THE METHODOLOGICAL APPROACHES TO THE ASSESSMENT OF THE ECONOMIC EFFICIENCY LEVEL OF AGRICULTURAL LANDS USE OF THE REGION

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Abstract

The study of the issue of the effective use of lands is carried out using the calculation of economic indicators, on the basis of which a general rating has been determined and a cluster analysis has been carried out. The methodical instrument for constructing cluster analysis was the method of complete linkage at the Euclidian distance to combine the most similar administrative districts of Lviv region according to standardized indicators of economic efficiency of agricultural lands use. The article presents the results of cluster analysis, which showed the formation of three clusters in terms of economic efficiency of agricultural lands use in Lviv region. The research confirms empirically that the condition of land resources in Skole and Turka districts of Lviv region is unsatisfactory. Sambir and Horodok districts are defined as areas with a satisfactory state of agricultural land. In other districts of the region, we can witness a good state of land for the production of agricultural products. The results of the conducted research may be useful for the unification of business entities on an innovative basis to achieve competitive advantages and support economic growth at the regional level.

Key words: agricultural lands, cluster analysis, efficient lands use, assessment, region.

INTRODUCTION

In Ukraine, due to the transformational processes of land relations development, the problems related to the assessment of land use efficiency in market conditions of the economy remain unresolved. The issue of improving the economic efficiency of agricultural lands use, forming a land market, recognizing the land as commodity and capital, determining its market value are extremely relevant.

Under the current conditions of economic activity, the reduction of the efficiency of agrarian production and living standards of the population, the assessment of the economic potential of the regions is not sufficiently studied and requires the improvement of methodological approaches to address the problems of the efficiency of land use in the region and management.

Such scholars as V. Andriichuk [1], Y. Dorosh [2], O. Hutorov [3], Z Ryzhok [8],

A. Tretiak [9], O. Ulianchenko [10], and others made an analytical analysis of the issues decision on the organization of land resources efficient use under conditions of their reproduction and protection due to administrative and managerial decisions at the present stage of implementation of land reform, the formation of a market economy. They examined theoretical and methodological approaches to improving the land use management system.

However, in the framework of socio-economic development of the regions mechanisms for the regulation and land resources use of administrative and territorial entities require further scientific development and substantiation in order to preserve the land potential and to form effective mechanisms for preserving the productivity of the land, raising the level of the population welfare.

MATERIALS AND METHODS

The concept of the effective use of land potential in the regions has a practical need and expediency and should be based on new innovative principles and methodological approaches. Therefore, we have the task of studying the level of economic efficiency of land use on the example of Lviv region. The methodology for calculating the system of indicators for assessing the economic efficiency of land resources use is presented in Table 1.

Table 1. The methodology for calculating the system of indicators for assessing the economic efficiency of land resources use

	Indicators	Formula for calculation	Content
Economic	Production of gross agricultural products GDP	$GDP = GDPp + GDP_1$ (1) where $GDPp$ – products of some industries of plant growing, a GDP_1 – livestock in cash for a certain period (as a rule, per calendar year), UAH.	characterizes the total amount of agricultural production and represents the full cost of the manufactured product
	Income from the sale of agricultural products I	$I = S - C$ (2) where S – the volume of sales of agricultural products, C - its full cost	is the purpose of entrepreneurship and the main economic indicator
	Profitability from the sale of agricultural products P	$P = \frac{ЦO - C}{C}$ (3) where P – price of agricultural products sales, UAH/p; V - volume, p; C - cost of production, UAH	provides an objective assessment of the efficiency of agricultural enterprises
	Cost price of production of agricultural products C	$C = \sum B$ (4) where E – expenditures on production of agricultural products in cash, UAH	is the basis for determining prices for agricultural products

Source: It is done by the author on the basis of [1, 7]

To identify regional features state of agriculture conducted a hierarchical cluster analysis using the complete linkage method at the Euclidian distance. It defines the distance between the clusters as the greatest distance between any of the most distant two objects (x_i and y_i) in different clusters. The proximity measure, which is determined by the Euclidean distance, is a geometric distance in the n-dimensional space, which is calculated as [6]:

$$d\,(x, y) = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$

RESULTS AND DISCUSSIONS

Furthermore, we believe that in assessing the efficiency of agricultural lands use, an increase in the volume of agricultural production, that is, income from the land use, subject to compliance with environmental requirements of land use and increase of soil fertility, should be an indicator. Therefore, in the analysis of efficiency, it is necessary to take into account indicators of assessment of the land use efficiency using economic indicators, determined on the basis of modern factual data.

In assessing the economic potential of land resources, the following indicators were taken into account, such as profit − 1,299,338 thousand UAH and the profitability from the sale of agricultural products − 31.7%, the cost of production of 1 c of grain and legume crops − 245.97 UAH. Economic indicators have been used to determine the rating assessment of the efficiency of land use (Table 2). According to them, Brody district receives the best general assessment, and Skole district is the worst one.

The level of land use efficiency determines the yield of gross output per hectare of agricultural land. In total, in Lviv region, gross agricultural output per person is 2,282 UAH, per 100 hectares − 757.4 thousand UAH. The indicator of gross agricultural production is partial and, consequently, may vary depending on the spatial aspect, the time range, under the influence of organizational, economic and innovative mechanisms and, as a result, subject to increase as a result of the ecological and economic formation of sustainable land use in the region.

Among the reasons for low-cost use of land are:
- imbalance of the structure of landscapes and agricultural lands, a high degree of plowing, which reduces their buffer properties and makes it very vulnerable to any external factors of influence: climatic, man-made, etc.;
- application of low-efficiency unbalanced agricultural systems;
- low fertilizer and pesticide culture;
- low crop yielding capacity;
- low export price of agricultural products [4].

An important step is to determine the indicators of economic potential of land resources of regions at the present stage of formation of a regional economy. In turn, the economic potential depends directly on the effective use of land, the development and structure of the agricultural production industry in a particular territory.

Table 2. Assessment of efficiency of agricultural lands use according to economic indicators in Lviv region, 2017

| Administrative district | Economic indicators | | | | | | | | Total rating |
| | Production of gross agricultural products per 100 hectares of agricultural lands, thousand UAH GDP | | Income from the sale of agricultural products, ths. UAH I | | Profitability from agricultural products sales, % P | | Cost of production of 1 c of grain and legume crops, UAH C | | |
	value	rating	value	Rating	value	rating	value	rating	
Brody	751.8	9	141,466.5	3	46.6	5	162.56	1	1
Busk	661.5	16	87,640.0	7	19.5	14	294.69	17	16
Horodok	769.8	7	109,281.2	6	127.2	1	265.48	13	4
Drohobych	844.9	5	3,186.6	16	9.3	16	204.69	3	10
Zhydachiv	637.2	18	126,551.3	5	33.8	7	245.44	9	9
Zhovkva	904.0	3	28,159.1	12	49.2	4	255.37	10	5
Zolochiv	1,166.0	1	45,696.5	11	30.0	10	242.39	7	6
Kamianka-Buzka	637.9	17	152,872.9	2	20.2	13	279.87	15	14
Mykolaiiv	883.7	4	5,087.9	15	5.6	17	232.51	5	13
Mostyska	735.6	11	20,089.2	13	14.9	15	300.67	18	17
Peremyshliany	799.3	6	67,251.9	9	54.8	3	240.26	6	17
Pustomyty	1,143.1	2	67,477.3	8	38.4	6	195.01	2	2
Radekhiv	764.9	8	236,782.1	1	24.8	11	255.72	11	7
Sambir	509.2	20	5,491.1	14	72.1	2	279.45	14	14
Skole	519.3	19	-	19	-	19	-	19	20
Sokal	743.0	10	63,862.7	10	31.7	8	226.91	4	8
Staryi Sambir	687.5	13	662.0	18	22.7	12	244.24	8	15
Stryi	673.3	15	136,381.5	4	31.4	9	264.22	12	11
Turka	732.3	12	-	20	-	20	-	20	19
Yavoriv	683.6	14	1,397.9	17	2.3	18	282.47	16	18
Lviv region	*757.4*		*1,299,338*		*31.7*		*245.97*		

Source: Own calculation based on the data from [5].

Hierarchical cluster analysis was conducted on the basis of economic indicators of the efficiency of agricultural lands use for identifying regional features of the agricultural production in Lviv region. Creation of cluster formations based on economic indicators in Lviv region will allow uniting business entities on an innovative basis to achieve competitive advantages and support economic growth at the regional level. In addition, cluster analysis was performed on the basis of the data shown in Table 2.

Table 3. Standardized indicators of economic efficiency of agricultural lands use in Lviv region, 2017

| Administrative district | Economic indicators | | | |
	Production of gross agricultural products per 100 hectares of agricultural lands	Income from the sale of agricultural products	Profitability from agricultural products sales	Cost of production of 1 c of grain and legume crops
Brody	-0.06301	1.13852	0.50301	-0.73034
Busk	-0.60001	0.33744	-0.41340	0.85065
Horodok	0.04404	0.65952	3.22856	0.50114
Drohobych	0.49064	-0.91946	-0.75832	-0.22624
Zhydachiv	-0.74452	0.91654	0.07017	0.26135
Zhovkva	0.84210	-0.54780	0.59093	0.38017
Zolochiv	2.40018	-0.28680	-0.05833	0.22486
Kamianka-Buzka	-0.74035	1.30828	-0.38973	0.67332
Mykolaiiv	0.72138	-0.89116	-0.88344	0.10664
Mostyska	-0.15935	-0.66790	-0.56895	0.92220
Peremyshliany	0.21947	0.03401	0.78030	0.19937
Pustomyty	2.26400	0.03736	0.22572	-0.34206
Radekhiv	0.01490	2.55708	-0.23417	0.38436
Sambir	-1.50571	-0.88516	1.36531	0.66830
Skole	-1.44565	-0.96688	-1.07280	-2.67544
Sokal	-0.11534	-0.01643	-0.00085	0.03964
Staryi Sambir	-0.44539	-0.95703	-0.30519	0.24700
Stryi	-0.52983	1.06284	-0.01099	0.48606
Turka	-0.17897	-0.96688	-1.07280	-2.67544
Yavoriv	-0.46858	-0.94608	-0.99503	0.70443

Source: Own calculation on the basis of data [5].

The data from Table 2 characterized the efficiency of land use in agricultural enterprises of Lviv region for 2017, taking into account the scale of distances between clusters.

Based on these date, the standardized indicators of economic efficiency were calculated and presented in Table 3.

Cluster territorial and industry development of agriculture will promote its innovative modernization, the increase of human capital, the improvement of the quality of agrarian products and balance of the obtained industrial results considering economic, social and ecological coordinates [11].

In Fig. 1 shows the vertical dendrogram of cluster analysis performed in the program Statistica using the complete linkage method at the Euclidean distance to combine the most similar administrative districts of the region according to standardized indicators of economic efficiency of agricultural lands use.
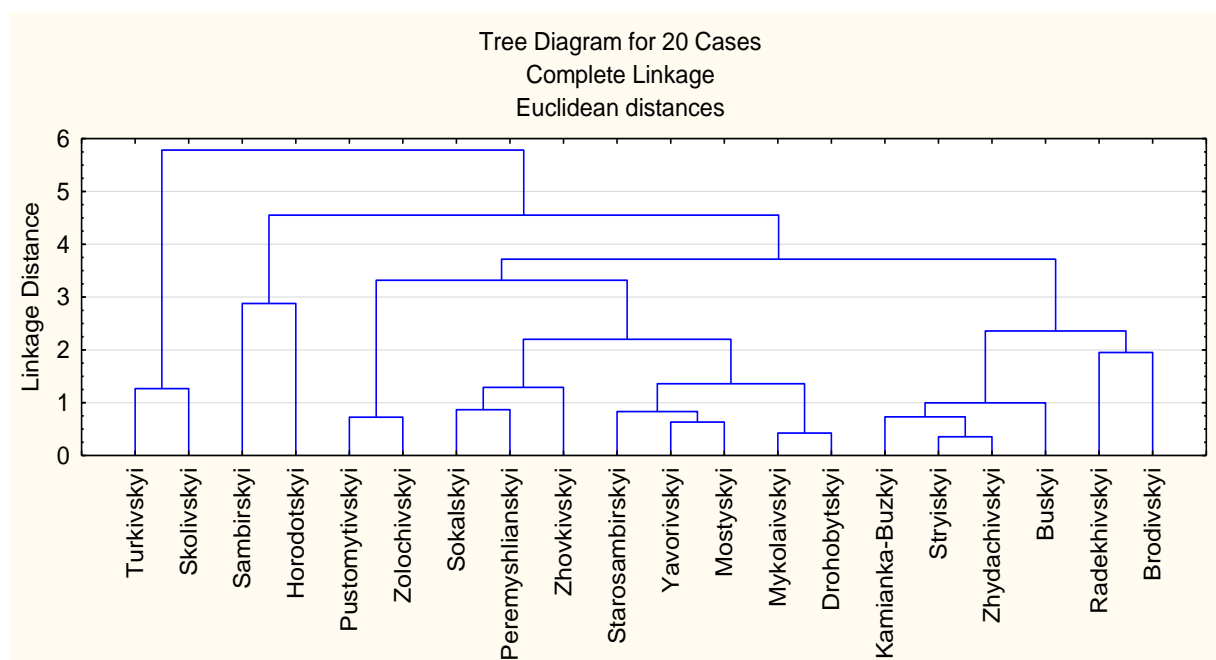

Fig. 1. Vertical dendrogram of cluster analysis according to standardized indicators of economic efficiency of agricultural lands use in Lviv region, 2017.
Source: It is done by the authors on the basis of [5].

The number of clusters is shown on the graph using the k-medium method using the indicators of economic efficiency of agricultural lands use in Lviv region (Fig. 2).
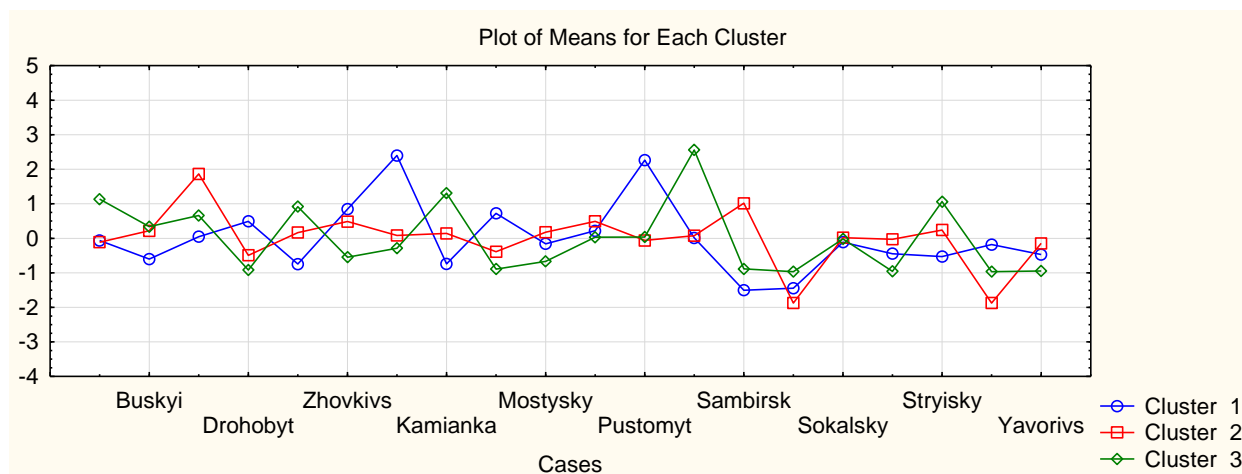

Fig. 2. The Schedule of average values for clusters according to the indicators of economic efficiency of agricultural lands use in Lviv region, 2017.
Source: It is done by the authors on the basis of [5].

In Table 4 the differences between the received clusters, namely the analysis of the deviations obtained using the dispersion analysis are shown. And also the distances between objects of the cluster, which allows you to display the Euclidean distances of objects from the center, that is, the average values of the corresponding clusters.

Table 4. The analysis of the deviations according to standardized indicators of economic efficiency of agricultural lands use in Lviv region

Administrative district	The analysis of the deviations		Distances
	between clusters	inside the clusters	
Brody	1.146186	0.760573	0.75350
Busk	0.561840	0.798909	0.35163
Horodok	2.478797	3.719399	0.33323
Drohobych	1.071407	0.141556	3.78440
Zhydachiv	1.385918	0.018276	37.91590
Zhovkva	1.080429	0.022210	24.32339
Zolochiv	4.557477	0.040099	56.82823
Kamianka-Buzka	2.118659	0.565037	1.87480
Mykolaiiv	1.392266	0.490127	1.42031
Mostyska	0.477710	1.111769	0.21484
Peremyshliany	0.149038	0.168737	0.44163
Pustomyty	3.940267	0.161188	12.22260
Radekhiv	4.697599	0.191292	12.27864
Sambir	5.086552	0.242913	10.46989
Skole	0.560637	1.284213	0.21828
Sokal	0.012164	0.000819	7.42302
Staryi Sambir	0.582626	0.152453	1.91084
Stryi	1.269150	0.123532	5.13694
Turka	2.003506	1.284213	0.78005
Yavoriv	0.429883	1.444085	0.14884

Source: Own calculation on the basis of data [5].

CONCLUSIONS

As a result of the conducted cluster analysis, three clusters were identified based on the economic efficiency of agricultural lands use in Lviv region:
-Skole and Turka districts, where the state of land resources is assessed as unsatisfactory;
-Sambir and Horodok districts – as areas with a satisfactory state of agricultural lands;
-Zolochiv, Kamianka-Buzka, Pustomyty, Peremyshlyansky, Mykolaiiv, Yavoriv, Staryi Sambir, Mostysks, Drohobych, Stryj, Zhydachiv, Zhovkva, Radekhiv, Busk, Sokal and Brody districts with a good state of land for the production of agricultural products.

The unsatisfactory state of use and protection of land resources in Lviv region is observed due to the extremely high economically and environmentally unjustified level of economic (primarily agricultural) development of territories; significant land-tenure of the main sectors of the economy; uneven agricultural development of territories; intensive development of degradation processes; the spontaneous formation of new types of land use in market conditions through the lease of land shares (shares) characterized by instability, fineness and through mussels; insufficiency of lands of natural reserve and other nature conservation, recreational, health and historical and cultural purposes; high level of technogenic pollution of the environment, insufficient development of ecological infrastructure; absence of programs of complex solution of issues concerning the use and protection of land; unsatisfactory state of legal and technical support that regulates the use and protection of land.

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