

## MARKET MECHANISMS OF SPACIOUS ORGANIZATION OF LAND RESOURCES - A CASE STUDY IN CHERNIVTSI DISTRICT, UKRAINE

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### Abstract

*The purpose of this research is to study the market mechanisms of spatial organization of land resources on the basis of the development and implementation of a system of crop rotation on arable land, and ways of forming plant communities on forage lands. The systematic approach to sustainable development is the leading methodology of territorial organization of land use and environmental protection. The technique of creating a sustainable agro-landscape through the formation of an ecologically adapted organization of agricultural land is proposed. The mechanism of spatial organization of land resources is carried out in accordance with the pro-posed methodologies: the composition of crop rotations and grass mixtures is correlated with the corresponding agro-economic group. The technique was tested on the territory of Chernivtsi district of Vinnytsia region. The article provides an overview of the historical development and state of implementation of concepts and tools for land-use planning and land-use management for land resources and landscapes, and pro-vides recommendations for future action. These issues are especially relevant for agricultural land, as well as for other categories of land subject to anthropogenic loading in the conditions of agrarian production extensification and modern globalization challenges. It is proposed to define the spatial system of organization of land resources as a functional, structural transformation, which implies a certain placement of components of the natural, social and economic environment in space and its spatial indivisibility. In this case, the main role is given to land resources, namely agricultural land.*

*It has been proven that agricultural land use planning and, more broadly, land planning are tools for achieving sustainable and efficient use of resources, taking into account biophysical and socio-economic dimensions. In order to solve this problem, mechanisms of spatial organization of land resources have been developed using the example of Chernivtsi district. The ecologically adapted area of crops' sowing of Chernivtsi district, Vinnitsa region is calculated.*

**Key words:** land resources, spatial planning, landscape, efficiency, land-use optimization, agricultural land

### INTRODUCTION

Land, as a space for living and productive activity, is an extremely valuable resource and an important component of the environment. Territorial organization of agriculture land use and environmental protection include the organization of land use in multi-sectoral relations that combine economic development with environmental protection [5]. The implementation of the territorial organization of land use is necessary in order to optimize the natural and socio-economic potentials of efficient, environmentally-safe use of available resources while preventing environmental pollution. The urgency of this is increasing in the face of today's global challenges, namely changes in the world market. Accordingly, market mechanisms significantly affect the

spatial organization of land resources of agriculture.

In order to evaluate the market mechanisms of of the territorial organization of land resources, various domestic and foreign methods have been developed and applied, based on taking into account the influence of external and internal factors. We considered that each of these techniques takes into account the ability to assess the various components of land transformation, the most common among which are economic, environmental and social factors. Achieving an effective balance between them is an extremely difficult process that requires continuous improvement.

The scientific works of many domestic and foreign scientists [1; 3; 4; 9; 10; 19] are devoted to the issues of development of land-use planning and influence of market tendencies on these processes. There are

different scientific approaches to understanding the nature of spatial land planning, the interaction of its components, both at the regional level and beyond [6]. A considerable number of scientists have dedicated their own researches to these issues. Scientists' attention is focused on agricultural land use planning and greening of land use. Thus, Antonets S.S. investigated the regional aspect of agricultural biology: research directions, achievements and prospects [1]. Atamanyuk O.P. carried out the analysis of land management in the village council during the completion of the land reform [2]. Boyko L.M. explored the specifics of regulation of land relations in agriculture [3]. Haydutsky P.I. studied the balanced development of the agro-sphere: an environmental dimension of the impact of public consciousness [9]. Galushkin T.P. investigated the role of land resources in economics and ecology [7]. Gutorov O.I. studied the problems of sustainable land use in agriculture [8]. Kalenska O.V. explored the features of the use of low-productive and degraded land: problems and prospects; agro-landscapes: concepts, subjects and factors of transformation [10]. Kravchenko M.S. investigated spatial planning in agriculture and market mechanisms of spatial organization of land resources [11]. Zubets V.M. developed the scientific foundations of agro-industrial production in the Polesie region and the western region of Ukraine [14]. Sabluk D.T. developed approaches to the greening of agro-industrial production – the defining component of modern agrarian policy [13]. Sinyakevych I. explored the concept of greening the development and planning of the territory [15]. Stepenko O.V. studied market mechanisms of spatial organization of land resources [18]. Voityuk V.D. investigated the organizational mechanism of agricultural production with limited land resources [20].

Most approaches to spatial planning are based on the fact that any system is in a constant state of interaction within its own environment. The system is considered as a complex of interacting elements [6]. The territorial system is a collection of specially combined elements

and structural interrelations that have a spatial character [3].

In spatial organization of land resources, attention should also be paid to the interdependence of the complex elements of regional spatial development and rational land use, emphasizing the purpose of their functioning in the process of ensuring their balanced growth [6]. The study of domestic and foreign studies suggests that the spatial system of land resources should be understood as a functionally-complex, structural transformation, which involves a certain placement of components of the natural, social and economic environment in space, its spatial indivisibility [10]. The main role is given to land resources, namely agricultural land.

At the same time, a considerable number of issues related to market mechanisms for spatial organization of land resources need further investigation.

Distinguishing previously unsolved parts of the general problem.

Taking into account that leading positions among Ukraine's land resources occupy agricultural land, it has been, it is and will be very important to develop the constituent mechanisms for the spatial organization of agricultural land resources [7].

The goals of our article are the next: to study of the basic market mechanisms of spatial organization of agricultural land; to identify the influence of positive and negative external factors on the spatial organization of agricultural land resources.

## **MATERIALS AND METHODS**

In this paper, the following methods, particularly the method of comparative analysis, abstract-logical, statistical-economic method have been used.

Creation of sustainable agro-landscape and spatial organization of land resources is carried out at the expense of ecologically adapted organization of agricultural land. Its main components are the development and implementation of a system of crop rotation on arable land and ways of forming plant groups – on forage lands.

The marginal area of sowing of a particular crop is calculated by the formula:

$$P = \frac{P_{total}}{T},$$

where:

$P$  - boundary area of crop;

$P_{total}$  - the total area of arable land suitable for cultivation;

$T$  - is the period of return of the crop to the previous place.

Investigating the spatial organization of land resources, it was found that the main methods of research include: field surveys; analysis of samples of environmental components; mapping, remote sensing and GIS. Integrated and interdisciplinary surveys were conducted along passageways between major relief types and characteristic production areas. Soil, water and air samples are analyzed to assess the state, spatial and temporal changes in the quality of the environment in the study area or region.

Display, remote sensing and GIS methods have been used at various stages of the research process to represent the distribution and relationship between natural and socio-economic components.

## RESULTS AND DISCUSSIONS

The spatial organization covers a wide range of issues related to the territorial division of labor, the location of production forces, the place of the region in the national and international division of labor, regional differences in economic relations, socio-economic and environmental development [6].

Spatial development of the country and available land resources is carried out through regional policy, the implementation of which is aimed at solving problems of local self-government on economic, social, environmental, administrative, organizational and other issues that take into account national and local interests [19]. Considering territorial development through the prism of interconnection of components of the regional spatial land and economic system, scientific literature focuses on the combination of priority prerequisites for its development [6]. And so, some scientists point out the interdependence and integrity of economic and

environmental objects in this territory, taking into account natural resources and labor potential [9].

The environmental component in the conservation, restoration and protection of natural ecosystems makes an important contribution to the balanced development of regional spatial and economic land use systems [6]. The available resources of the territory, according to scientists, form a valuable reserve, which is used when it is needed to solve problematic issues. At the same time, resources as well as prerequisites for the development of the regional spatial and economic system are divided into natural-historical, cultural, demographic, socio-economic, which should be considered through the prism of the geographical location of the territory, which is a universal resource and whose importance increases over time, especially in view of the usefulness of local location [1; 3].

A systematic approach to sustainable development is a leading methodology for territorial organization of land use and environmental protection. A system is a set of factors that interact with one another and with the environment [8]. Any system is part of a higher-level system. There is a mutual connection between these systems. Each system is structurally complete and unified. Therefore, when acting on a system component, its other components also change, leading to changes in the system as a whole. Analyzing geo-systems, it should be noted that they are formed by the interrelationship between natural factors (geological, climatic, biological, etc.), socio-economic factors and forms of exploitation and use of natural resources (industrial and agricultural). Each natural system is fully and functionally unified, performing economic, administrative, environmental, social and other functions.

The approach to sustainable development and the spatial organization of land resources requires a harmonious combination between socio-economic development and environmental protection [6], in particular to achieve the following goals: effective economic development, addressing existing food problems; raising living standards;

pollution prevention and environmental friendliness.

Exploring the spatial organization of land resources, it is important to divide the territory into sub-regions with special natural, socio-economic and environmental characteristics.

A sub-region is a territorial unit that is considered to be a geo-system consisting of relatively homogeneous natural conditions, interacting socio-economic activities that create specific characteristics that allow it to focus on the exploitation and use of natural resources. The research and evaluation of these sub-territories create the scientific basis for economic development planning, which is related to the rational exploitation and use of natural resources, environmental protection in the direction of sustainable development [6]. This is especially true taking into account the rapid change in market conditions [5] and the need to adapt the existing resources to the ever-changing needs.

Each sub-area is defined on the basis of the following characteristics: relative homogeneity in natural conditions (geology, climate, soil, vegetation); degree of urbanization and industrial development. The isolated components of the mechanism of spatial organization of land resources are presented in Fig. 1 [6].

Components of the mechanism of spatial organization of land resources are to determine the public needs of agriculture, to establish the resource potential of agricultural land, to study the production potential of existing producers, and so on.

It should be noted that the need for decision-makers to solve problems, change drivers and facilitate effective and sustainable responses requires an updated set of tools and approaches to participate in the spatial organization of land resources [5].

Such a set of tools should take into account biophysical, economic, socio-cultural and managerial dimensions [10], and should facilitate integrated management of agricultural landscapes to meet the needs of many stakeholders and the implementation of various national strategies and commitments.

In order to improve the spatial organization of land resources, it is now important to carry out

a consultation process involving a wide range of stakeholders [2; 8; 10] working in different fields, to align lessons and experience in spatial planning tools and approaches, and to identify major gaps and opportunities.

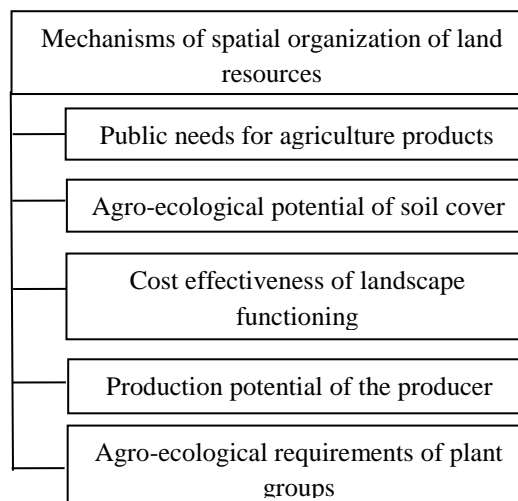


Fig. 1. Components of the mechanism of spatial organization of land resources\*

\*Source: Completed by the author according to the data [6].

The study considered the spatial organization of land resources of a certain territorial system, in particular the Chernivtsi district of Vinnytsia region. In addition, the emphasis is placed on the importance of the environmental component in ensuring a balanced development of the regional spatial and economic system [7].

Analyzing the state of land use in Vinnytsia region it should be noted that the highest degree of agricultural land development is noted in Bershad (81%), Kozyatyn (86%), Lipovets (88%), Orativ (84%), Teplitsk (87%), Pogrebyshe (83%), Tivrivtsi (80%), Khmelnytsk (82%) and Chernivtsi (84%) districts. The environmental sustainability of land resources is characterized by the degree of land plowing [8].

One of the main criteria for assessing the ecological status of agricultural land is the level of soil fertility as a basis for the functioning of this category of land. The combination of natural factors (natural vegetation in the past, climate) contributed to the formation of different soil properties and fertility. The use of soils for a long time under

crops with unbalanced fertilizer application leads to an acute shortage of a nutrient, ie a decrease in fertility [12].

A more detailed analysis of land use planning is made on the example of the agricultural landscape of the Chernivtsi district of Vinnytsia region. Chernivtsi district is located in the southwestern part of Vinnytsia region. It borders on the west with Mogilev-Podilsky, in the north – Shargorod, in the east - Tomashpol, in the south – Yampil districts of the region. Geographically, the territory of the Chernivtsi district belongs to Transnistria. The climate of the area is temperate continental and according to agro-climatic zoning belongs to the second agro-climatic region.

Table 1. Structure of agricultural landscaping in Chernivtsi district, Vinnytsia region

Type of land	Area	
	ha	%
Total land	59,161.00	100.00
Agricultural land	50,243.25	84.93
including arable land	43,541.08	73.60
Forests and other wooded areas	5,186.62	8.77
Built land	2,557.16	4.32
Including under residential development	388.16	0.66
Industry land	88.24	0.15
Wetlands open	248.29	0.42
Dry covered land with a special vegetation cover	0.00	0.00
Open land without vegetation	533.55	0.90
In land waters	392.13	0.66

Source: based according to [16; 17].

The natural and climatic conditions of the area are favorable for the development of agricultural production [10]. The structure of the agricultural landscape of the Chernivtsi district of Vinnytsia region is presented in Table 1.

The ecologically adapted area of cropssowing of Chernivtsi district, Vinnytsia region is presented in Table 2.

In the course of the research, according to the degree of agricultural development, all districts of Vinnytsia region are divided into three groups: I. up to 70%; II. 71 – 80% and III. > 80%. The proposed ecologically adapted crop sowing area of Chernivtsi district of Vinnytsia

region will help optimize land use taking into account both economic and environmental factors.

Table 2. Ecologically adapted area of crops sowing of Chernivtsi district, Vinnytsia region

Crop	Total crop area, ha	Return period, years	Boundary crop area, ha
Winter wheat	23,419.30	4	5,855
Winter rye	23,419.30	3	7,806
Spring barley, wheat	23,419.30	4	5,855
Oat	43,541.08	3	14,514
Buckwheat*	20,992.61	4	5,248
Millet*	3,123.35	4	781
Legumes	43,541.08	5	8,708
Linen (fiber)	20,760.39	7	2,966
Potato	22,943.25	4	5,736
Forage root crops	43,065.03	3	14,355
Rape (seeds)	3,123.35	5	625
Clover	23,419.30	4	5,855
Annual herbs (mixtures)	43,541.08	3	14,514
Maize	22,943.25	3	7,648

Source: based according to [16].

Currently, it is important for a spatial organization of land resources to strike a balance between market needs, the desire to increase profits and the rational use of land. The current market conditions and population trends have a significant impact on global food demand. Demand for food is increasing, it makes the pressure on natural resources. Significant changes are needed to address current trends and move to sustainable food and agriculture production. So, FAO has identified five interconnected principles for the transition to sustainable nutrition and agriculture [15]:

- 1) improving resource efficiency;
- 2) conservation of natural resources;
- 3) improving rural livelihoods;
- 4) increase of stability;
- 5) management.

FAO recognizes that the spatial organization of land resources, the adoption of sustainable land use strategies and land management are important to achieve the sustainability and economic development of each region and country as a whole [8].

In the context of changing market conditions, a modern agro-landscape balancing assessment system, including land valuation and land-use planning, should be used in land use management - a systematic assessment of land potential and alternatives for optimal land use and improvement of economic and social conditions [5] through multi-sectoral participatory processes, multilateral, and scale-dependent. The agro-landscape balancing assessment should be carried out throughout the land use system.

## CONCLUSIONS

Components of the mechanism of spatial organization of land resources are to determine the public needs of agriculture, to establish the resource potential of agricultural land, to study the production potential of existing producers, and so on.

The mechanism of spatial organization of land resources is developed on the example of one of the districts of Vinnytsia region. The proposed ecologically adapted crop sowing area of Chernivtsi district of Vinnytsia region will help optimize land use taking into account both economic and environmental factors.

It is substantiated that it is important for the spatial organization of land resources to strike a balance between market needs, the desire to increase profits and rational land use.

Land-use planning tools and methods should encourage and assist diverse and often competing land users in selecting land-use and management options that increase their productivity, support stable agricultural and food systems, and promote land and water management.

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