

ENVIRONMENTAL ASPECTS IN LAND MANAGEMENT AS A BASIS FOR SUSTAINABLE DEVELOPMENT

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Summary

The paper examines the main aspects that affect rational land use and protection as a basis for sustainable development. The main problem is identified as insufficient attention to soil cover and the use of chemical fertilizers, while ecologisation is seen as the main direction of agricultural development. The purpose of the study is to summarize theoretical knowledge on land management with due regard to environmental aspects and to design ways to ensure sustainable development and protection of economic entity land.

Measures to increase soil fertility were considered, such as the system of soil cultivation, use of fertilizers, crop rotation, and others aimed at increasing soil fertility and reducing the negative impact on the environment. Support is also expressed for the implementation of effective systems, such as drainage systems and cultural engineering works, to achieve the set goals. Emphasis is placed on the further improvement of environmental monitoring systems and the use of sanctions for violators in order to ensure the sustainable development of agriculture and the preservation of natural resources.

Keywords: land management, agricultural land, agricultural land

Introduction

Land is an essential resource for the existence and development of human society, playing an important role in the production and satisfaction of human needs. Food is a universal human need, making agriculture an important source of livelihood for most people around the world, as well as a sector linked to the fundamental right to food and nutrition. There is no one-size-fits-all solution to addressing these issues, as there are advantages and disadvantages. Land use often causes conflicts in society related to legal, political, environmental and social governance. On the one hand, it is about generating profits and ensuring a sufficient amount of production. On the other hand, it is about protecting land, using chemical fertilizers and pesticides wisely, controlling product quality and maintaining soil fertility.

The purpose of the study is to summarize theoretical knowledge on land management with due regard for environmental aspects and to design ways to ensure sustainable development and protection of the economic entity land.

To achieve this goal, the following tasks were identified: to analyze current legislation and the state of agricultural land, to investigate the environmental, economic and social components of sustainable development, to develop offers for land management and ensure the rational land use and protection. Today, there are several major problems in land management, such as environmental problems of nature management, ploughed land, irrational land use by large agricultural holdings and the lack of a clear state policy on agricultural land, the main directions and mechanisms for improving the regulation of territorial relations in agriculture.

In their work Budziak O.S. covers various aspects of interaction between society and nature, including environmental relations and the role of environmental law. The author examines the impact of land use on the environment and proposes effective methods of its regulation in order to preserve natural resources. He examines the evolution of ecology from a biological science to an integral interdisciplinary field, as well as the structure of modern ecology and its role in the modern world. In addition, the author emphasizes the importance of understanding the relationship between society and nature to ensure harmony between economic needs and environmental protection. Additionally, two agricultural land use strategies are compared: the intensive policy recommended by the FAO and the ecological strategy that has emerged in developed countries such as the European Union and the United States. The intensive policy of the FAO has led to a crisis situation in agroecosystems due to monocultures and chemical fertilizers, while the ecological strategy is aimed at preserving natural resources and public health. The text also describes the stages of development and measures aimed at greening land use, including the use of new technologies and changes in agriculture. The author emphasizes the importance of preserving natural ecosystems and suggests measures for their greening. The article goes on to discuss organic farming as a method of greening land use aimed at producing environmentally friendly products. The author notes that Ukraine is gradually developing this area, but still needs state support (Budziak 2017).

In this paper, A.M. Tretiak and V.M.Tretiak (2021) examine various aspects of land interests and their impact on the distribution and use of land resources in Ukraine during the period from 2000 to 2015. They analyze the social, economic and environmental aspects of land use, highlight trends in these areas and examine different groups of public interests in land and their aspirations and orientations. Particular attention is paid to the problem of agriculture in Ukraine, in particular to the reduction of organic fertilizers and the growing deficit of humus in soils, which leads to a loss of soil fertility and a decrease in crop yields. The authors emphasize the importance of introducing new technologies and approaches in agriculture to solve these problems, as well as the need for government support in this process. The study also contains statistics on humus losses and fertilizer application volumes, and examines the distribution of land resources by their functional use, emphasizing the stability of these indicators over the period under review. In addition, the environmental and economic aspects of land use are studied in order to preserve and restore natural and soil potential.

The main emphasis is placed on economic and legal instruments aimed at encouraging land users to restore disturbed and degraded lands and soil fertility. In addition to this, methods of assessing damage to land and soil, tools for rationalizing land use from an economic and environmental perspective, and the role of economic losses in making sound land management and land protection decisions are discussed. The text also examines the relationship between land ownership rights and environmental aspects, showing that an understanding of the environmental relations of land ownership helps to effectively implement environmental policy (Tretiak, Tretiak, 2021; Dorosh, Yurechko, 2017).

According to Tretiak A.M. and Tretiak V.M. (2021), in land management it is necessary to focus on the development of comprehensive strategies and measures for soil protection, taking into account not only technical and technological aspects, but also socio-economic and institutional solutions, including land management. They believe that the effectiveness of soil monitoring and control should be improved, stricter environmental standards should be introduced, and sustainable use of land resources should be promoted through economic mechanisms and incentives. At the same time, they emphasise the need for active participation of the state, NGOs and businesses to achieve the goal of preserving land resources and ensuring sustainable development. They also emphasize the importance of considering local peculiarities and needs in solving land protection problems in each particular region (Tretiak, Tretiak, 2021).

Sustainable development of rural areas should be based on the efficient use of agricultural land, which primarily involves the development of livestock production, optimisation of crop structure and development of effective crop rotations that ensure the reproduction of soil fertility. The choice of appropriate crop rotations is the main strategy for managing the agro-ecosystem to ensure agricultural production by maintaining soil fertility and suppressing harmful organisms such as weeds, diseases and pests.

However, research by foreign scientists, such as P. Weisshun, M. Reckling, U. Stachow and H. Wiggering (2017), on the use of crop rotations has shown that the crop rotations most commonly practiced on farms last an average of three to four years and are focused on cash crops, with cereals often dominating with a share of 75% or more, while legumes, which are known for their many beneficial properties, are less common. This suggests that on farms, the use of inputs such as pesticides and fertilizers is replacing some of the benefits of crop rotation and leading to narrower crop rotations (Weißhuhn et. al., 2017).

Land management plays an important role in rational land use. Through a system of engineering, technical, economic and legal measures, it allows organizing environmentally and economically feasible use of land, ensuring efficient organization of the territory and location of production. Using the example of a particular business entity, the article examines the state of agricultural land and proposes solutions for its rational use and protection, taking into account environmental aspects.

The legislation analysis results of a number of foreign countries suggest that almost all of them have various restrictions. Restrictions on the size of land plots are typical for countries with economies in transition and countries with limited land resources. As a rule, such restrictions are set at the municipal or regional level, in particular: Hungary: no more than 300 hectares (for individuals and legal entities); Romania: no more than 200 hectares (for individuals and legal entities); Denmark: no more than 30 hectares (for persons with professional education and experience in agriculture) (Dankevich, 2017, Ukraine Recovery Land market, 2023).

Since 2014, Lithuania has allowed the sale of land to foreigners, but has set limits on the area of land that individuals and legal entities can purchase. Individuals can own no more than 500 hectares, and legal entities - no more than 2,000 hectares. At the same time, individuals must have the appropriate professional qualifications, and young farmers must obtain permission from the National Land Service. After the completion of the land reform in 2019, Lithuania moved to liberalize the land market, with about 70% of agricultural land in private ownership, leaving the market open but with certain restrictions

Land ploughing is one of the most important environmental issues that needs to be addressed now. Ukraine's average ploughing rate is 54% (figure 1a), with some regions having 70% or more, while the average rate in the EU is 30-35%. For comparison, in France, 33.50% of the land is ploughed, in England - 18.5%, in the USA - 27.90%.

In order to reduce the ploughing level of the country's territory to 44%, it is necessary to withdraw degraded arable land from intensive cultivation. According to expert estimates, the area of these lands exceeds 6.5 million hectares. Implementation of land protection measures, including withdrawal of degraded land from cultivation and its further use for alkalisation, reforestation or renaturalisation, will increase the area of land under the nature reserve fund. According to the State Statistics Service of Ukraine, the area of these funds grew by only 0.17% from 2015 to 2020, currently accounting for 6.77% of the country's territory. This will also allow for the expansion of forested areas, which, according to the same data, grew by 0.09% and currently account for 17.71% of the country's territory.

For comparison, Finland has 64.7% forest cover, France 27.6%, and Poland 28.6%. For clarity, we present the data in figure 1 (Riepin, 2018).

The object and methods of the study

The object of the study is the land of the farm "AGROBUD" in the Sakhnovshchanskyi district of Kharkiv region.

The research used the following methods: analytical, monographic and abstract and logical. The analysis method was used to study the characteristics of agricultural land and aspects of land management in the system of land relations. The monographic method was used to determine the effectiveness of the offered solutions that ensure the rational land use and protection. The abstract and logical method was used to determine the essence of agricultural land management

and its special status. Taking into account environmental aspects, the study was conducted to identify effective strategies for the use of land resources for agricultural production and ensuring the environment's sustainability.

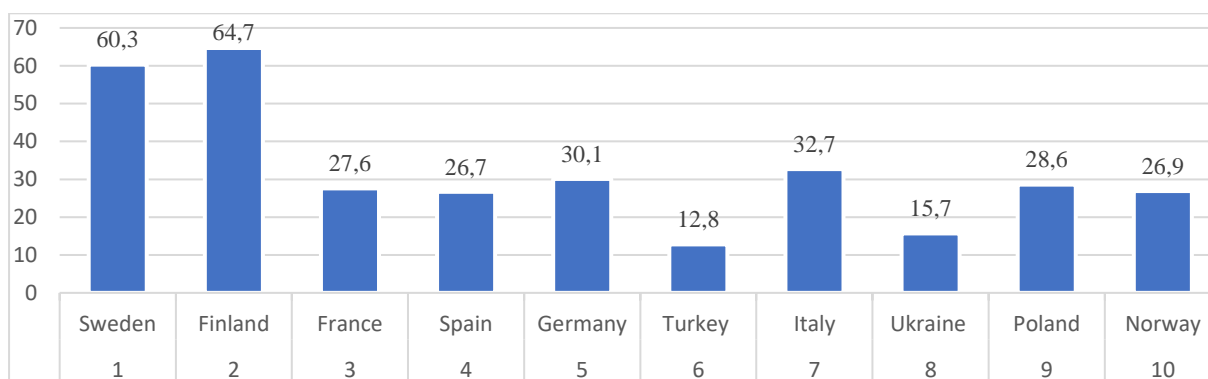


Fig. 1. Percentage of forest cover

The case study is a municipally owned agricultural land plot leased by “AGROBUD” for commercial agricultural production, located in Sakhnovshchanskiy district of Kharkiv region. The total area of the district is 1170 square meters or 116,991 ha, 3.7% of the territory of the region, and is located in the forest-steppe zone (Fig. 2, Fig. 3).



Fig. 2: Plot layout and farm boundaries

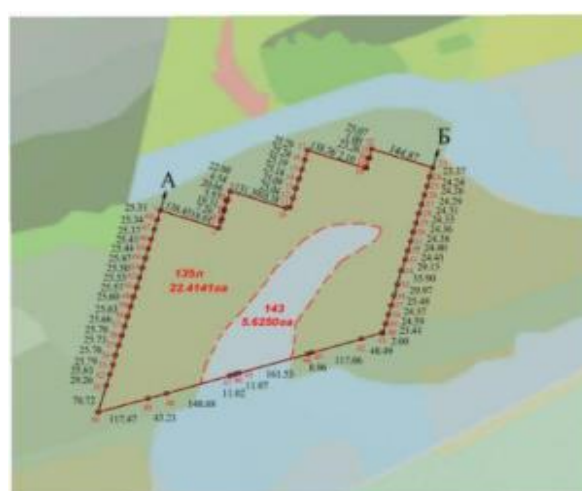


Fig. 3. Diagram of the agricultural groups boundaries in a farm

Sakhnovshchanskiy district is located in the forest-steppe zone in the south of Kharkiv region. The climate is temperate continental. The district is characterized by hot summers and relatively cold winters. The relief is an undulating plain, with 105 artificial reservoirs and 5 rivers, the largest of which is the Oril River, 72 km long, 614 hectares of forests, including 48 hectares of coniferous.

According to the enterprise’s charter, the main activities of the farm are the cultivation of grain, industrial and other crops. Agricultural products are essential commodities to meet the needs of the population, processing industry and export-oriented enterprises.

The irrational use of soils in agriculture has caused a number of problems that lead to the loss of soil fertility. The main reasons for the loss of soil fertility include the following:

1. Erosion and deflation, over-compaction of surface and sub-surface horizons, alienation of soil from functioning ecosystems.
2. Devegetation (destruction of vegetation), soil dehumidification, soil exhaustion and depletion.
3. Violation of water and chemical regimes, in particular: salinity, natural and secondary acidity, waterlogging, overdrying.

Financing of the works is carried out at the expense of the land user “AGROBUD”.

In order to rationally use the land and bioclimatic potential, the project provides for crop rotation with flexible crop rotation, replacing one crop with another, provided that they are biologically related and depending on the demand for products on the market.

Crop rotation is the time interval during which crops and pairs pass through each field in the sequence provided for by the offered crop rotation.

Crop rotation:

1. Soybeans + annual legumes for green manure %.
2. Winter wheat + post-harvest crops.
3. Barley + post-harvest crops.

4. Corn for grain + Sunflower.

Other options for crop rotation are also possible, but without violating the biological basis of crop rotation and observing soil use warnings.

The main measures to improve soil fertility include proper soil cultivation, rational use of organic and chemical fertilizers, application of sound land reclamation measures, introduction of crop rotations and highly productive plant varieties, effective control of weeds, pests and plant diseases.

When using the land plot leased to “AGROBUD” for commercial agricultural purposes located outside of settlements, the project provides for the following measures:

- creation of double regulation drainage systems;
- cultural and technical work on waterlogged soils;
- ensure rational land use;
- protecting land from erosion, waterlogging, secondary salinisation, overdrying, compaction, pollution by chemical and radioactive waste and other adverse natural and man-made processes.

In addition, an important step in agricultural production is the application of manure compost. This helps to preserve soil fertility, increase its fertility and improve soil structure. This approach helps to conserve natural resources and reduce the negative impact of agricultural activities on the environment.

Conclusion

Thus, the results of the study on rational land use in the context of growing crops at AGROBUD farm demonstrate the importance of a balanced approach between economic and environmental aspects of agriculture, as the average level of plowed land is 34%, but in some regions this figure exceeds 70%. In order to reduce this level to 44%, it is necessary to withdraw degraded arable land, which exceeds 6.5 million hectares, from intensive cultivation. The further use of these lands for reforestation or renaturalization will increase the area of the natural reserve fund. To ensure environmental safety and rational use of land resources, it is necessary to improve soil cultivation, use fertilizers rationally and implement an effective crop rotation system. The use of drainage systems, cultural practices and rational land use are key factors in improving soil fertility and reducing the negative impact of agricultural activities on the environment. However, to achieve maximum results, it is necessary to improve the environmental monitoring system and introduce effective sanctions for violators. This is the only way to ensure sustainable agricultural development while preserving natural resources for future generations.

References

1. Dankevich, V. E. 2017. *Development of land relations in agriculture: theory, methodology, practice*. The dissertation on completion of a scientific degree of the doctor of economic sciences, 8.
2. Ukraine Recovery Land market: Lithuania and the Netherlands are not afraid of foreigners 2023, 3-5 stor. [Electronic resource] Available at: <https://rpr.org.ua/news/rynok-zemli-v-lytvi-i-niderlandakh-ne-poboialys-inozemtsiv/>
3. Riepin, K. 2018. Land relations in Europe. [Electronic resource]. Available at: <https://agro-business.com.ua/agro/ekonomichnyi-hektar/item/10330-zemelni-vidnosyny-u-yevropi.html>
4. Tretiak, A. M., Budziak, O. S., Tretiak, V. M., & al. 2017. Ekolohiia zemlekorystuvannia: navch. posib. (A. M. Tretiak, Ed., pp. 7-16). AHROBUD. (Library of environmental knowledge).
5. Tretiak A. M., Tretia V. M. 2021. Teoretychni zasady rozvytku suchasnoi systemy zemlekorystuvannia v Ukraini. Systema zemlekorystuvannia, 2021, 3–11 stor. [Theoretical basis of a modern land use system development in Ukraine].
6. Weißhuhn, P., Reckling, M., Stachow, U., & Wiggering, H. 2017. Supporting agricultural ecosystem services through the integration of perennial polycultures into crop rotations. *Sustainability*, Vol. 9(12), 2267 <https://doi.org/10.3390/su9122267>.