UDC 332.365:631.582

OPTIMIZATION OF THE AGRICULTURAL LAND STRUCTURE AS THE BASIS OF SUSTAINABLE DEVELOPMENT OF RURAL AREAS

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The modern structure of agricultural lands, formed in the conditions of a radical reformation of land relations in rural areas, is analyzed. It is revealed that this structure in agricultural enterprises of different forms of ownership does not meet the principles of rational use of nature due to the excessive share of arable land and low - environmentally sustainable land. At the same time, the share of the arable land in the structure of agricultural land in the non-state agricultural enterprises is 11-12% higher than in the state-owned, which is explained by the efforts of private entrepreneurs – tenants aimed at increasing agricultural production by expanding the area of arable land. The extremely high level of plowing of agricultural land is a consequence ofthe extensive use of land resources and the main reason for the spread of degradation processes. The only solution to this problem is the development of land management projects that provide ecological and economic justification for crop rotation and land management.

It is shown that the sustainable development of rural territories is not possible without improvement of the structure of sown areas, the main current disadvantage of which is the market-driven excessive share of highly profitable crops of the technical group and a very low shareof forage crops, which can be the cause not only of the ecological but also of the socio-economic problems. Optimization of the structure of the sown areas of crops should be carried out on the basis of ecological-landscape land management in consideration with the soil and climatic conditions of specific rural territories and resource provision of agricultural enterprises.

Keywords:*agricultural land, structure of cultivation ares, agrarian enterprises, organization of territory, crop rotation.*

Actuality. Deterioration of the ecological status of rural territories in the condition of land reforming is caused by the insufficient and inefficient use of environmentally-protective measures, by neglecting the requirements of environmental safety in agricultural production processes, by the environmental imbalance of the land fund, by the violation of the structure of agricultural land, by the absence of the ecological practice of formation and protection of the ecological value of the modern agroscapes as well as of the securement of the sustainable functioning of soils and the reproduction of their fertility. The legal regulation of this issue is conducted by the Laws of Ukraine: “On Land Management”, No. 858-IY of May 22nd, 2003, “On Land Protection” No. 962-IY of June 19th, 2003, “On the Main Principles (Strategy) of the National Environmental Policy of Ukraine for the Period until the Year 2020” No. 2818-YI of December 21st, 2010; the Decree of the Cabinet of Ministers of Ukraine “On Approval of the Concept of Rural Development" No. 995-p September 23rd, 2015. However, these norms are mainly declarative in their nature; currently there is no detailed legislative algorithm for optimization of the structure of agricultural land and for the protection of the soil cover from degradation.

The modern trends in the development of the world agriculture stipulate the simultaneous solution of the problems of providing the population with food and environmental protection, conservation of landscape and biological diversity, restoration of soil fertility. Because of this, the priority task of the land use is not maintaining maximum productivity of crops, but maintaining functional links between natural components of the environment. The adaptive-landscape system of agriculture, which is based on such principles as ecology, adaptability, science-intensiveness and biogenicity, is fully consistent with this direction [3]. The latter provide the transition from the concept of total intensification of land resources, the result of which is the destruction of soil cover and the entire landscape sphere, to the concept of resource-saving adaptive-land use and environmentally sustainable agroecosystems.

The dominance of the chernozem soils (more than 60%) in the composition of the arable lands structure of Ukraine, combined with favorable natural and climatic conditions, provides high potential of agricultural production. However, the attempt to increase agricultural output by expanding the arable land fund without proper scientific justification has led to a breach of environmental equilibrium in agricultural landscapes. The result is an exceptionally high level of plowing and agricultural development of the country (54 and 71% respectively), which has no analogues in the world. In addition, 6.5 million hectares of degraded and unproductive land have been unjustifiably enlisted to arable land, intensive use of which is environmentally dangerous and economically impractical [6].

The scientifically unreasonable expansion in cultivation of highly profitable industrial crops under the influence of market conditions, as evidenced by the practice of the previous and the present periods, causes an increase in degradation processes; the slope territories become dominated by the water erosion, the plainsface dehumification and agrochemical degradation, as agricultural producers are mostly unable to compensate,by the means of organic and mineral fertilizers, the nutrients extracted from the soil by the cultivated crops. Exacerbating these environmental problems can now lead to the significant economic losses and social

hardships in the future, which is linked to the country's food security and environmental plight.

Thisindicatesthatthesystemoflandprotectionmeasuresis under-implementedandthecostsoftheirimplementationreachonly 0.5% of GDP. Theimplementationoflandandnatureconservationmeasuresshouldbebased«onscientifically soundmethodologicalmeasuresoftheirspatialdevelopmentintheappropriatehierarchicalsequence: territory - landscape - land - soilcover» [1, Art. 23].

Therefore, in order to ensure the sustainable development of the rural territories, it is necessary to optimize the structure of agricultural lands, with a view to the modern ecological and landscape approaches to the organization of the territory, soil and climatic conditions of specific regions.

Analysis of the recent researches and publications. The works of such scientists as D.Dobryak, O.Kanash, V.Kryvov, L.Novakovsky,Y.Dorosh, O.Dorosh,A.Sokhnich, A.Tretyakand others are dedicated to the issue of the development of scientific and methodological principles of rationalization of the agricultural land use in the conditions of land relations reformation. However, the dynamic processes in the agricultural sector of the economy necessitate the specification of methodological approaches to optimization of the structure of land in rural areas and the formation of environmentally sustainable high-performance agricultural landscapes at the regional and local levels.

Ukrainian system of land relations established on the basis of private property did not provide the conditions and the effective mechanism for economically efficient and at the same time environmentally safe land use. The division of land into shares (pai) and the concentration of a significant share of agricultural production in households caused the violation of the territorial organization of the agricultural enterprises, the violation of the scientifically based alternation of crops in crop rotations, increased erosion processes, etc. While in the USA the largest (by the volume of production) farms, which make up 10% of the total number of agricultural producers, produce about 90% of all agricultural production [10].

In economically developed countries, the forms of management are considered to be effective if the jobs are kept for the rural residents (peasants are both owners and workers), if the over-exploitation of land resources and anthropogenic loading on the soil cover is prevented, and if the significant reduction of the restorative power of soils does not occur [7]. In particular, in Canada, more than 400,000 hectares of low-productive, mostly eroded land, have been annually withdrawn from the arable land fund within the framework of the permanent soil protection program [9]. However, unlike in a similar American program, Canadian farmers are allowed to partially use these lands, for example, as hayfields or pastures (only plowing of the soil cover and cultivation of annual crops is prohibited).

Inaddition, wemustalsotakecareofthesocialdimension. Forexample, «… fortheconditionsoftheSteppezone, theoptimalsizeoffarmsis 500 ha. Thismeansthatoneagriculturalholdingwith a totalareaofleasedlandof 10 thousandhectarescancontain 20 farms, eachofwhichwillemployabout 25 people. As a result, 500 peoplewillbeinvolvedintheproductionprocess…» [2, Art. 15]. Inaddition, itshouldbeunderstoodthatsmallfarmshaveanadvantageoveragroholdings, astheyconducttheirbusinessincompliancewithlandconservationmeasures.

Undoubtedly, thesolutionof themoderneconomic, environmentalandsocialproblemsintheagrosphereisimpossiblewithoutlandmanagement, whichcreatesafavorableecologicalenvironmentandimprovesnaturallandscapes [4].The land management is the core that provides the organization of the territories of agricultural enterprises and creates the spatial conditions for the ecological and economic optimization of the use and protection of agricultural land, introduces the progressive organizational forms of land management, improves the structure and the placement of agricultural lands, crop-cultivated areas, crop rotation systems, hay and pasture rotation systems [3]. Thus, the improvement of the structure of agricultural lands and cultivated areas at the regional and local levels requires the development of the land management projects that provide ecological and economic justification of crop rotation and land

management, in consideration with the complex of natural-climatic and socio-economic factors of specific regions.

The purpose of the article is to analyze the current structure of agricultural lands and cultivated areas at national, regional and local levels; to substantiate theoretical and methodological approaches in order to ensure the sustainable development of the rural territories by the example of the Kyiv region.

Presentation of the essential material. The current structure of the farmland at the national level does not meet the principles of rational use of natural resources due to the unbalanced ratio of environmentally sustainable and unstable land, which continues to deteriorate. According to the State Statistics Service of Ukraine [8], the share of the arable land in the structure of agricultural land for the 10-year period increased from 77.8 to 78.4%; it is caused by the expansion of an arable land during this time by 89.4 thousand hectares, with simultaneous reduction of the area of agricultural land by 214.3 thousand hectares. Such an extremely high level of plowed agricultural land is a consequence of the extensive use of land resources in the post-Soviet period and contributes to the intensification of degradation processes.

A similar situation is observed in the use of land in agricultural enterprises. Thus, in the studied period the level of plowing of agricultural lands in agro-formations of different forms of ownership increased from 92.8 to 93.9% (Table 1).

1. The structure of land in agricultural enterprises *

	Overall land area thousand hectares/%	**Agricultural land, %**	**Among them:**		
			arable	**hay**	**pastures**
Year 2005					
Lands of agricultural enterprises	21854,0/100	96,18	89,28	2,10	3,73
including state-owned	1253,3/100	84,97	70,17	2,95	8,76
non-state-owned	20600,7/100	96,86	90,45	2,04	3,42

Year 2010					
Lands of agricultural enterprises	21376,5/100	96,32	89,99	1,92	3,41
including state-owned	1205,8/100	84,76	70,07	2,78	8,90
non-state-owned	20170,7/100	97,01	91,18	1,87	3,08
Year 2015					
Lands of agricultural enterprises	21450,8/100	96,72	90,79	1,88	3,10
including state-owned	1118,1/100	83,80	69,22	2,97	8,53
non-state-owned	20332,7/100	97,43	91,98	1,83	2,80

* according to the State Statistics Service of Ukraine [8] and the authors' own calculations

This is mainly due to the expansion of an arable land in non-state agricultural enterprises (by 1,5%). Such a high share of the arable land in the structure of the agricultural land of market-type agro-formations indicates an excessive level of anthropogenic load on land resources, which will unambiguously lead to a deterioration of their quality in the near future.

Therefore, given the actual structure of land of the non-state agricultural enterprises, it is necessary to determine at what level (national, regional, local) it is necessary to ensure the optimal ratio of land for the formation of environmentally sustainable agro-landscapes, which must be legally enshrined in the national program and reflected in the regional and local target programs, as well as in the documentation on land use and land protection.

The analysis of the dynamics of the structure of the areas with agricultural crops shows that its transformation during the period of intensive reforming of land relations, occurred mainly under the influence of market conditions: the area of crops of the technical group (in particular, sunflower with a level of profitability of 24-32% increased in 1.6 times, which is the highest indicator among the main agricultural products) and the area of crops of the forage group decreased by 2.2 times (Table 2).

2. The structure of the cultivated areas at national and regional levels (%)

Agricultural crops	2005	2010	2015	2016	2017	2018

Ukraine						
All cultivated areas, thousands hectares/%	26044/100	26952/100	26902/100	27026/100	27585/100	27699/100
Cereal crops	57,6	56,0	54,8	53,3	53,0	53,6
Technical	20,2	27,1	31,0	32,7	33,6	33,4
Potatoes, vegetables and melons	7,8	7,3	6,8	6,8	6,7	6,6
Forage crops	14,3	9,6	7,4	7,1	6,7	6,4
Kyiv region						
All cultivated areas, thousands hectares/%	1157/100	1106/100	1153/100	1164/100	1184/100	1191/100
Cereal crops	58,7	55,3	48,0	49,0	49,8	50,3
Technical	11,4	22,7	33,9	33,0	33,0	33,2
Potatoes, vegetables and melons	10,1	10,8	10,6	10,8	10,6	10,4
Forage crops	19,8	11,1	7,5	7,2	6,6	6,0

* accordingtotheStateStatisticsServiceofUkraine [8] andtheauthors' owncalculations

At the same time, trends identified at the national level are typical for the Kyiv region: the area used for the industrial crops has increased by 191%, and the area for the forage has decreased by 70%. On average, over the period under study, the structure of cultivated areas at the national level was as follows: cereal crops– 54%, technical crops – 32%, potatoes, vegetables and melons – 7%, forage– 7%; in the Kyiv region – 49%, 33%, 11% and 7% respectively.

Cultivation of crops of intensive type (sunflower, rapeseed, maize) requires significant expenditures of material and energy resources (use of high volumes of organic and mineral fertilizers, application of pesticides, repeated row cultivation of soil, etc.). And given that the harvest of these crops is ensured by using the potential soil fertility, which is often observed in the practice of agricultural production; the consequence is a variety of degradation processes: dehumidification, soil depletion of nutrients, soil erosion and aridization of

territories.

Taking into account the norms of returning sunflower to its previous place of cultivation (not earlier than 7-9 years), its share in the structure of acreage should not exceed 10-15% (at the national level this figure was 14.4% in 2005, in 2010 – 17.0%, in 2015 – 19.0%, in 2018 – 22.1%). The same applies to industrial crops as a whole, whose area over the 13-year period has grown by 4.0 million hectares (or 76%) without adequate scientific substantiation.

On the one hand, the breach of scientifically based crop rotation in crop rotation is caused by the fragmentation of agricultural land uses as a result of land ownership reform on a private property basis (almost 70% of farmers use land no larger than 100 hectares, which is why they are inferior to large-scale production in terms of market efficiency). On the other hand, the concentration of the large pieces of land by large agro holdings in one locality not only creates threats of the regional monopolism for the agrarian sector of economy and for the sustainable development of rural territories, but also causes further deterioration of soil cover quality through the cultivation of export-oriented cereal and oil crops, which significantly deplete the soil for nutrients and moisture.

The reduction of the share of forage crops (by 7.9% – at the national level and by 13.8% – at the regional level) in the structure of the cultivated areas of the vast majority of agricultural enterprises worsened the quality composition of precursors for winter cereals and weakened the forage base for animal husbandry; this prevented sufficient production of the organic fertilizers to optimize the basic properties of soils. Considering the high cost of energy and fertilizers, perennial legumes can be considered as the cheapest means of reproducing soil fertility, since they leave behind 7-8 t/ha of organic residues, from which 17-20 c/ha of humic substances are formed. They provide an intensification of the biological factor in increasing the productivity of agricultural land, improve the physical properties of soils and increase their anti-erosion resistance.

In addition, a set of crops, different in agrotechnical requirements in crop rotation, determines the level of land use intensity (fertilizer rates, plant protection

products, number of row cultivations, etc.). At the same time, the relevant indicators should be determined with consideration of the data from the agrochemical passport of the land (field) and provide for the establishment of a group of plants whose cultivation is restricted or prohibited, as well as the technology or separate agrotechnical operation for their cultivation. For instance, on slopes $3\text{-}7^0$ the cultivation of hoed crops and placement of black steam is restricted.

These negative aspects are complex (because they are related to the environmental, economic and social spheres of life of the population of rural areas), and therefore the measures to eliminate them should be systematic and comprehensive. Therefore, social and environmental factors should be taken into account when optimizing the structure of cultivated land at the national, regional or local level, along with the economic factors (in particular, market conditions).

Conclusions. The current structure of agricultural land, both at the national, regional and local levels, formed in the context of a land reform, does not meet the principles of rational use of nature, which is a significant obstacle to the sustainable development of rural areas. The unbalanced ratio of land, the use of the degraded and unproductive lands as arable leads to the intensification of degradation processes, deterioration of the land quality and to the decrease in the productivity of agroecosystems. A significant share of technical crops in the structure of the cultivated land causes a high level of anthropogenic pressure on soils of agricultural landscapes, which often exceeds their environmental sustainability. In order to prevent this, it is necessary to determine the optimal parameters of the land structure at the level of a specific agro-landscape and to develop an effective mechanism for their practical implementation.

Sustainable functioning of agrarian enterprises undoubtedly needs a rationalization of the structure of the cultivated areas in compliance with the adaptive-landscape approaches to the organization of their territory, as well as it needs the resource provision for the entity, soil and climatic conditions of a particular region. A comlex solution to this problem can only be achieved by

developing land management projects that provide ecological and economic justification for crop rotation and land management.

In the Kyiv region, the reduction of the share of ecologically unsustainable land in the structure of the land fund, the reduction of the level of plowing of agricultural land,the preference to growing winter rye, potatoes and flax in the Polissia areas, and abstaining from growing winter wheat and barley on soils with medium and strong acidity levelswill contribute to the sustainable rural development and agro-ecosystem productivity. In the forest-steppe parts of the studied region, further expansion of sunflower, rapeseed and soybean cultivation areas should be accompanied by appropriate scientific justification, since now the ecological consequences of the over-normative growth of the share of these, undoubtedly, highly profitable crops in the cultivated landstructure, have not been thoroughly investigated for both – the environment and the land resources.

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ОПТИМІЗАЦІЯ СТРУКТУРИ СІЛЬСЬКОГОСПОДАРСЬКИХ УГІДЬЯК ОСНОВА СТАЛОГО РОЗВИТКУ СІЛЬСЬКИХ ТЕРИТОРІЙ

Проаналізовано сучасну структуру сільськогосподарських угідь, що сформувалась в умовах кардинального реформування земельних відносин в сільській місцевості. Встановлено, що ця структура в сільськогосподарських підприємствах різнихформ власності не відповідає принципам раціонального природокористування через надмірну частку орних земель і низьку – екологічно стійких угідь. При цьому, частка ріллі в структурі сільськогосподарських угідь в недержавних аграрних підприємствах на 11-12% вища, ніж в державних, що пояснюється намаганням приватних підприємців – орендарів збільшити обсяги сільськогосподарського виробництва шляхом розширення площі орних земель.Надзвичайно високий рівень розораності сільськогосподарських угідь є наслідком екстенсивного використання земельних ресурсів і основною причиною поширення

деградаційних процесів. Єдиним засобом вирішення цієї проблеми є розробка проектів землеустрою, що забезпечують еколого-економічнеобгрунтування сівозміни та впорядкування угідь.

Показано, що сталий розвиток сільських територій неможливий без удосконалення структури посівних площ, основним недоліком якої на сучасному етапі є ринково обумовлена надмірна частка високорентабельних культур технічної групи і дуже низька – кормових культур, що може бути причиною не тільки екологічних, а й соціально-економічних негараздів. Оптимізацію структури посівних площ сільськогосподарських культур необхідно проводити на засадах еколого-ландшафтного землеустрою з врахуванням грунтово-кліматичних умов конкретних сільських територій та ресурсного забезпечення сільськогосподарських підприємств.

Ключові слова: *сільськогосподарські угіддя, структура посівних площ, аграрні підприємства, організація території, сівозміна.*

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ОПТИМИЗАЦИЯ СТРУКТУРЫ СЕЛЬСКОХОЗЯЙСТВЕННЫХ УГОДИЙ КАК ОСНОВА УСТОЙЧИВОГО РАЗВИТИЯ СЕЛЬСКИХ ТЕРРИТОРИЙ

Проанализированы современную структуру сельскохозяйственных угодий, сформировалась в условиях кардинального реформирования земельных отношений в сельской местности.Установлено, что эта структура в сельскохозяйственных предприятиях различных форм собственности не соответствует принципам рационального природопользования за чрезмерной долю пахотных земель и низкую - экологически устойчивых угодий. При этом, доля пашни в структуре сельскохозяйственных угодий в негосударственных аграрных предприятиях на 11-12% выше, чем в государственных, что объясняется попыткой частных предпринимателей - арендаторов увеличить объемы

сельскохозяйственного производства путем расширения площади пахотных земель. Чрезвычайно высокий уровень распаханности сельскохозяйственных угодий является следствием экстенсивного использования земельных ресурсов и основной причиной распространения деградационных процессов. Единственным средством решения этой проблемы является разработка проектов землеустройства, обеспечивающих эколого-экономическое обоснование севооборота и упорядочение угодий.

Показано, что устойчивое развитие сельских территорий невозможно без совершенствования структуры посевных площадей, основным недостатком которой на современном этапе является рыночно обусловлена чрезмерная доля высокорентабельных культур технической группы и очень низкая - кормовых культур, что может быть причиной не только экологических, но и социально-экономических проблем. Оптимизации структуры посевных площадей сельскохозяйственных культур необходимо проводить на основе эколого-ландшафтного землеустройства с учетом почвенно-климатических условий конкретных сельских территорий и ресурсного обеспечения сельскохозяйственных предприятий.

Ключевые слова: *сельскохозяйственные угодья, структура посевных площадей, аграрные предприятия, организация территории, севооборот.*