	1 : 0,39 : 0,14
III	1 : 0,32 : 0,40	1 : 0,46 : 0,44
IV	1 : 0,28 : 0,14	1 : 0,29 : 0,15
Kharkiv Region		
I	1 : 0,21 : 0,18	1 : 0,22 : 0,21
II	1 : 0,27 : 0,29	1 : 0,28 : 0,30
III	1 : 0,19 : 0,04	1 : 0,20 : 0,08

* Note: calculated by the author

On the territory of agricultural enterprises within the agricultural zones, measures of economic and ecological land resource management are proposed: cultivation of agricultural products that meet international and state quality standards and are competitive in both external and internal markets; preferential taxation of producers of environmentally friendly products; economic incentives for rational land resource use.

Economic incentives for rational land resource use include providing tax and credit benefits for implementing measures according to regional land use and conservation programs, allocating funds from state and local budgets to legal entities and individuals for restoring the previous state of land damaged through no fault of their own, exemption from land payments for land plots under development and restoration of their fertility according to national and regional land use and conservation programs, compensation for legal entities and individuals for land plots subject to conservation or inclusion in the national state reserve fund. Economic incentives entail cost savings for agricultural enterprises through reduced expenses on ecological measures by withdrawing eroded land areas from intensive use within the agricultural enterprise, through exchange for non-eroded land. Soil erosion on the territory of agricultural zones and the cost of 1 ton of humus are presented in Table 4.

Table 4.

Soil erosion, calculated in tons per hectare per year, and the cost of one ton of humus, in US dollars, within the agricultural zones of Sumy and Kharkiv regions *

Agricultural zones	Soil erosion, tons per hectare per year	Cost of one ton of humus, US dollars
Sumy Region		
I	3 – 5	200
II	до 5	200
III	5 – 10	200
IV	3 – 5	200
Kharkiv Region		
I	5 – 10	200
II	3 – 7	200
III	до 5	200

* Note: Formed by the authors

The acquisition of land for the purpose of its transformation into other land uses should be carried out by local state administrations upon the directive of the departments of state control over land use and protection, which identify eroded lands. If there is no ownership or land use right registered for the land plot within which the lands subject to transformation are located, the department of state control over land use and protection, upon receipt of the directive from the local state administration (based on the location of the land plot), must initiate the corresponding transformation activities within 30 days. If there is ownership or land use right registered for the land plot or its part within which the lands subject to transformation are located, the department of state control over land use and protection, together with the territorial bodies of the State Geocadaastre of Ukraine, must offer the owner or user an equivalent land plot that is subject to withdrawal (conduct land plot exchange at the normative monetary evaluation according to Article 132 of the Land Code) from the land reserve, reserve fund, or from unused land plots (shares) based on the location of the withdrawn land plot. If the landowner disagrees with the exchange, the withdrawn agricultural land plot must be repurchased at the expert monetary evaluation according to Article 5 of the Law of Ukraine "On the Alienation of Land Plots, Other Real Estate Objects Located Thereon, in Private Ownership, for Public Needs or for Reasons of Social Necessity". Losses incurred by the owner and user as a result of land plot withdrawal must be compensated in accordance with the Resolution of the Cabinet of Ministers "On the Procedure for Determining and Compensating for Losses to Landowners and Land Users". We recommend that the Ministry of Agrarian Policy and Food of Ukraine legislatively establish these provisions and adopt the Procedure for the Transformation of Lands located on eroded and contaminated lands.

The withdrawn land plots are transferred to state ownership and form the national state reserve fund within the designated administrative-territorial unit, which will contribute to protecting the agricultural land market from monopolists.

Conclusions. In our opinion, management of agricultural land resources of agricultural enterprises should be considered as an activity in agricultural production aimed at providing the population with food and other sectors of the national economy

with raw materials at an optimal level of capital investment in resources and their maximum return while adhering to environmental goals and programs to ensure compliance with norms and requirements for the rational use of agricultural land with the aim of obtaining environmentally friendly crop and livestock products while simultaneously conserving natural resources.

When introducing research into production, it is taken into account that ecological zoning imposes restrictions on the cultivation of certain crops, taking into account local characteristics. It is proposed to introduce oat and pea crops into crop rotation on contaminated lands, which provide ecological balance and contribute to the purification of lands from harmful elements.