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CONCEPTUAL PRINCIPLES OF FORMATION OF THE SYSTEM OF RATIONAL AGRICULTURAL LAND USE

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Abstract. *The article analyses the current state of agricultural land use in Ukraine, which is characterized by extremely high levels of ploughing of agricultural lands, violation of scientifically substantiated crop rotation, and hence significant anthropogenic pressure on the soil, which in turn increases the intensification of degradation.*

The conceptual bases of formation of the system of rational agricultural land use in the conditions of transformation of land relations are substantiated. It is proved that such systems should be formed at the national, regional and local levels based on the principles of environmental friendliness, adaptability, biogenicity, variability, etc. using a landscape approach to the organization of agricultural enterprises. To ensure the conservation of soil resources and zero level of degradation processes, the main block of such systems, their basis should be soil protection and reclamation of the territory.

Only land management should be considered as the main mechanism for the formation of a system of rational agricultural land use, and therefore the process of its formation at the national level should be carried out through the development and implementation of the National Land Use and Protection Program; at the regional level – through the development and implementation of regional land use and

protection programs; at the local level – through the development and implementation of relevant land management projects.

Keywords: *agricultural land use, system, degradation processes, soil protection and reclamation landscaping.*

Problem statement. Sustainable development of rural areas, food security, high competitiveness of national agricultural producers, preservation and reproduction of natural resource potential, and above all, the main means of production in the agricultural sector of the economy – land, inextricably linked with the formation of rational agricultural land use. At the same time, currently used methods of agricultural production often lead to the spread of degradation processes, the destruction of agrarian landscapes and, as a result, reduce the economic efficiency of the vast majority of agricultural producers.

According to the State Statistics Service of Ukraine, in the current structure of agricultural land almost 80% is arable land and only 20% – ecologically stable land [16], which clearly does not meet the principles of environmental management and causes intensive degradation processes. In addition, the National Economic Strategy for the period up to 2030, approved by the Resolution of the Cabinet of Ministers of March 3, 2021 №179 states that "*due to human activities, namely the principles of agriculture, Ukraine already has about 6.5 million hectares of arable land lands that arose due to depleting land use in the form of excessive agricultural cultivation*" [12]. Further use of such lands in intensive agricultural circulation is not only economically impractical, but also environmentally unsafe.

In this regard, the development and substantiation of updated conceptual foundations for the formation of a system of rational agricultural land use is relevant.

Analysis of recent research and publications. Scientific and methodological principles of forming a system of rational land use in terms of reforming land relations are revealed in the works of such scientists as S.Y. Bulyhin, D.S. Dobriak, O.P. Kanash, V.M. Kryvov, V.V. Medvediev, V.F. Saiko, A.Y. Sokhnych, O.H. Tarariko, A.M. Tretiak and others. All these authors are unanimous in stating

that to ensure the rational use of land resources, it is necessary to harmonize socio-economic and environmental factors of rural areas on the basis of a landscape approach to the arrangement of the latter.

In particular, according to A.M. Tretiak and V.M. Tretiak (2021) "*the land use system should be understood as an integrated multifunctional socio-economic and natural system, and an important institution and mechanism for forming and regulating its functioning is land management*" [19].

Exploring the conceptual foundations of land management as a system of state land policy for sustainable development of civil society, A.M. Tretiak (2013), argues that "*governments of all countries should take into account environmental, social, demographic and economic factors, and then develop laws, administrative regulators and economic incentives that encourage the rational use and management of land resources*" [18].

M. Stupen and N. Stoiko (2010) note that the problem of "*rationalization of land use in terms of private ownership of land should be addressed comprehensively, taking into account economic, social, environmental and organizational and legal aspects of land use and protection*" [17].

O.S. Dorosh notes that "*for the development of an effective market-oriented land use system today the ecological and landscape component of the content of land management should be prioritized*", which is currently significantly underestimated and thus not properly addressed the fundamental "*task of land use – improving landscape sustainability, productivity and fertility of lands, overcoming food shortages*" [8].

Despite the rather in-depth study of this problem, the dynamic processes in the study area, especially in relation to agricultural land use, necessitate the development of updated theoretical and methodological principles of rational land use and substantiation of methodological approaches to the implementation of soil protection and reclamation measures to increase the ecological sustainability of agricultural landscapes, taking into account soil, climatic and geomorphological conditions of specific rural areas.

The purpose of the article – substantiate the conceptual basis for the formation of a system of rational agricultural land use in the transformation of land relations, the introduction of market circulation of agricultural land, decentralization of power and global climate change.

Materials and methods. Scientific analysis – in the study of theoretical and methodological foundations related to the formation of a system of rational agricultural land use; monographic analysis – for the research of domestic and foreign scientific publications on the scientific basis for the formation of a system of rational agricultural land use; abstract-logical – to clarify the essence of the basic concepts, definitions and categories in the field of agricultural land use, as well as for conclusions.

Main Material. Land use as a method and form of land use, according to the principle of systematization, is one of the subsystems of the nature management system, so all measures aimed at rational use of land resources in general and in agriculture in particular, should be implemented within environmentally safe, economically viable and socially oriented use of natural resources, including water and forest, which, together with soil resources, form a single ecosystem - the Earth. Therefore, the formation of a system of rational agricultural land use should be considered in the context of conservation and reproduction of other natural components, given that the degradation of water and / or forest resources will inevitably lead to deterioration and destruction of soil cover, which forms the basis of modern agricultural landscapes. The close relationship of these components of the Earth ecosystem necessitates a comprehensive approach to solving this problem, in particular by agreeing on the National Program of Land Use and Protection and the relevant Programs of Use and Protection of Other Natural Resources, harmonization of norms of the Land, Water and Forest Codes and other normative legal acts. The comprehensiveness of the approach should be ensured by the availability of norms, rules and regulations in the field of land management and land protection, which provide not only for "*the establishment of environmental standards in regulatory and technical documents, but also technical regulation of land use and environmental*

measures", the obligation to comply with which are "*regulated by land, environmental and urban law*" [6].

The key mechanism for the formation of a system of rational agricultural land use is land management, which provides: "*forecasting, planning and organization of rational use and protection of land at the national, regional, local and economic levels; organization of the territory of agricultural enterprises, institutions and organizations in order to create spatial conditions for ecological and economic optimization of use and protection of agricultural lands, introduction of progressive forms of land management, improving the structure and location of land, sown areas, crop rotation and pastures*" [13].

At the same time, land management acts both as a tool that provides interaction between the main components of the land use system and the system (complex) of relevant measures: "*socio-economic and environmental, aimed at regulating land relations and rational organization of administrative-territorial units carried out under the influence of social and industrial relations and the development of productive forces*" [13]. Therefore, land management support for the formation of a system of rational agricultural land use is almost the main component of the latter. After all, "*rational use of land resources is based primarily on approaches to their differentiated (separate) use*", which "*necessitates land zoning, ie division of land into areas of different order with established permissible types of use and certain restrictions*" [7].

In view of this, the formation of a system of rational agricultural land use should be carried out at 3 levels: national – through the implementation of the National Program of Land Use and Protection, which "*determines the composition and scope of priority and future land protection measures, as well as works on their implementation*" [15]; regional – through the implementation of regional land use and protection programs, which are "*developed in accordance with the national program taking into account local characteristics*" [15]; local – through the implementation of land management projects for the organization of agricultural enterprises, which must combine the composition and content of at least two existing types of land

management documentation: "*land management projects for the organization of land shares and land management projects for justification of crop rotation and landscaping*" [13].

The main principles of building a system of rational agricultural land use should be: environmental friendliness, which prioritizes the requirements of environmental safety in the economic activities of land users over their economic interests, adaptability – consideration of natural, social and economic conditions of rural areas in planning and implementing economic activities, biogenicity – broad use of elements of naturalisation of agriculture in the practice of agricultural production and variability – development of a system of agricultural land use on a multivariate basis with the possibility of choosing the most optimal option for agricultural producers. Adherence to these principles will allow to move from the concept of excessively intensive use of land resources of rural areas, as a result of the practical implementation of which degradation processes have significantly accelerated in terms of soil cover and the environment in general, to the concept of rational nature and land use based on preservation and reproduction and high productivity of agricultural landscapes.

In order to practically implement the principle of biogenicity in the process of forming systems of rational agricultural land use, updated scientific and methodological approaches to the development of experimental land management projects for the organization of state research institutions and enterprises for organic production are proposed. According to O.S. Dorosh and co-authors (2020), "*the main feature of such projects is the assessment of the suitability of arable land for organic production, the location of buffer zones between areas of organic and inorganic land use, crop rotation according to organic farming standards and labelling of agricultural products. and food*" [9].

In accordance with these principles, the main blocks (modules) of the system of rational agricultural land use should include:

Block (module) №1 – **soil protection and reclamation landscaping,** which in practice is implemented using elements of contour and reclamation organization of

land use: anti-erosion hydraulic structures, water regulation and protective forest strips, etc., and provides reliable protection of soil cover. In addition, these permanent measures form the spatial structure (framework) of environmentally sustainable agricultural landscape.

The problem of soil protection from erosion should be considered at least on two levels: strategic (conceptual) and tactical (design). Solving this problem at the first level requires a differentiated quantitative assessment of the development of erosion processes and their danger and the degree of implementation throughout the country. This will allow to scientifically substantiate the priorities for anti-erosion measures by region, to determine the relevant areas of investment policy. Strategic planning of erosion protection of rural areas is carried out through the development of conceptual models of soil protection and reclamation of agricultural landscapes in accordance with the severity of the problem of erosion and resource and staffing. Strategic plans should be implemented in the practice of agricultural production through the development and implementation of National Programs and General Schemes of anti-erosion management of agricultural landscapes, enshrined in law with a planning period of 20-30 years [4]. The content of the organization of erosion protection of agrarian landscapes at the tactical level is the development and implementation of projects for erosion management of rural areas. This level involves the performance of all works using engineering methods on a quantitative basis, taking into account the probability of erosion processes and the corresponding degree of reliability of the designed erosion protection.

Block (module) №2 – **optimal land structure**, which is based on a scientifically substantiated ratio of arable land and ecologically stable lands in agricultural landscapes and provides the normative level of anthropogenic footprint on land resources, zero level of soil degradation and high environmental agroecological sustainability. By the way, “improvement of the country's land structure, restoration of anthropogenically altered ecosystems, introduction of sustainable land use and achieving a neutral level of land degradation” is provided by the National Economic Strategy of Ukraine until 2030 among the ways to achieve the Strategic Goal №10

“State policy in the agro-industrial sector for environmental protection and management of natural resources in agriculture” [12].

In addition, in order to preserve landscape and biological diversity, the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the period up to 2030 determine “*the increase and expansion of nature reserves (including protected areas in national nature parks and regional landscape parks), creation on land and in the Black and Azov Seas and ensuring the preservation and functioning of a representative and effectively managed system of territories and objects of nature reserves, including ones of cross-border, European and international importance*” [14].

However, the norms of the optimal ratio of land provided for in paragraph 4 of part 1 of Article 30 and paragraph 2 of part 2 of Article 33 of the Law “On Land Protection” are not legally established and are currently of a recommendatory nature.

Block (module) №3 – **optimal structure of sown areas**, which is based on a scientifically substantiated ratio of crops in crop rotations and is aimed at ensuring an acceptable level of technological load on land resources, preservation and reproduction of soil fertility.

Bringing the structure of sown areas to optimal parameters allows to harmonize economic and environmental factors in the process of ensuring the most efficient use of bioclimatic potential of rural areas, as it is the least resource consuming and environmentally friendly means of increasing productivity of agricultural landscapes. However, the transformation processes in the agricultural sector of our economy, mainly due to market conditions in combination with neglect of environmental safety requirements, led to a significant increase in the share of highly profitable crops of the technical group (from 15.4% in 2000 to 32.8% in 2020) and reducing the area under forage crops (4.4 times over a 20-year period), in particular, under perennial grasses, which are the basis of soil-protective crop rotations (3.6 times) [16]. Shifting the balance in the structure of sown areas in favour of intensive crops, as confirmed by the practice of agricultural production in the previous period and now, significantly accelerates degradation processes: in sloping areas – water erosion, in

the plains – dehumidification and depletion of root soil. That's why most agricultural producers are unable to recover nutrients extracted from the soil during crop formation by applying scientifically sound standards of organic, mineral or organo-mineral fertilizers [2].

Considering this, the process of formation of the optimal structure of sown areas at the appropriate levels (national or regional) should be guided not only by market-driven (economic) factors, but also social and environmental factors. For the actual implementation of this principle, D.S. Dobriak and co-authors (2007) propose to plan the area of agricultural crops "*taking into account the class of suitability of arable land for their cultivation*" [5].

From an economic point of view, it seems appropriate to give preference to high-margin crops (in particular, vegetables). As stated in the National Economic Strategy of Ukraine for the period up to 2030 "*currently the structure of crop production is dominated by low-margin crops (89 percent of the area under crops), which leads to lower profits than it is possible to obtain from sales of high-margin crops*" [12]. In terms of ecology, perennial legumes and continuous crops should be preferred to enhance the soil protection efficiency of crop rotations and reproduce the quality of land. In addition, these crops are associated with the proper functioning of the fodder base for livestock. In view of this, the formation of the structure of sown areas should take into account both socio-economic and environmental factors of rural areas, which in practice can be done through the development and implementation of land management projects providing environmental and economic justification of crop rotation and landscaping [13].

Block (module) №4 – **soil protection technologies for growing crops**, the basic component of which is tillageless cultivation, and which, due to the preservation of plants or their remains on the soil surface, provides additional protection of soil cover from degradation processes, and due to optimization of humification processes – reproduction of soil resources.

In addition, the norm of paragraph 4 of Article 35 of the Law "On Land Protection" states that owners and land users, including tenants in their economic

activities must: "*increase soil fertility and preserve other useful properties of land through the use of environmentally friendly tillage technologies and techniques, implementation of other measures that reduce the negative impact on soils, prevent the irreversible loss of humus, nutrients, etc.*" [15].

In general, it should be noted that the formation of a system of rational agricultural land use at the level of a specific rural area should be carried out through the implementation of a set of soil protection and reclamation measures provided by relevant land management projects. The process of developing such projects, along with general principles (use of engineering methods in project work, in particular: quantitative calculation basis with erosion risk assessment and ensuring the appropriate degree of reliability of the designed agricultural landscape [3], should include a detailed study of natural and social economic features of specific rural areas.

In particular, in the plains of Kyiv Polissia under the conditions of variegated soil cover in the process of designing land protection measures should dominate not relief, but agro-ecological grouping of lands under cultivation by establishing their suitability for growing cereals, legumes or industrial crops. In this case, the principle of adaptability is consistent with the preference for cultivated plants tolerant of acidic soil environment, and relatively undemanding to the level of soil fertility (winter rye, potatoes, lupine) [1]. On the other hand, underestimation of the importance of reclamation measures on acidic lands leads to an annual shortage of crop products in the amount of 2 million tons of grain units [10]. In the sloping areas of Kyiv Forest-Steppe, with a total potential soil erosion of 54-55 t/ha [11], the key is the introduction of anti-erosion organization of the territory, with linear boundaries and working areas that form fields of crop rotation.

Conclusions. The current state of land use potential in the agricultural sector of Ukraine does not meet the principles of rational nature management due to the use of arable land in active agricultural circulation, violation of scientifically substantiated ratio of land in the structure of modern agricultural landscapes, non-compliance with crop rotations, inadequate state control of land use and protection.

In order to form a system of rational agricultural land use, it is necessary to ensure the harmonization of environmental, economic and social factors of sustainable development of rural areas. In the ecological sense, such a system should provide at least soil protection and reclamation landscaping of agricultural enterprises, optimization of the structure of land and sown areas, the introduction of soil protection technologies for growing crops. At the local level, the implementation of these measures should be carried out through the development and implementation of land management projects for the organization of agricultural enterprises, which in turn requires their inclusion in an exhaustive list of land management documentation, enshrined in Part 2 of Article 25 of the Law of Ukraine “Om Land Management”.

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КОНЦЕПТУАЛЬНІ ЗАСАДИ ФОРМУВАННЯ СИСТЕМИ РАЦІОНАЛЬНОГО СІЛЬСЬКОГОСПОДАРСЬКОГО ЗЕМЛЕКОРИСТУВАННЯ

Анотація. *У статті проаналізовано сучасний стан сільськогосподарського землекористування в Україні, яке характеризується надзвичайно високим рівнем розораності сільськогосподарських угідь, порушенням науково обґрунтованого чергування сільськогосподарських культур, а отже, значним антропогенним навантаженням на ґрунтовий покрив, що в свою чергу посилює інтенсифікацію деградаційних процесів і спричинює зниження продуктивності аграрних ландшафтів.*

Обґрунтовано концептуальні засади формування системи раціонального сільськогосподарського землекористування в умовах трансформації земельних відносин. Доведено, що такі системи мають формуватися на національному, регіональному та місцевому рівнях на основі принципів екологічності, адаптивності, біогенності, варіативності тощо з використанням ландшафтного підходу до організації території сільськогосподарських підприємств. Для забезпечення збереження ґрунтових ресурсів і нульового рівня деградаційних процесів основним блоком таких систем, їхньою основою (фундаментом) має бути ґрунтозахисно-меліоративне упорядкування території.

В якості основного механізму формування системи раціонального сільськогосподарського землекористування слід розглядати лише землеустрій, а тому процес її формування на національному рівні потрібно здійснювати через розробку і реалізацію Загальнодержавної програми використання та охорони земель; на регіональному - через розробку і реалізацію регіональних програм використання та охорони земель; на місцевому – через розробку і реалізацію відповідних проектів землеустрою.

Ключові слова: *сільськогосподарське землекористування, система, деградаційні процеси, ґрунтозахисно-меліоративне упорядкування території.*