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ASSESSMENT AND ANALYSIS OF REGIONAL FEATURES OF RESOURCE-SAVING LAND USE FOR SUSTAINABLE MANAGEMENT

Anatolii KUCHER, Alina HRECHKO

V. N. Karazin Kharkiv National University, 6 Svobody Sq., Kharkiv, 61022, Ukraine, Phone: +38(057) 70-75-636; E-mail: kucher@karazin.ua, alinkaandreevna23@gmail.com

Corresponding author: kucher@karazin.ua

Abstract

The purpose of this study is a comprehensive assessment and mapping of resource-saving land use in terms of regions of Ukraine as a basis for the organization of sustainable land management in the agricultural sector. The rating of regions of Ukraine was compiled by a comprehensive assessment of land use savings, which made it possible to identify regional features and reserves of increasing resource-saving land use. It was found that land capacity index had the most significant impact on the degree of land use savings. This paper is one of the first article where a comprehensive assessment and analysis of the current state of resource-saving of land use in the agriculture of the regions of Ukraine and the search for factors of increasing land use savings based on regional differences was carried out, making a contribution to the lack of literature on this issue. The results of the study can be used to make economically sound management decisions to increase land use savings in Ukrainian regions. The practical use of the obtained results can help to improve the efficiency and effectiveness of sustainable land management at national and regional levels.

Key words**:** *resource-saving land use, regional differences, comprehensive assessment, fertility, sustainable land management*

INTRODUCTION

In the conditions of post-industrial formation society should agree that the development of the natural sciences will be more and more regulated by pragmatism [25]. In this regard, the objects of these sciences approach such categories as «spatial economy», «geoeconomics», «prostrology» and others [25, 29, 27]. It is from the standpoint of spatial economics that we consider regional features of resource-saving land use as a basis for sustainable land management in the agricultural sector of Ukraine. An analysis of recent research and publications shows that there are currently no works in Ukraine on the issue of resource-saving land use. At the same time, the problem of sustainable land and soil management is being actively studied by foreign scientists. For example, soil is recognized as the basis for creating favorable conditions for the transition to sustainable land management as a key to achieving the Sustainable Development Goals by 2030 [31]; long-term efficiency of sustainable land management for control of runoff, soil erosion, loss of nutrients in Mediterranean agroecosystems has been determined [20]; the scale of the impact of vegetation restoration on soil and water conservation in the semi-arid region of China in the context of resource conservation and sustainable management has been studied [32]; assessed the technical and environmental effectiveness of sustainable land management practices for small farmers in Ghana [8]; regional aspects of sustainable land management in Greece are substantiated [3]; spatial identification of land use functions and their trade-offs and synergies in China in the context of implications for sustainable land management [34].

Foreign scientists also thoroughly study various aspects of resource-saving activities, in particular: environmental and economic efficiency of resource-saving technologies in crop production in different countries [1, 5, 6, 13]; coordination of interaction between the environment, economy and tourism in China [19]; saving resources and increasing productivity in crop management in Ethiopia [9]; planning of resource-saving and environmentally friendly agricultural

demonstration parks [35].

The economic basis of resource conservation is formed in the work of I.M. Sotnik [26]. Modern publications of Ukrainian authors focus mainly on such issues as: economic, environmental and social aspects of land use [30]; theoretical and methodological foundations of rational and efficient use of land resources [11, 12, 28]; spatial features of soil cover as a basis for sustainable soil management [2]; sustainable soil management and its role in forming the competitiveness of agricultural enterprises [14, 15]; investment attractiveness of soils of the Carpathian region of Ukraine [22]. At the same time, the issues of substantiation of ecological-and-economic bases of organization of resource-saving land use in the agricultural sector remain unexplored in Ukraine.

The purpose of this study is a comprehensive assessment and mapping of resource-saving land use in terms of regions of Ukraine as a basis for the organization of sustainable land management in the agricultural sector.

MATERIALS AND METHODS

To achieve the goal of the research study, the following methods were used: economic-statistical, calculation-analytical and monographic (for calculation and analysis of indicators characterizing the degree of land use savings), correlation analysis (to identify the relationship between factors of land use savings), regression and analysis of variance (to determine the degree of influence of factors on which land use savings depend), cartographic method (for mapping the land consumption of the economy and land use savings). To assess the degree of savings in the use of land resources in Ukraine, we used a method developed by one of the co-authors of this article [16, 17]. The methodological plan uses a number of special indicators, in particular such as: land return – characterizes the level of economic return of land taking into account their quality, calculated by dividing the gross agricultural output (gross value of agricultural production at constant prices) of all categories of farms to the general normative monetary value of agricultural lands; land consumption of the economy (or land capacity) – determined by the ratio of the region to the volume of gross regional product; loss-making gross output with characterizes the degree of environmental friendliness of production, determined by dividing the environmental-and-economic damage from the loss of humus by the value of gross agricultural output; the loss-making capacity of the gross regional product is determined by dividing the ecological-and-economic loss from the loss of humus by the value of the gross regional product. The information base of the study was the data of the State Statistics Service of Ukraine for 2017 [21]. The study consisted of several stages:

(i) calculation of key indicators used to assess the degree of savings in land use in the regions of Ukraine;

(ii) standardization of the obtained indicators and calculation of the integrated indicator of land use savings;

(iii) correlation and regression analysis of the obtained data to determine the indicators that have the most significant impact, and the construction of maps showing the degree of land use savings in the regions of Ukraine.

RESULTS AND DISCUSSIONS

At the first stage, such indicators are calculated as: the level of economic use of land, the level of plowed land, productivity of agricultural land use, production of gross agricultural output per 1 person, coefficients: land consumption, land return and land consumption of the economy. The calculation results are presented in Table 1. According to the results of the study it was found that the highest level of economic use of land in Kirovograd (82.9%) and Zaporizhia (82.5%) regions, the lowest – in the Transcarpathian region (35.4%), in turn, with natural conditions, but the highest level of plowing was found in Kherson (90.2%) and Cherkasy (88.2%) regions. Productivity of agricultural land use (10.17 thousand UAH/ha), as well as production per 1 person (13.2 thousand UAH), were the highest in Vinnytsia region, which may indicate successful management

decisions of land users. According to the indicator of land return by gross output in agriculture, the leaders were Transcarpathian and Ivano-Frankivsk oblasts (0.519 and 0.512, respectively), with Luhansk oblast (0.115) being an outsider.

Table 1. Assessment of the degree of savings in the use of land resources in the regions of Ukraine according to the main indicators, 2017

Administrative-territorial unit	Level of economic use of land, %	Level of plowing, %	Productivity of agricultural land use, thousand UAH/ha	Produced gross output in agriculture per 1 person, thousand UAH	Land return on gross output	Land consumption of gross output	Land consumption economy, ha/thousand UAH
UKRAINE	68.4	78.8	6.04	5.93	0.249	4.012	0.020
CRIMEA	68.9	71.3	NO DATA				
VINNYTSIA	76.0	85.7	10.14	13.16	0.410	2.438	0.029
VOLYN	52.1	64.2	6.55	6.65	0.403	2.480	0.039
DNIPRO	78.8	84.6	6.07	4.78	0.220	4.551	0.010
DONETSK	77.0	81.0	3.76	1.85	0.135	7.400	0.016
ZHYTOMYR	48.2	76.5	6.92	8.19	0.386	2.590	0.049
TRANSCARPATHIAN	35.4	44.2	8.90	3.21	0.519	1.926	0.030
ZAPORIZHIA	82.5	84.9	4.28	5.66	0.189	5.285	0.021
IVANO-FRANKIVSK	44.5	63.1	9.74	4.40	0.512	1.953	0.022
KYIV	58.8	82.1	9.01	8.39	0.379	2.636	0.018
KIROVOGRAD	82.9	86.6	5.09	11.04	0.174	5.740	0.046
LUHANSK	69.7	68.8	2.43	2.11	0.115	8.730	0.088
LVIV	57.9	63.0	7.77	3.90	0.494	2.024	0.015
MYKOLAYIV	81.6	84.7	4.41	7.85	0.180	5.571	0.035
ODESSA	77.0	80.8	4.60	4.97	0.162	6.160	0.022
POLTAVA	75.2	81.8	6.62	10.27	0.249	4.012	0.019
RIVNE	46.3	70.9	7.61	6.11	0.441	2.265	0.041
SUMY	71.3	72.2	6.00	9.48	0.278	3.600	0.042
TERNOPIL	75.4	82.0	9.09	9.09	0.355	2.815	0.034
KHARKIV	76.5	80.1	5.86	5.29	0.207	4.835	0.017
KHERSON	69.2	90.2	5.68	10.83	0.248	4.038	0.059
KHMELNYTSKY	75.9	80.0	8.97	11.16	0.335	2.989	0.032
CHERKASY	69.0	88.2	9.20	11.06	0.290	3.452	0.029
CHERNIVTSI	58.1	70.5	9.59	5.00	0.335	2.981	0.028
CHERNIHIV	63.5	69.6	5.39	10.94	0.277	3.608	0.056

Source: author's calculations based on data from the State Statistics Service of Ukraine.

The next step was to calculate the specific indicators of land consumption and land return in the regions of Ukraine. According to calculations, the largest share of agricultural land in the Odessa region (6.2% of the total area in Ukraine), then, accordingly, the overall regulatory monetary value of these lands is also the largest. However, in the territory of this region the relative rate of land return is quite low, probably due to the climatic conditions of the region and the soil cover, which allows to grow not all crops. The higher level of land consumption, the worse the situation with land use savings. The highest relative level of land consumption in Luhansk region, all other indicators in this region also tended to the worst values.

Thus, the worst conditions for the preservation and reproduction of humus were observed in Zaporizhia, Mykolaiv and Kharkiv regions, which indicates insufficient efforts of farmers to protect the land on the basis of a set of anti-degradation measures. In this regard, the ecological-and-economic

assessment of the balance of humus in these areas is the lowest, and the best indicators in Chernihiv and Cherkasy regions, which indicates the effectiveness of measures to preserve and reproduce humus. The highest rate of loss of gross regional product in the Mykolayiv and Lugansk areas, the lowest – in the Ivano-Frankivsk region.

Agri-environmental monitoring of soils is the key to systematic control of fertility, as a negative balance of humus has been found in most areas of the country, which can lead to a significant deterioration in soil fertility. The points of systematic agrochemical monitoring of fields should include at least the following parameters: humus content, content of mobile forms of micro- and macroelements, soil pH [28].

The use of modern technologies, such as precision (digital) agriculture (based on satellite images make electronic maps, study the chemical composition of the soil, give recommendations for economical land use) [18], allows to rationalize the use of chemical fertilizers, harmonize land reclamation measures in time. It is also advisable to use the Satellite online service EOS Crop Monitoring, which allows us to assess the condition of sown areas and compare them with the maps of the State Geocadastre. Using this service on the territory of Ukraine, it was found that 4.3 million hectares of fields are not registered in the state cadastre. The harvest of them in monetary terms is 88.5 billion UAH per year [30]. Also, these data further explain the low land productivity in Odessa and Mykolayiv regions, because they are leaders in the shadow market of agricultural products.

In order to carry out a comprehensive assessment of resource-saving of land use in the regions of Ukraine, standardization of indicators was carried out. Since the studied phenomenon is multifaceted and is characterized by indicators that have different units of measurement, the integrated quantitative assessment of land use savings can be performed only in relative terms using multidimensional analysis methods. The following indicators were used for this: plowing level – x_1 (destimulator); productivity of agricultural land use – x_2 (stimulator); produced gross agricultural output output per 1 person – x_3 (stimulator); land return on gross agricultural output – x_4 (stimulator); land consumption of the economy – x_5 (destimulator); relative land consumption according to the natural assessment of land resources – x_6 (stimulator); relative land consumption according to the value of land resources – x_7 (stimulator) [16, 17]. Two formulas have been used to standardize these indicators: the first formula for indicators that have a positive effect (stimulators), the second – for those that have a negative effect (destimulators).

$$S = \frac{X_{max} - X_i}{X_{max} - X_{min}}, \quad (1)$$

$$S = \frac{X_i - X_{min}}{X_{max} - X_{min}}, \quad (2)$$

where X_i is the actual value of the indicator;
X_{min} – the minimum value of the indicator;
X_{max} – the maximum value of the indicator.

It should be noted that this methodological approach to standardization has been tested in previous studies [14, 16, 17, 33] and officially approved by the Cabinet of Ministers of Ukraine and is used to monitor and evaluate the effectiveness of state regional policy [24].

Table 2 shows the results of a comprehensive assessment of resource-saving of land use on the basis of standardized indicators. Unfortunately, the lack of a significant number of indicators in the Autonomous Republic of Crimea made it impossible to assess the real situation regarding the resource-saving of land use in this region.

To determine the rating of regions by the degree of land use savings, the average value of all indicators was calculated. The best assessment of resource-saving of land use is obtained by the region with the lowest average value. To expand the analytical capabilities and ease of analysis, the degree of land use savings in points on a 100-point scale was also determined. In this case, the best assessment of resource-saving of land use is the region with the highest score.

Table 2. Comprehensive assessment of resource-saving of land use in the regions of Ukraine, 2017

ADMINISTRATIVE-TERRITORIAL UNIT	STANDARDIZED INDICATORS							COMPREHENSIVE ASSESSMENT		
	SX_1	SX_2	SX_3	SX_4	SX_5	SX_6	SX_7	COEF.	POINT	PLACE
CRIMEA	NO DATA									
VINNYTSIA	0.902	0.000	0.000	0.269	0.237	0.000	0.075	0.212	79	3
VOLYN	0.434	0.466	0.576	0.287	0.367	0.173	0.081	0.340	66	11
DNIPRO	0.877	0.528	0.741	0.740	0.000	0.212	0.386	0.498	50	16
DONETSK	0.799	0.827	1.000	0.949	0.074	0.535	0.804	0.713	29	23
ZHYTOMYR	0.701	0.417	0.439	0.329	0.492	0.147	0.098	0.375	63	12
TRANSCARPATHIAN	0.000	0.160	0.880	0.000	0.250	0.044	0.000	0.191	81	1
ZAPORIZHIA	0.885	0.760	0.663	0.816	0.137	0.432	0.494	0.598	40	21
IVANO-FRANKIVSK	0.410	0.052	0.774	0.018	0.149	0.013	0.004	0.203	80	2
KYIV	0.823	0.147	0.421	0.346	0.099	0.040	0.104	0.283	72	5
KIROVOGRAD	0.920	0.655	0.188	0.853	0.464	0.313	0.561	0.565	44	19
LUHANSK	0.535	1.000	0.977	1.000	1.000	1.000	1.000	0.930	7	24
LVIV	0.407	0.308	0.818	0.062	0.060	0.096	0.014	0.252	75	4
MYKOLAYIV	0.880	0.744	0.469	0.839	0.324	0.411	0.536	0.601	40	20
ODESSA	0.795	0.718	0.724	0.882	0.155	0.380	0.622	0.611	39	22
POLTAVA	0.818	0.457	0.256	0.667	0.114	0.168	0.307	0.398	60	13
RIVNE	0.579	0.328	0.623	0.192	0.396	0.105	0.050	0.325	68	9
SUMY	0.608	0.537	0.325	0.597	0.410	0.218	0.246	0.420	58	14
TERNOPIL	0.821	0.136	0.360	0.405	0.305	0.037	0.131	0.313	69	7
KHARKIV	0.781	0.555	0.696	0.772	0.085	0.230	0.428	0.507	49	17
KHERSON	1.000	0.579	0.206	0.671	0.632	0.248	0.310	0.521	48	18
KHMELNYTSKY	0.777	0.151	0.177	0.456	0.284	0.041	0.156	0.292	71	6
CHERKASY	0.956	0.122	0.186	0.567	0.236	0.032	0.224	0.332	67	10
CHERNIVTSI	0.572	0.071	0.721	0.454	0.233	0.018	0.155	0.318	68	8
CHERNIHIV	0.551	0.616	0.196	0.598	0.592	0.278	0.247	0.440	56	15

Source: author's calculations based on data from the State Statistics Service of Ukraine.

As we can see, the first place in the ranking is occupied by Transcarpathian region, the second – Ivano-Frankivsk region and the top three is closed by Vinnytsia region, the last steps of the ranking are occupied by Odessa, Donetsk and Luhansk regions. The degree of land use savings in Ukraine ranges from 0.191 to 0.930. Thus, in the regions with the lowest level of land use savings, there is a need to green agricultural land use as a basis for sustainable land management.

The last places of Luhansk and Donetsk oblasts in the above ranking can be explained in some way by the situation related to military actions in the region, while the outsiders of Odessa oblast are directly related to irrational and «shadow» use of land resources.

The next step was to develop maps of land use savings in Ukraine by region. The constructed cartograms of land consumption of the economy (Fig. 1) and land use savings (Fig. 2) clearly represent the regional differences of the analyzed indicators in points.

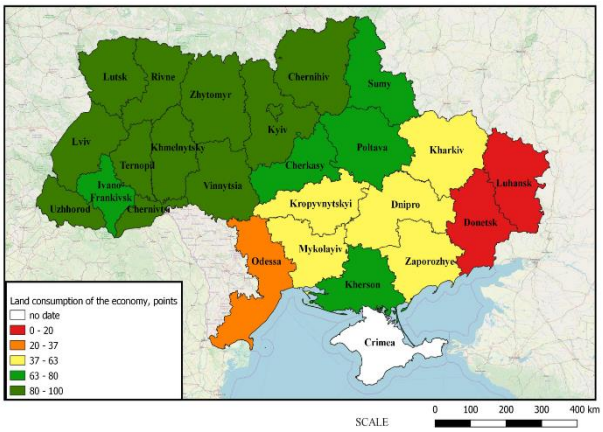

Fig. 1. Land consumption of the economy in terms of regions of Ukraine in 2017, points

Source: built by the authors on the basis of their own calculations.

Fig. 2. Land use savings in terms of regions of Ukraine in 2017, points
Source: built by the authors on the basis of their own calculations.

The gradation is performed according to the Harrington desirability scale [23], where 80–100 is a high level of savings, 63–80 is sufficient, 37–63 is medium, 20–37 is low, and 0–20 is a very low level of land use savings.

Thus, (i) a high level of land use savings is characteristic of the following regions: Transcarpathian and Ivano-Frankivsk regions; (ii) sufficient level – for the following oblasts: Vinnytsia, Lviv, Kyiv, Khmelnytsky, Ternopil, Chernivtsi, Rivne, Cherkasy and Volyn oblasts; (iii) middle level – for the following oblasts: Zhytomyr, Poltava, Sumy, Chernihiv, Dnipro, Kharkiv, Kherson, Kirovohrad, Mykolaiv, Zaporizhia and Odesa oblasts; (iv) low level – for Donetsk region; (v) very low level – for Luhansk region.

Thus, five groups (clusters) of regions with fundamentally different levels of agricultural land use savings have been identified. Therefore, the cluster approach can be promising for the organization of resource-saving land use in the agricultural sector.

Our further research was aimed at identifying reserves to improve the resource-saving of land use. There is a significant gap between the leading regions and outsiders in the degree of land use savings. Thus, the difference in points between the leader and the outsider is 74 points. Six indicators were selected as factors influencing the degree of land use savings. In order to identify the relationship between the degree of land use savings in points (y) and these factors, a correlation analysis was performed (Table 3).

Table 3. Matrix of coefficients of pair correlation between factors and a comprehensive assessment of resource-saving of land use in the regions of Ukraine, 2017

VARIABLES	У	X_1	X_2	X_3	X_4	X_5	X_6
У	1.000						
X_1	-0.332	1.000					
X_2	0.928	-0.202	1.000				
X_3	0.317	0.514	0.305	1.000			
X_4	-0.970	0.360	-0.856	-0.309	1.000		
X_5	0.108	-0.082	0.076	0.371	-0.080	1.000	
X_6	-0.282	0.701	-0.051	0.240	0.430	0.101	1.000

Note. Plowing level (%) – x_1; productivity of agricultural land use (thousand UAH/ha) – x_2; produced gross agricultural output per 1 person (thousand UAH) – x_3; land consumption of gross agricultural output (coefficient) – x_4; ecological-and-economic assessment of humus balance (UAH/ha) – x_5; monetary value of 1 ha of agricultural land (UAH) – x_6.
Source: author's calculations.

As we can see, most of the factors are not closely related, so there is no multicollinearity. To interpret the degree of relationship between the factors, the Chaddock scale was used, according to which: the value of the correlation coefficient up to 0.100 indicates the absence of a relationship; 0.100–0.300 – weak; 0.301–0.500 – moderate; 0.501–0.700 – noticeable; 0.701–0.900 – high; 0.901–0.990 – very high; 1.0 – functional connection [7]. A weak correlation was found between the degree of land use savings and: the monetary value of agricultural land (x_6), ecological-and-

economic assessment of humus balance (x_5). A moderate inverse relationship was found between the degree of land use savings and the level of plowing (x_1), and with the production of gross agricultural output per person (x_3) it was directly moderate. A high direct relationship was found between the degree of land use savings and agricultural productivity (x_2), while the land consumption of gross agricultural output (x_4) the relationship was highly inverted. The next step was to conduct a regression analysis to quantify the dependence of a comprehensive assessment of resource-saving of land use in points (y) on the following factors: productivity of agricultural land use (x_2) and land consumption of gross agricultural output (x_4). According to the results of regression analysis, the following mathematical model was obtained:

$$y = 62.50 + 3.0433x_2 – 6.5809x_4$$

Each of the coefficients characterizes the average change in excluding the influence of variation of other factors. Thus, increasing the productivity of agricultural land use (x_2) per 1 thousand UAH contributes to increasing the resource-saving of land use by 3.043 points; increase in the coefficient of land consumption of gross agricultural output (x_4) per unit causes a decrease in resource-saving of land use by 6.581 points. According to the results of regression analysis, it was found that the multiple correlation coefficient $R = 0.988$, ie there is a direct very high relationship between performance and factor indicators. The value of the coefficient of determination (R^2) is 0.976, which indicates that (i) the constructed model is close to satisfactory, ie it adequately describes the phenomenon of land use savings; (ii) the selected factors explain 97.6% of the degree of variation in land use savings. The normalized coefficient of determination ($R^2 = 0.973$) does not differ significantly from R^2 and is evidence of the reliability of the latter. Based on analysis of variance, it was found that the reliability of the model is also confirmed by the value of the Fisher's ratio, which is 420.59. According to the criterion of P-value, the influence of the analyzed factors was also statistically reliable at a given level of probability (95%).

As a result of regression analysis, it was found that the most significant impact on the degree of land use savings has a land consumption indicator, so it is important to reduce it taking into account the best domestic and international experience. On the other hand, the monetary value of agricultural land needs to be updated, especially in the context of the opening of the land market in Ukraine. In order to increase the resource-saving of land use in Ukraine, it is advisable to increase production per unit of land area in outsider regions, which is possible by regulating the sectoral structure of production, the structure of sown areas and/or through the use of innovative environmentally friendly agricultural technologies, involving the use of optimal crop fertilization systems. To do this, it is necessary to monitor the quality of agricultural soils and lands, this can be done by all types of stakeholders: the owners of these lands and their tenants to optimize the cultivation of crops; the state – as a guarantor of the preservation of agricultural land, because according to the Constitution of Ukraine, land is the main national wealth, which is under special protection of the state. Higher education seekers of various natural specialties and subjects of scientific activity can also act as a possible stakeholder, as they can use the data obtained as a result of monitoring to write their own scientific works. Another important step to improve the degree of savings in land use is to reduce land consumption, because in developed countries this figure is 2–3 times lower. By reducing this indicator, we can increase the number of products while reducing the load on the soil cover.

One of the promising areas may be the implementation of typical models of crop rotations of organic farming for crop enterprises, that are characterized by positive predictive humus balances [10].

Comparative analysis of the absolute values of key components of resource-saving of land use of leading regions (high and sufficient level), middle peasants (middle level) and outsider regions (low and very low level) using the econometric model developed above

allowed to make a forecast of comprehensive assessment through reserves in the medium term (Table 4).

Table 4. Forecast to increase the comprehensive assessment of resource-saving of land use in the regions of Ukraine through the use of reserves in the medium term

variables	Average values of variables by groups of areas			The difference between the mean values between:		Regression, coefficient	Growth reserve, coefficient	
	outsiders	among some	leader	among some and outsiders	leaders and among some		outsiders to among some	among some to leaders
x_2, thousand UAH/ha	3.10	5.54	8.78	2.44	3.24	3.0433	7.426	9.860
x_4, coef.	8.065	4.545	2.542	-3.520	-2.003	-6.5809	23.165	13.182
y, points	18.0	49.7	72.4	31.7	22.7	-	30.591	23.042

Source: author's calculations.

Therefore, if the average productivity of agricultural land use (x_2) of outsider oblasts will increase by 2.44 thousand UAH/ha, and the average land consumption coefficient of land consumption of gross agricultural output (x_4) will decrease by 4.545, they will be able to implement the growth reserve of a comprehensive assessment of resource-saving of land use by 7.426 and 23.165 points, respectively. Thus, the total growth reserve due to the improvement of these factors of outsiders to the average level is 30.591 points; in turn, due to the improvement of the indicators of middle regions to the level of leaders, the reserve for resource saving growth is 23.042 points.

CONCLUSIONS

As a result of the study of ecological-and-economic bases of resource-saving land use in the agricultural sector, a comprehensive assessment and analysis of the current state of land use in the agriculture of Ukraine and further substantiated the factors of increasing land use savings in modern realities, which allowed to draw the following main conclusions: the current state of land use in Ukraine needs optimization at the national, regional and local levels. At the mega, macro and meso levels, resource-saving land use means land use that provides a balance between society's needs for agricultural products and food and the renewable capacity of land resources, ie land use must meet the requirements of sustainable development. At the micro level, we consider resource-saving land use, which provides (i) production of the planned volume of production with minimal use of land resources or (ii) production of the maximum volume of production with a certain (fixed) land resource. The balance of humus in the arable lands of the country is negative, which indicates the need to resolve the situation in land use in the direction of creating conditions for at least simple reproduction. The worst conditions for the preservation and reproduction of humus are observed in Zaporizhia, Mykolaiv and Kharkiv regions, which indicates insufficient efforts to protect the land. In this regard, the ecological-and-economic assessment of the balance of humus in these areas is the lowest, and the best indicators in Chernihiv and Cherkasy regions, which indicates the effectiveness of measures to preserve and reproduce humus. Integral assessment of the degree of savings in the use of land resources in the regions of Ukraine ranges from 7 to 81 points.

According to the results of a comprehensive assessment of land use savings, it was found that the first place in the ranking is occupied by Transcarpathian region (81 points), the second – Ivano-Frankivsk region 80 points), and the top three is closed by Vinnytsia region (79 points); Odessa (39 points), Donetsk (29 points) and Luhansk (7 points) regions occupy the last steps of the rating. The outsider positions of Luhansk and Donetsk oblasts can be explained by the situation related to military actions in the region, while the outsidership of Odesa oblast is directly related to the irrational and «shadow» use of land resources. Management of resource-saving land use should be based on the

regulation of factors that affect the degree of land use savings.

Based on the correlation analysis, it was found that: between the degree of land use savings and the level of plowing, the production of gross agricultural output per person there is a moderate connection; a high correlation was found between the degree of land use savings and the productivity of agricultural land use and land consumption of gross agricultural output. It was found that a high rate of land use has a significant impact on the deterioration of land use savings.

As a result of building a two-factor regression model, it was found that the increase in land consumption per unit of measurement caused a decrease in resource-saving of land use by 6.581 points; increase the productivity of agricultural land use by 1 thousand UAH contributed to an increase in resource-saving of land use by 3.043 points.

Therefore, the factor of land consumption requires priority attention in the management of resource-saving land use. The reduction of land consumption can be achieved by increasing the volume of production in outsider regions per 1 ha, in particular, by regulating the sectoral structure of production, the structure of sown areas and/or the introduction of innovative agricultural technologies.

In Ukraine, there is a need to improve the resource-saving of land use, because land is a national wealth that makes a significant contribution to the economy. This is possible by improving the management of land use savings by: updating the monetary valuation of land, bringing the indicator of land consumption in outsider regions first to the average level, and in the future – to the level of leading regions, bringing the land consumption indicator of leading regions to the level of advanced European countries, regulation of land productivity by harmonization of ecological and economic aspects, ie through the selection of profitable crops taking into account the soil and climatic features of the regions of Ukraine.

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