

EVALUATION OF EFFICIENCY OF AGRICULTURAL LAND USE: COMPARATIVE METHODOLOGY

The targeted use of land relations at different stages of historical development was determined based on economic considerations. Reforming land relations in Ukraine, increasing the political, economic and social importance of land and its inclusion in the economic turnover require improving the economic mechanism of land management: increasing the efficiency of its use and creating optimal environmental conditions to increase investment and production potential of land [24].

Land – the main means of production in a number of sectors of the economy and, above all, in agriculture. It is a necessary material prerequisite for the labor process and one of its most important material factors. Unlike other resources, land in its natural-productive and territorial functions is a universal factor of social reproduction, it performs many important functions both in human life and in the economic development of the state [12, 20].

The choice of effective forms of organization and mechanism of land use at the present stage of economic development is one of the conditions for further successful improvement and development of land relations with the formation of a productive economy [1, 14]. Therefore, the main directions and priorities of socio-economic development of Ukraine are largely determined by the presence of high land and resource potential, and the success of radical transformations in the economy, especially in the agricultural sector, will significantly depend on its effective use and reproduction [10].

Many scientific works of such leading economists and practitioners are devoted to the study of economic efficiency of land use in Ukraine as D. Dobryak, M. Fedorov, V. Gorlachuk, O. Hauke, O. Khismatulov, B. Martynov, I. Mozzhukhin, L. Novakovsky, M. Oganovsky, P. Pershin, P. Rusnak, M. Shulgin, A. Tretiak, A. Tykhonov, A. Varlamov, V. Vasylichenko, S. Volkov and many others.

When studying the efficiency of land management, it is necessary to distinguish between such economic concepts as "effect" and "efficiency".

As noted by P. P. Rusnak, "the effect is the result of the production activity of the enterprise. For example, from the use of fertilizers the effect is expressed in the form of increase in yield, but the result does not give a complete picture of the feasibility of using fertilizers. To do this, it is necessary to compare the result with the cost of fertilizers or feed, ie to determine the economic efficiency" [19].

According to A. Varlamov and O. Khismatulov under the effect is more appropriate to understand the result of any action, activity, consequence of any cause, and efficiency – the ability to bring effect due to the degree of use of resources or influence on the process [30]. A similar interpretation of the effect in the works of A. Tretiak [22].

Economic efficiency of agriculture is a multifactorial category, because in order to determine the degree of influence of factors of production on the efficiency of the economy is an assessment of the use of production potential of agricultural enterprises [26, 28].

There are three types of efficiency of agricultural production [16, 17]:

- technological;
- economic;
- social.

Technological efficiency characterizes the use of production resources. The main criterion of technological efficiency is the maximum yield per unit of land resources or herd of animals while preserving the natural environment and maintaining ecological balance [9].

Economic efficiency is considered as the degree of realization of production relations, which characterizes the efficiency of production. The criterion of economic efficiency is to obtain maximum income.

Social efficiency characterizes the level of social development of the team, the degree of achievement of the normative standard of living of society.

Depending on the above types of efficiency, there are four groups of factors: technological, economic, social and organizational. A. Varlamov, A. Tretiak, O. Khismatulov believe that all these factors affect the results of production, usually in the aggregate, which determines the complex nature of the assessment of production efficiency [9, 23].

Production efficiency is an economic category that reflects the mechanism of functioning of production forces and production relations, which shows the effectiveness of the functioning of means, objects of labor and labor [17]. It determines the essence of the process of reproduction and characterizes the degree of achievement of the main goal, which depends on the system of economic laws regarding social and individual reproduction [11].

Some economists [11, 13, 18] consider the types of efficiency more broadly, ie combine 2 separate types of efficiency into one group and at the same time distinguish:

- production and technological efficiency;
- production and economic efficiency;
- socio-economic efficiency.

The concept of production and technological efficiency in the economic literature was first considered by academician VASGNIL Serhyeyev S. [23]. He believed that production and technological efficiency reflects the use of productive forces in the production process, and this is primarily a derivative of the technological subsystem [9].

Socio-economic efficiency expresses the degree of realization of the purpose of production, and production-technological and production-economic – a means of achieving it [11].

American scientists [3, 4, 5, 15, 29] define the essence and criteria of production efficiency in a different way. They argue that efficiency in production is achieved when the company cannot reduce the cost of production of a certain fixed volume of output by changing the use of factors of production. Production efficiency, in turn, requires two conditions:

- technological efficiency, in which the company achieves the maximum possible output at the cost of available resources;
- economic efficiency, when the company uses a combination of factors of production, which minimizes the cost of production of a given volume of products.

Comparative characteristics of the essence of production efficiency of different scientific approaches are given in table 2.4.1.

Table 2.4.1

Comparative characteristics of the essence of production efficiency of different scientific approaches of a number of foreign and domestic scientists [9]

Comparative characteristic	Scientific approach foreign scientists	Scientific approach ukrainian scientists
1	2	3
The essence of the concept "Production efficiency"	One possible best result	Performance evaluation
Criterion of efficiency production	Maximum output; Minimum production cost	Maximum output per unit of resource used Maximum income
The degree of use of resource potential	Maximum use of available factors of production	"Rational" use of factors of production
The task of assessing the efficiency of resource potential of production	Determination of Pareto-optimal resource allocation	Identifying ways to increase the productivity of a unit of resource
Methodological approaches used to	Least cost combination rule of resources	Graphic methods Statistical methods

Continuation of table 2.4.1

1	2	3
<p>determine the assessment of the efficiency of use of resource potential of production</p>	<p>Profit maximizing rule</p>	<p>Assessment of land use:</p> <ul style="list-style-type: none"> – size, composition and structure of land (by type);
	<p>Methods of analysis:</p> <ul style="list-style-type: none"> – marginal rate of technical substitution (of labor for capital) – analysis of isoquant & isocost map 	<ul style="list-style-type: none"> – size, composition and structure of sown areas; – loading of cattle on 100 hectares of agricultural lands; – land armament; – soil quality.
	<p>Graphic methods</p> <ul style="list-style-type: none"> – Edgvort box diagram 	<p>Estimation of land productivity:</p> <ul style="list-style-type: none"> – yield; – yield of livestock products per 100 hectares of land; – profit and gross income per 1 ha of land
		<p>Evaluation of feed use:</p> <ul style="list-style-type: none"> – livestock and poultry productivity
<p>Methodological approaches used to determine the assessment of the efficiency of use of resource potential of production</p>	<p>Graphic methods:</p> <ul style="list-style-type: none"> – production contract curve 	<p>Assessment of the use of labor resources:</p> <ul style="list-style-type: none"> – composition and structure of labor resources (by age, level of education, experience, level of qualification, etc.); – the level of use of labor resources; – productivity
		<p>Estimation of the use of fixed and current assets:</p> <ul style="list-style-type: none"> – structure of fixed and working capital; – structure of the equipment (technological and age); – the amount of own funds and their share in the total amount of the source; – coverage ratio; – share of own working capital in the total amount; – the share of long-term borrowings in the total amount of sources
		<p>The main generalizing indicators of efficiency:</p> <ul style="list-style-type: none"> – the level of profitability of industries; – rate of return

Given the above, we can conclude that if the manufacturer in determining the assessment of the effectiveness of the production potential of the enterprise will use methodological approaches or only domestic or only foreign scientists, the reliability of the results will not be very high [23].

This is justified by the following reasoning.

The subject of assessment according to the domestic methodology is the used resources, and according to the problem – the unused resource potential, the available production capacity of the agricultural enterprise. Thus, the task of assessing the efficiency of production potential is to determine the maximum (technologically acceptable) level of use of factors of production and develop such a combination of resource allocation, when it is impossible to redistribute available resources to increase output of one economic product without reducing output of another (Pareto-optimal distribution). resources) [9].

If the head of an agricultural enterprise uses the methodology proposed by domestic scientists, based on the results of assessing the efficiency of production potential, he will determine the level and efficiency of use of each factor of production separately – capital, land and labor.

In this case, the evaluation task will not be performed:

1) production factors are assessed separately, and not in the aggregate of their effect on production efficiency; thus, when determining the possibilities of productivity growth (return) of each individual resource do not take into account the criteria of growth and limiting the number of other factors of production;

2) this technique accurately determines the quantitative degree of resource use, but does not eliminate errors in terms of quality – all performance indicators (except for the rate of return) are determined taking into account only the resources used and do not take into account unused production capacity [9].

To avoid these errors, we propose to use both traditional and new methodological approaches (table 2.4.2).

Statistical methods make it possible to more fully characterize each factor of production, modeling methods – to develop the best combination of them taking into account the criterion of efficiency [9].

In the agricultural sector of Ukraine there are specific industry features that are not taken into account by foreign researchers.

The specifics of production in the agricultural sector, in particular in crop production, requires consideration of a specific resource – land. Therefore, when applying the methods proposed by foreign scientists, it is necessary to evaluate, in addition to capital and labor, also land.

Table 2.4.2

Methodological approaches used by some foreign scientists to determine the assessment of the efficiency of the use of resource potential of production [9]

Methods research	Classifications	
	performance evaluation	planning, forecasting
Statistical methods	Index analysis Correlation analysis Regression analysis Methods of chain substitutions and differences Grouping method Method of comparisons The method of average, absolute and relative values Deviation method Coordinate matrix method	Medium sliding method Least squares method Exponential mean method Trend extrapolation method Adaptive method
Methods modeling	Methods of formalizing economic conditions Functional cost analysis	Economic and mathematical modeling: – linear programming; – network planning; – method of intersectoral balance
		Logical simulation: – method of analogues; – scenario method; – Delphi method; – method of "brainstorming"; – Synectics method; – method 635
		Information modeling: – method of flow analysis; – method of scientific publications; – method of analysis of scientific and technical discoveries
		Methods of economic justification: – business plans; – Investment projects; – balance calculations

In carrying out the assessment, in order to determine the effective redistribution of resources, the following specific features of this factor of production should be taken into account:

1) land use is limited by its scale and technological requirements for use;

2) the soil is able to restore and even increase its productivity (fertility).

It should be noted that the methods of some domestic scientists also do not fully take into account these features. According to these methods, it is proposed to calculate a set of indicators: the value of gross output, profit, total cost of sales, and so on. In general, production costs, gross output, sales revenue and profit reflect performance, but cannot be used as criteria for assessing performance, as none of these indicators reflect resource efficiency. Combining the above indicators are the level of profitability and profit margin.

In methodological terms, the first indicator characterizes the efficiency of production costs (provided that it is calculated from the data for the production year), and the second – the use of production resources. It is impractical to compare them in order to assess the efficiency of the use of production potential. This is due, firstly, to the different content of sales profit and balance sheet profit, which are used to calculate according to the level of profitability and profit margin, and secondly, if the rate of return is determined for a calendar year, then the working capital includes unfinished production that already contains certain costs. Therefore, the proposed indicators of the level of profitability and profit margins, which are determined by this method, cannot be a criterion for assessing the economic efficiency of production potential, as their use can lead to errors in calculations. Thus, the level of profitability does not determine the degree of use of all available production potential of an agricultural enterprise, but only used (in industry these two categories coincide provided full involvement in the production process of available fixed assets), and the rate of return does not take into account such an important element of production potential. land, because according to the above methods in the cost of production does not take into account the cost of land as the main means of production [9, 23].

To avoid errors in determining the assessment of the effectiveness of the use of production capacity in the application of indicators of profit margin and level of profitability, it is advisable to use the rate of return, as defined by T. A. Khomchuk [6].

A specific feature of agriculture is the advantage in the agricultural sector of highly integrated agricultural enterprises. The close

interconnection of industries in such enterprises requires the obligatory interconnection of their development plans. To take into account these features, it is necessary to apply an appropriate system of indicators of efficiency of use of the production potential of the enterprise

There is another important feature – the activity of the agricultural sector is closely related to climatic conditions. Therefore, in determining the economic efficiency of agriculture, it is advisable to include the stage of assessment of natural conditions, as most environmental factors due to the impact of economic results are unstable [23].

This assessment of natural and climatic factors (rainfall, sunny days, air temperature, etc.) is carried out in order to determine their impact on performance.

The development of market forms of entrepreneurial activity requires new approaches to the organization of production and management.

The system of market organization of microeconomics includes marketing and management.

The implementation of marketing principles is ensured through a number of methods of marketing activities. The most important of them are:

- analysis of the external environment;
- analysis of consumers, both real and potential;
- study of existing and planning of future goods;
- planning the movement of goods;
- planning the system and price levels, the use of various discounts and benefits.

However, unfortunately, the lack of some experience in conducting such studies inhibits the implementation of these methods. As a result, manufacturers are more likely to make intuitive decisions in practice because they are unable to rationally assess problems or issues.

On the other hand, the level of reliability of traditional sources of information (statistical reports, publications of sectoral agencies, etc.) has significantly decreased, as, according to experts, the scale of the shadow economy has reached almost 60 % [9].

Based on the above scientific approaches to determining the effectiveness of the agricultural sector, in agricultural land use, they are adapted to the land management system. Thus, in land management design, the effect is determined by comparing the design condition with the actual. Tretyak A. believes that the effect should be understood as the result of any action, activity, consequences of any cause, and efficiency – the ability to bring effect due to the degree of resource use [21].

V. Gorlachuk [2] believes that the efficiency of land use should be determined by comparing the actual data on land use with their possible use depending on the quality of land. Therefore, the quality of land depends on the size and, consequently, the savings of social labor to obtain the same amount of products per unit physical area. At the same time, the basis of comparison should be the indicators of the use of the worst in quality, which is determined by the need to use them in agriculture. To determine the effectiveness of the proposed formula:

$$I_e = I_o - I_a \quad (2.4.1)$$

I_e – land use efficiency, increase or decrease, UAH/ha;

I_o – indicators of optimal (possible) land use, UAH/ha;

I_a – indicators of actual land use, UAH/ha;

If the efficiency of land use is considered in relation to natural resources, material production and society as a whole, it is divided into environmental, economic and social efficiency, respectively. Thus, the overall effect of land management has three important components: environmental, economic and social efficiency.

Economic efficiency is a generalized and complete reflection of the final results of the use of funds, objects of labor and labor in an agricultural enterprise for a certain period of time and is determined by the ratio of results to the cost of obtaining them. Economic efficiency indicates the return on the total investment. In agricultural enterprises – is to obtain the maximum number of products from 1 hectare at the lowest cost of labor, material and financial resources for the production of a unit of production [19].

The purpose of economic efficiency of land use is to determine the level of useful effect in value and in kind per 1 hectare of land; identification of reserves and ways to increase the beneficial effect of land use, which includes the optimal structure of land use and rational use of land resources. It is economically feasible to use land that maximizes their profitability.

Economic efficiency of land use is characterized by a system of natural and cost indicators that reflect the ratio of individual end results and the level of land use. It is manifested in obtaining a certain effect when using the resource potential of the territory for the period, reducing the cost of restoring the normal state of the environment as a result of increasing the efficiency of its use, protection and expanded reproduction of resources [7, 8].

Land management is a component of the existing economic system and is a complex, multifaceted process that depends on the nature of

industrial relations, forms of land ownership and other means of production. This determines the following:

1) economic efficiency of land use must be assessed on the basis of a system of economic laws and the laws of nature, which accordingly requires a system of estimated indicators of land management;

2) in determining the economic efficiency of different types of land use should take into account, on the one hand, the collective and personal interests of land users and landowners, and on the other hand – the public interest. This requires the use of both self-supporting (commercial) and social approach;

3) since land is an element of the natural environment (biosphere), in the economic assessment of land management, it is necessary to take into account the conditions of reproduction of soil fertility and ecological characteristics of the territory;

4) when calculating efficiency indicators, it is important to highlight the effect of land management, comparing it with the corresponding costs, ensuring qualitative homogeneity and quantitative comparability of indicators for different agricultural enterprises, components and elements of the project, etc.

5) as land management projects are related to improving land use, water management, production and road construction and other elements of engineering infrastructure, it is necessary to take into account the investment efficiency of measures carried out in the period before full development of the project, the cost of fixed assets and working capital. and costs related to compensation for losses and environmental protection;

6) gaps in time between the implementation of capital investments and obtaining the effect of them, require a comparison of the effect and costs that do not coincide in time, and special consideration of the time aspect of land management in market conditions [22, 23, 28].

A. Tretiak [22] and S. Volkov [31] believe that it is possible to distinguish between absolute and comparative economic efficiency of land management.

The calculation of absolute efficiency involves the selection of the most appropriate areas and scope of land management measures in the agro-industrial complex, its industries and enterprises. When evaluating the comparative effectiveness, the best option for a particular measure is chosen.

In contrast to the economic justification, environmental efficiency allows not only the choice of the best version of the project measure, but also its maximum effect on the basis of assessment (the existing situation compared to standards) [22, 26, 27]. From a methodological point of view,

it is also necessary to distinguish between actual and calculated efficiency of land management. The actual efficiency is determined to verify the return on costs, to establish systematic control over the development of the project in the process of author's supervision and, if necessary, adjust it. Estimated (project) efficiency is determined when compiling and substantiating land management schemes and projects, as well as when performing certain land management actions and measures [25].

The actual efficiency of land management is determined by comparing the actual organization of the territory with the planned in previously developed projects, as well as comparing the reporting indicators with the design and regulatory. The actual efficiency of land management makes it possible to assess its real result, the degree of usefulness for the development of social production. In the implementation of organizational and economic measures, it is detected immediately after the transfer of the project in kind and on this basis the appropriate restructuring of the agricultural enterprise (division of crop rotation into fields or work areas, devices for efficient operation of agricultural machinery; placement of crops on the most suitable for them soils, the approach of labor-intensive crops to economic centers, the formation of internal road network).

The actual efficiency reaches its maximum at the time of full development of the project, but the years of its implementation due to different weather conditions may be different.

When implementing measures related to additional capital investments or current costs, the actual efficiency of land management depends on the length of the design periods of these measures, construction time and time of normal operation of facilities. It can be judged by the economic efficiency of such measures (land reclamation, agricultural development, radical land improvement, planting perennials, construction of fields, roads, etc.), fully or partially carried out during the settlement period on the basis of working projects (design estimates), designed to develop a technical project [23].

Actual and estimated efficiencies may not match for the following reasons:

- ✓ estimated efficiency is determined at the time of full development of the land management project according to the planned indicators of crop yields, animal productivity, production costs, etc. The actual efficiency depends on the prevailing weather conditions and other natural and economic factors;

- ✓ the estimated efficiency is based on the whole system of measures related to capital investments, which are expected to be completed by the

end of the project period, and the actual consists only of those that are fully or partially implemented at the time of the assessment;

✓ the actual efficiency depends on the actual funds spent, the timing of the implementation of various engineering structures, while the estimated is assessed by aggregated indicators;

✓ if the calculated efficiency is determined on the basis of comparability of the base and calculation periods, the actual – based on real production conditions.

The stated methodological approaches are recommended to be applied at a substantiation of any concrete projects of land management [22].

Considering land management as the main tool for organizing land use, it should be noted that, according to economists such as S. M. Volkov [31] and A. M. Third [21], it is implemented in several areas – in the natural environment, material production and society as a whole. Accordingly, its effectiveness is divided into environmental, production and economic (or economic) and social (table 2.4.3).

Table 2.4.3

Relationship between land use efficiency with components and the purpose of production

Classifications	Efficiency of land management		
	ecological	production and economic	social
Relation to the basic conditions of production	Natural resources	Means of production	Labor resources and living environment
The dominant goal of the reproduction process	Reproduction of soil fertility as a component of the ecosystem	Reproduction of land potential as a means of production	Reproduction of social (land) relations
The role of land in social production	Land – a general condition of production, the main natural resource	Land – the subject and means of labor, the main means of production	Land – the object of socio-economic relations

From the above we can conclude that, given the close connection of agricultural production with the organization of its fixed asset, which to some extent provides it, the efficiency of land management can be adequately divided into environmental, production and economic (economic), social and investment.

Environmental efficiency is related to the need to protect nature, reproduce and rationally use natural resources. Therefore, it is manifested primarily through the impact of land management measures on the environment and the nature of land use as an important component.

Production and economic (economic) efficiency is due to the influence of the organization of the territory on the organization of production and vice versa. Land management decisions that contribute to the creation of optimal proportions of production, improving economic conditions, directly affect the performance of agricultural enterprises.

The economic efficiency of land management can be understood in two ways. In a broad sense, it is to ensure a rational combination of labor, land and other means of production. For example, projects of territorial land management of agricultural enterprises allow to solve questions of their optimum size, placement, structure of production, structure of lands. Projects of in-farm land management contribute to the rational organization of the territory and various lands in a particular economy, the creation of the best conditions for the development of the economy and a steady increase in soil fertility.

Social efficiency of land management is characterized by the strengthening of land relations, the stability of the rights of land users and landowners. It is due to the importance of land as an object of socio-economic ties and aims to improve the social conditions of social reproduction.

Investment efficiency is due to the investment attractiveness of land use, the totality of investments in land improvements and land protection.

REFERENCES

1. Barvinsky, A., Tykhenko, R. (2009). *On the relationship between the categories "system" and "mechanism" and their use in the economy of land use. Zemleustrii i kadastr, 1, 63–69 [in Ukrainian].*
2. Gorlachuk, V. (1996). *Ecological and economic problems of rational land use in Western Ukraine. Lviv [in Ukrainian].*
3. Katz, M., Rosen H. (1997). *Microeconomics. – 3rd ed. Boston: McGraw-Hill/Irwin. ISBN-13: 978-0256171761.*
4. Khaiman, D. (1992). *Modern microeconomics: analysis and application. Moscow: Finansy i statistika [in Russian].*
5. Khicks, J. (1988). *Cost and capital. Moscow: Prohress [in Russian].*
6. Khomchuk, T. (2000). *Methodical approaches to determining the efficiency of the production potential of the industry. Visnyk DAAU, 1, 190–195 [in Ukrainian].*
7. Koreniuk, P. (1996). *Ecological and economic efficiency of land use. Ekonomika APK, 1, 35–37 [in Ukrainian].*

8. Koreniuk, P. (1997). *Efficiency of land use in the Forest Steppe zon. Ekonomika APK*, 1, 69–71 [in Ukrainian].
9. Kotykova, O. (2002). *Methodological bases of an estimation of efficiency of use of production potential of the enterprises APK. Naukovi pratsi. Ekonomichni nauky*, 6, 81–89 [in Ukrainian].
10. Kovalchuk, I., Martyn, A., Ievsiukov, T., Tykhenko, R., Zhuk, O., Bogdanets, V. & Openko, I. (2015). *Conceptual bases of the decision of problems of land management of rural territories in modern conditions. Kyiv: Medinform* [in Ukrainian].
11. Kovanov, S., Svobodin, V. (1991). *Economic indicators of agricultural enterprises. Moscow: Ahropromizdat* [in Russian].
12. Kryvov, V., Tykhenko, R. & Hetmanchyk, I. (2008). *Fundamentals of land management. Kyiv: Urozhai* [in Ukrainian].
13. Kulikov, V. (1996). *Once again about changing the privatization model. Rossyiskyi ekonomycheski zhurnal*, 5–6, 22–23 [in Russian].
14. Martyn, A., Barvinsky, A. & Tykhenko, R. (2017). *Problems of conceptual apparatus in environmental economics: relationship between the systems and mechanism of land use. Zemleustrii, kadastr i monitorynh zemel*, 4, 21–28. DOI 10.31548/zemleustriy2017.04.021.
15. Maurice, C., Thomas, C. (1995). *Managerial economics – 5th ed. Chicago, Illinois Irwin*.
16. *Methodological recommendations for determining the efficiency of agricultural production (1996). Moscow: All-union scientific research institute of economics* [in Russian].
17. *Methodology of economic research in agro-industrial production. (1995). Ed. Botev, M. Moscow* [in Russian].
18. Notkin, A. (1987). *Issues of efficiency and intensification of social production. Moscow: Nauka* [in Russian].
19. Rusnak, P. (2002). *Economy of agricultural enterprises. Kyiv: NAU* [in Ukrainian].
20. Shevchenko, O., Openko, I., Zhuk, O., Kryvoviaz, Ye. & Tykhenko, R. (2017). *Economic assessment of land degradation and its impact on the value of land resources in Ukraine. International Journal of Economic Research*, Vol. 14, 15(4), 93–100. Retrieved from http://serialsjournals.com/abstract/34405_ch_11_f_-_ivan_openko.pdf.
21. Tretiak, A. (2001). *Methodical basis for evaluating the effectiveness of the system of state land cadaster. Zemlevporiadkuvannia*, 2, 39–43 [in Ukrainian].
22. Tretiak, A. (2004). *Economics of land use and land management. Kyiv: CZRU* [in Ukrainian].
23. Tykhenko, R. (2006). *Ecological and economic efficiency of land management in the conditions of transformation of land relations in Ukraine. Kyiv: Anva-print* [in Ukrainian].
24. Tykhenko, R. (2006). *Efficiency of land management – the key to sustainable land use in the context of spatial development. Land relations and spatial development in Ukraine, Scientific and practical international conference, April 13–14, Kyiv, Ukraine*.

25. Tykhenko, R. (2008). Comparative analysis of determining the efficiency of land management. *Naukovyi Visnyk Natsionalnoho Ahrarnoho Universytetu*, 128, 47–54 [in Ukrainian].
26. Tykhenko, R. (2010). Evaluation of optimizing land size of newly created agricultural enterprises. *Visnyk Kharkivskoho Natsionalnoho Ahrarnoho Universytetu*, 6, 400–406 [in Ukrainian].
27. Tykhenko, R. (2011). Evaluation of land management efficiency: theoretical aspects. *Land resources and land relations: state, problems of reform, prospects of optimization, Scientific and practical international conference, September 29–30, Kyiv, Ukraine*.
28. Tykhenko, R. (2012). Evaluation of land management efficiency at the local level. *Innovative economy*, 10(36), 85–94 [in Ukrainian].
29. Varian Hal, R. (1993). *Intermediate Microeconomics: A Modern Approach*. – 3rd ed. New York, London: W. W. Norton & Company, Chap. 16.
30. Varlamov, A., Khismatulov, O. (2001). *Efficiency of the state land cadaster system*. Moscow: HUZ [in Russian].
31. Volkov, S. (2001). *Land management. Economics of land management*. Moscow: Kolos [in Russian].