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ORIGINAL ARTICLE

Ecological and economic aspects of agricultural land use in European integration processes

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The directions to increase land resources reproduction efficiency and the modal formation strategy of ecologically balanced measures system for their effective employment are defined. Theoretical and methodological principles of the formation and development of effective employment of land resources at agricultural enterprises in the context of European integration processes are substantiated. Economic and ecological problems of land use and the ways to solve them were analyzed. It is established that the organization of land resources employment should be based on considering the land resource potential and regional features of productive forces development. Simultaneously, it is obligatory to comply with the ecological requirements during land management and rational use of land at the expense of regulating their distribution according to the categories, lands, and owners. A structural and logical model of objective factors influencing agricultural enterprises' efficient products such as market relations, government regulation, ecological and social conditions is proposed. In the course of the research, the main directions of improving agricultural land use efficiency were identified. We established that to improve land use, it is necessary to introduce the optimization of the sown area structure, taking into account the anti-erosion measures, ecological factors, and ecologically safe management requirements. It is necessary to consider the solution of agriculture's economic and ecological problems through environmentally friendly land use, which should be based on an ecologically balanced approach to the employment of natural resources, which allows restoring soil fertility and increasing agricultural productivity lands.

Key words: land resources, ecological and economic efficiency, ecologically safe land use, efficiency, rational use, land ownership, soil protective system, agricultural lands, crop rotations, production technologies, legal regulation.

Improving the agricultural enterprises' economic and ecological efficiency is the key to their highly efficient activities. Under the conditions of property reform and formation of market relations, the structural and ecological balance of land resources employment, restoration of soil fertility, the functioning of agricultural landscapes, and the efficiency of agricultural land use at the agricultural enterprises depend on these resources employment.

With the transition to market relations and private ownership to land, land use conditions have changed both in Ukraine and in the European countries. The land reform during the period of Ukraine's independence did not lead to the renewal of the economy of agricultural land management, rational employment and protection of land resources, and reproduction of the productive potential of the agricultural lands.

The exacerbation of agricultural enterprises' ecological, economic, and social problems necessitates the economic and environmental efficiency of land resources employment. The world experience shows that the economic and ecological problem combined with the rational use and protection of agricultural land is one of the most important ones in the transition to the agricultural sector's sustainable development.

Today, many scientists are engaged in solving the problems concerning the rational use and protection of agricultural lands and their efficiency. Among the well-known domestic research are the works of I.K. Bystriakov, O.I Hutorov, B.M. Danylyshyn, D.S. Dobriak, S.I. Dorohuntsov, L.Ya. Novakovskyi, O.I. Novakovska, P.T. Sabluk, A.Ya. Sokhnych, V.M. Trehobchuk, A.M. Tretiak, Yu.Yu. Tunytsia, M.M. Fedorov, and O.V. Khodakivska. Among well-known foreign scientists, we should name A. Jung, F. Harrison, M. Geffney, G. Japa, R. Kempell, J. Swinnen, P. Ciaian, A. Kancs, K. Van Herck, and L. Vranken.

Simultaneously with the significant achievements of scientists in the development of land relations and the efficiency of land use as the primary means of production, more attention should be paid to introducing environmentally friendly land use under market conditions. The issues of improving land-use efficiency, optimizing the structure of sown areas, land resources management, and preservation and reproduction of land resources following the declared principles of sustainable development require further study.

It should be noted that nowadays, some aspects of efficient agricultural land use are considered in the scientific works, i.e., there is a necessity to study the formation of a system for efficient agricultural land management, taking into account the ecological and economic aspects in the system of the environmentally friendly land resources employment.

The article aims to elaborate practical recommendations for ecologically and economically efficient use of agricultural lands to reform land relations in Ukraine towards the European integration processes.

Results

Land relations are the most challenging object of reform in the economy, as land is the most valuable natural resource on the planet. At the heart of land use is the turnover of the agricultural lands, which is characterized by rent, i.e., land management is directly dependent on agricultural entities' ability to efficient management. A necessary condition for rational land use is improving land relations by creating the conditions for the equal development of various forms of ownership and land management, forming a multi-structure economy, and efficient use and protection of lands.

Improving the economic efficiency of the land resources employment at the agricultural enterprises should be ensured by a scientifically substantiated structure of lands, which will simultaneously create the preconditions for ecological stability of the territory and increase the productivity of natural forage lands.

On January 1, 2021, the land fund of Ukraine makes up 60.3 million hectares or about 6% of the European territory. The acreage of black soil in Ukraine is from 15.6 to 17.4 million hectares or about 8% of the world's reserves. The agricultural lands make up about 19 % of the European ones; about 27% fall on the arable land (Zemelnyi..., 2021). The index of the acreage of the agricultural land per capita is the highest among the European countries and is 0.9 ha, including 0.7 ha of arable land (the average index of the European countries is 0.44 and 0.25 ha, respectively).

In general, the agricultural land area makes up 42.7 million hectares or 70% of the country's total area, and the area of arable land is 3.5 million hectares or 78.4% of all agricultural lands.

Today the Ukrainian people cultivate such areas of arable lands that correspond to one-third of the European lands and constitute 32.7 million hectares. According to the statistics, one Ukrainian inhabitant has twice as much arable land as one European inhabitant. Table 1 shows the indices of land use in Ukraine concerning Europe (Zemelniy.... 2021; European Statictis, 2019).

Table 1. Primary indices of land use in Ukraine and Europe

Indices	Value and measure	Value in relation to Europe
Total area of Ukraine	60.3 ha 10^6	6 %
Area of agricultural lands	41.4 ha10^6	19 %
Acreage of arable lands	32.7 ha 10^6	27%
Rate of plowed lands	54%	35%
Lands per capita	0.90 ha	0,44 ha

In the European countries, the agricultural development of the territory is quite different. Due to the unfavorable climatic conditions in northern Europe, plowed land does not exceed 10 % of the Scandinavian countries' total area. In the structure of agricultural lands, the area of pastures and haymaking in these countries reaches 2 %. Central Europe has the highest agricultural development of the territory. Thus, in France, it constitutes 54.9 % of the country's total area, in Poland – 57.8 %, in Germany – 4.9 %, in Spain – 59.7 %, and in Switzerland – 38.7 %. In southern Europe, the acreage of arable land ranges from 15 to 20,6 %. The largest areas of Spain and France territories are used to produce fodder crops (http://ec.europa.eu/eurostat/data/database).

Considering that most EU countries have open land markets, there are different approaches to land turnover. In Western Europe (Austria, Belgium, the Netherlands, Germany, France, and Switzerland), the land market is liberalized and open; there are no absolute foreign capital restrictions. However, in France, Belgium, and Austria, the vast majority of sale and purchase agreements are considered and approved by the local authorities, such as SAFER in France. This significantly complicates and delays the buying and selling process, which negatively affects the market's attractiveness and dynamics (for example, the price of the agricultural land in France is only 7,450 US dollars). The Scandinavian countries (Denmark, Finland, and Sweden) are characterized by significant ecological taxes and large-scale state support of agricultural producers (Ahner, 2004).

Problems of improving agricultural land-use efficiency, taking into account their ecological status in the intensification of agricultural production, are part of a single state environmental and economic policy that ensures their rational use, protection, and management of the land resources. In this connection, the formation of rational and efficient land use involves the creation of the best conditions for reproduction and protection of soil fertility, scientifically substantiated interaction of land with other natural factors, ensuring the development of the most complete and correct criteria, ways, and methods of the land resources employment.

From the research experience and analysis of the land use indices, the ecological and economic assessment of the agricultural land use should be based on assessing the scale and intensity of the impact of the economic activity on the state of the land resources. However, at the present stage, agricultural producers' desire to obtain the maximum profit leads to adverse environmental consequences (Palyanichko, 2011).

Such objective factors influence agricultural enterprises' efficient production as market relations, government regulation, ecological and social conditions (Fig. 1).

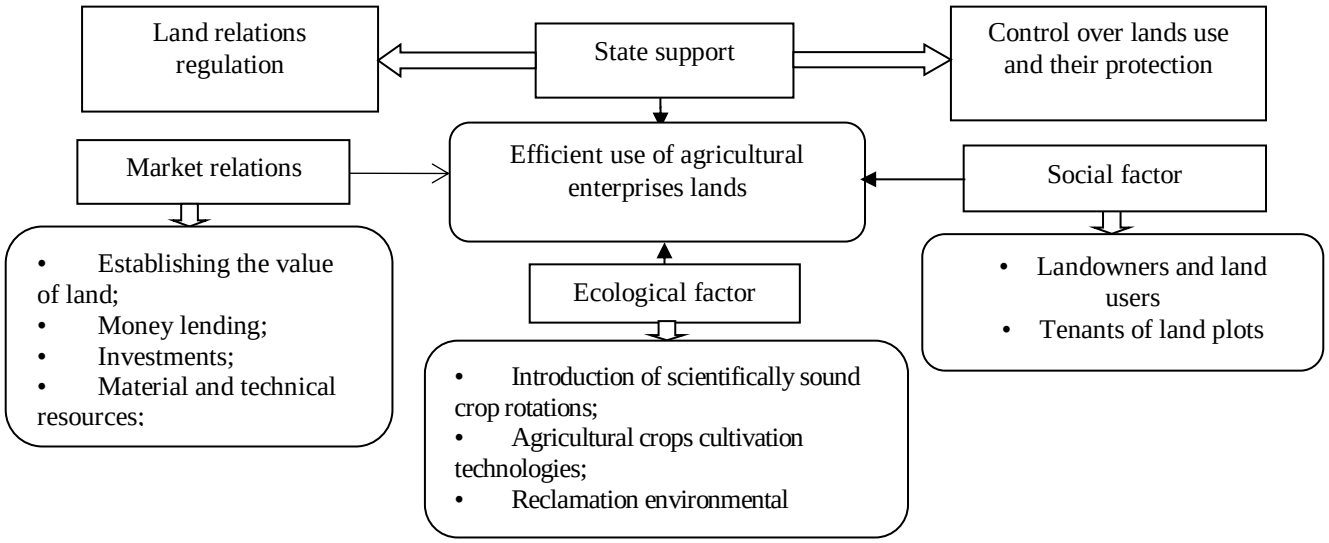

Fig. 1. Factors influencing the development of efficient land use

The efficiency of the agricultural land use depends on the level of profitability of the agricultural enterprises to a considerable extent. However, their financial interests should not lead to the deterioration of land resources' properties as the primary means of agriculture production. All lands of Ukraine need careful use and protection, especially soils. The soil is one of the most important natural resources of the state; it is the Ukrainian people's national wealth. More than 60% of the country's land fund is the unique chernozem soils. However, according to the experts in land issues, the modern use of Ukrainian land resources does not meet rational nature management (Gruntovi..., 2021). The intensity of land resource employment by increasing crop capacity due to organic and mineral fertilizers is one of the most important ways to increase agricultural enterprises' economic efficiency. The cost of purchasing and applying fertilizers is paid off by obtaining the additional products per unit area. It should also be noted that organic fertilizers' payback will be higher than the mineral ones due to their lower cost. Developed countries' experience shows that an effective measure to prevent and solve the environmental problems in a market economy is economic mechanisms for natural resources management.

The economic mechanism is a set of financial and economic instruments to influence the economic entities' material interests. In Ukraine, this mechanism is at the formation stage; its disadvantage is the regulation of mainly compulsory and restrictive nature (Novakovska, 2009). To overcome land use's ecological problems, it is recommended to more widely use the regulators of incentive and compensatory nature. In particular, we have proposed the following measures to rationalize agricultural land use:

1. Granting subsidies aimed at implementing the programs to protect land and increase soil fertility;
2. Preferential tax regime (reduction of land tax rates or temporary exemption from taxation) of the enterprises that use environmentally friendly technologies for the production of agricultural products, as well as take measures to improve the quality of soils and their protection;
3. Price incentives for the production of environmentally friendly products by setting higher purchase prices for them;
4. Preferential lending to the agricultural enterprises that produce environmentally friendly production and implement the measures to increase soil fertility;
5. State compensation for the decrease in the incomes due to temporary conservation and withdrawal from cultivation the degraded and unproductive lands.

The organization of land resources employment should be based on considering the land resource potential and the regional features of the productive force's development. In this case, it is obligatory to comply with the ecological requirements during the land management and rational use of lands at the expense of regulating their distribution by the category, land, and owners. We have identified the main directions for improving the efficiency of agricultural land use. They are as follows:

1. Establishing an ecologically balanced ratio of lands;
2. Gradual reduction of plowed lands;
3. Formation of the system for soil protection land use
4. Improving and introducing new economic levers of influencing the economic entities to ensure the sustainability and optimal structure of the lands.
5. Reduction of soil compactness, reduction of its structure disturbance, restoration of water and air regimes
6. Reduction of humus and nutrients losses in the soil and reduction of chemical load on it
7. Introduction of environmentally friendly technologies for crop and livestock production
8. Improving the normative and legal base in the sphere of land protection, preservation, reproduction, and increasing soil fertility
9. Development of a mechanism and procedure for financing the measures as for the improving the ecological condition of lands
10. Development and implementation of scientific and technical programs in land protection, preservation, reproduction, and increasing soil fertility considering the world experience.

11. Introduction of environmentally friendly production methods and use of resource-saving technologies
12. Introduction of economic stimulation of ecological activity at the agricultural enterprises

To improve land-use efficiency, it is necessary to introduce the sown area structure's optimization, taking into account the anti-erosion measures, ecological factors, and environmentally safe management requirements.

The solution of economic and ecological problems in agriculture should be considered through environmentally friendly land use, which should be based on an ecologically balanced approach to natural resources, which allows restoring soil fertility and increasing the agricultural lands' productivity.

Having a considerable land fund, Ukraine does not use it entirely for the production of competitive products. For example, the area of eroded lands in Ukraine is over 17 million hectares (42% of the total agricultural land). Economic losses caused by erosion processes amount to UAH 9.1 billion, and losses in the cash value of lands are 1.5–2.0 times higher than the total income from the agricultural exports. Total losses of humus due to mineralization and erosion amount to 32–33 million tons annually, and it is equivalent to 320–330 million tons of organic fertilizers (Pankiv, 2008).

The essence of the mechanism for the adaptive-landscape farming system formation consists in finding the agroecological conditions corresponding to the agroecological requirements of crops growing, which should be based on their requirements or creating these conditions by consistent optimization of limiting factors taking into account the restrictions of technogenesis (Bogira, 2008).

The fundamental component of a landscape analysis of the territory is the agroecological assessment of the soil cover structure (the territory, i.e., the soil's spatial location), associated with lithological and morphological conditions. The ratio of natural landscapes and agricultural landscapes, including different lands, namely the arable lands, forests, meadows, and water reservoirs, is an indispensable object of the territory landscape analysis (Dzhigirej et al., 2004).

Therefore, it should be noted that the assessment of ecological stability of the landscape is considered as the ability of the agricultural landscape to maintain its structure and properties during the performance of a specific function in conditions of the anthropogenic influences. This assessment is of great importance in the agricultural enterprise's territory because it prevents soil degradation. In addition to the assessment indices, control over its implementation should be established. For example, in the EU member states, more than 5% of the agricultural lands in need of restoration are under environmental protection (Ciaian et al., 2012). Public and local authorities expect the landowners to carry out the land protection measures according to their plans and under their control (Belgium, Spain, Germany, and France). The land reclamation works are carried out at the expense of the state budget and financial support within the framework of the Common Agricultural Policy of the EU. Therefore, taking into account the EU countries' experience, it is necessary to create in Ukraine a mechanism of state regulation that will provide for penalties for those agricultural enterprises that intensively use the land potential without taking into account the ecological factors. The use of the appropriate economic, financial and organizational instruments will make it possible to strengthen the control over efficient land use in agriculture.

Substantiating the perspectives for the development of land relations in Ukraine, we should take into account the negative consequences of the land reforms in the EU member states that have affected the efficiency of land use: fragmentation and diminishing of land tracts due to the privatization processes (Estonia), lack of the effective mortgage loan mechanism (Latvia, Lithuania), and the disparities due to limited financial resources of agricultural producers for buying land (Bulgaria) (Larsson, 1991; Gliessmann, 2001; Swinnen et al., 2013).

European experience shows a gradual narrowing of the market relations sphere. Land resources are limited, so any reform is a consequence of the redistribution of lands and income from their use. Considering the environmental and economic aspects of land use must play an essential role in the potential provision of rational use of the Ukrainian agricultural lands.

Conclusions

For the efficient use of the agricultural land, it is necessary to adhere to a set of elements for crop growing technologies aimed at preserving, restoring and increasing soil fertility and obtaining high yields and profits.

Improving the efficiency of the agricultural lands and increasing the capacity of the crops involves increasing the amount of applied fertilizer to the scientifically recommended optimum rates; proportional application of nitrogen fertilizers during the growing season based on soil and plant diagnostics; application of mixed organic and mineral fertilizer system and application of the integrated weed protection; introduction of plant growth regulators; high-quality execution of all technological operations, the provision of which involves increasing the capital equipment of the farming and capital-labor ratio in the economy at the expense of renewing the active portion of the fixed capital stock, i.e., increasing the investment into agricultural production. Ensuring the reproduction and increasing soil fertility involves introducing the systems for the environmentally friendly soil protection technologies into practice, which are adapted to zone features, and involvement of biological plant protection systems and the use of the alternative mineral fertilizers; involvement of the alternative sources of organic replenishment.

The system of economic and ecological measures for the protection and rational use of the land resources should be part of the socio-economic development of settlements, and the land policy should be aimed at developing and implementing a State targeted program to restore the soil fertility and at creating the regional programs of land use and protection in the future.

Therefore, the use of soil protection system of farming, rational organization of territory and lands, scientifically substantiated crop rotations, improvement of agricultural crop production technologies, ensuring the market for the agricultural products, ensuring legal regulation and consolidation of the enterprises are the main ways to improve the efficiency of land resources employment.

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