Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 22, Issue 1, 2022
PRINT ISSN 2284-7995, E-ISSN 2285-3952

METHODICAL APPROACHES TO THE ASSESSMENT OF THE FORMATION OF SUSTAINABLE (BALANCED) AGRICULTURAL LAND USE

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Abstract

The study considers the approach to the assessment of the formation of balanced agricultural land use by agricultural enterprises. Key efficiency indicators were proposed to use in the assessment of the effectiveness of sustainable agricultural land use measures, namely the environmental sustainability factor – to assess the environmental stability, the yield per unit area and gross value added – for economic and social sustainability assessment. In particular, the study presents the results of the calculations of the actual and potential economic and social efficiency of land use in agricultural enterprises, as well as the calculation of those for non-traditional land use on the example of Kyiv oblast. It was found that reducing the area under sunflower does not worsen economic and social sustainability, but rather improves it. The calculated indicators of economic and social sustainability of land use reveal that Kyiv oblast should adhere to the norms of ratio of the crops sowing scheme and the area under niche crops increase.

***Key words*:** *crops, land use, plowing, balancing, sustainability*

INTRODUCTION

In the context of overcoming soil depletion and desertification around the world, sustainable development that meets the needs of the current generation and does not damage next generations resources, namely agricultural land, is the basis for the development of any society. Many Ukrainian scientists, educators, and experts use the term "sustainable development" as the one that is more in line with the essence of development as a process of change with maintaining ecological, economic and social balance.

Economic and environmental interests of society is the basis of sustainable (balanced) development. The imbalance between the two types of interest affects the deterioration of life quality, both for modern and next generations.

If we consider sustainable (balanced) land use, it can be applied equally to ensuring the protection and maintenance of land potential for next generations, and to providing current social and economic opportunities. Keeping the balance will remain an ongoing task for society.

According to Article 1 of the Law of Ukraine On Land Management as amended in 2003 [10], sustainable land use is a form and corresponding methods of land use that provide optimal parameters of environmental and socio-economic functions of territories (and more specifically, in our interpretation, functions of the land). However, amendments to this article made in 2015 determined that sustainable land use is the long-term use of land without changing its purpose, deterioration of land quality characteristics and with provision the optimal parameters of

environmental and socio-economic functions of the territories. That is, the Law narrows the concept of "sustainable land use" from a understanding the territory as a land plot.

V.M. Tretiak and V. Yu. Sventukh consider this concept in a broader interpretation [20]. The scientists interpret sustainable development as a process that involves a new type of civilization functioning, based on radical changes in its historically formed parameters (economic, social, environmental). According to the scientists, the consumer attitude of land users to land is often observed in a market economy. Therefore, underestimation of environmental factors in its use is unacceptable, especially under conditions of the land market introduction in Ukraine. The scientists do not agree with the first part of the statement that "sustainable (balanced) land use cannot be interpreted as land use determined by long-term use of land without changing its purpose".

In addition, according to V.M. Tretiak and V.Yu. Sventukh [20], whom we follow, any radical changes in land relations necessitate scientific support of strategies and tactics for the development of sustainable land use. Therefore, the development of conceptual aspects of the problem and specific ways of its solution are of particular significance.

That is, sustainable (balanced) land use is a system of land, other natural resources and biodiversity use and protection organization along with appropriate land relations, corresponding to social development relations. The system involves achieving the optimal ratio between social, environmental and economic factors of land use, normalization the quality of land and other natural resources (neutral degradation), meeting the material and spiritual needs of modern and next generations.

Since the land and natural resources located on it are not only of territorial but also of food and public welfare importance for a country, the development of approaches to the formation of balanced (sustainable) land use should be given much more attention, especially now under combating land degradation and desertification all over the world.

MATERIALS AND METHODS

Scientific papers by Ukrainian and foreign scientists related to the problems of sustainable (balanced) land use were used in the process of covering the research issue.

The official database and reports of the State Service of Ukraine for Geodesy, Cartography and Cadastre, the State Statistics Service of Ukraine made the statistical base of the study. In particular, they were used in presenting the structure of land in Ukraine and for calculating the actual and potential economic and social efficiency of land use by agricultural enterprises.

The ecological and economic estimation of a difference of efficiency level of agricultural lands use in Ukraine and the Kiev area was carried out applying the system analysis and synthesis with the statistical analysis and the subsequent demonstration of results using the graphic method. Research experience of domestic schools of soil science and agroecology was generalized on the basis of the monographic method. The results were used to propose ways of institutional improvement of ways to overcome ecological and economic as well as social crisis of agricultural land use.

RESULTS AND DISCUSSIONS

Modern ecological, economic and social problems are a serious obstacle to the further economic development of both the rural area and the state as a whole. The depleting use of agricultural land, which exceeds the possibilities of their restoration is a characteristic feature of modern land management. Therefore, there arises a problem of running a balanced and efficient agricultural enterprise, which allows to increase production along with maintaining and improving the state of land resources in agriculture. In practical terms, solving these problems involves applying production methods based on the implementation of agricultural organization systems. The methods follow the principles of balanced environmentally safe land use and they can increase production, as well as solve

environmental and economic problems of agricultural areas.

The problem of agricultural land efficient use has not been solved, since land relations still do not meet the needs of sustainable (balanced) development of agricultural land use, which involves the coordination of economic, environmental and social factors. The successful solution of this problem will largely depend on the investment and innovation attractiveness of the agricultural sector in rural areas, which can further dramatically increase productivity and introduce environmentally friendly technologies into production.

It should be noted that the order of the Cabinet of Ministers of Ukraine of October 22, 2014 № 1024-p approved the Concept to combat land degradation and desertification [13] until 2020 and approved the National Action Plan to combat land degradation and desertification for its implementation [14], which postponed the implementation of measures untill 2025.

However, as of 2021, a set of measures aimed to combat land degradation and desertification in Ukraine have been implemented. These include: landscaping of arable land by removing their slopes, lands of water protection zones, erosion-hazardous and other unsuitable lands; creation and restoration of hayfields and pastures in accordance with scientifically substantiated indicators taking into account regional features, natural and climatic conditions; acceleration of works on conservation of degraded, technogenic-contaminated and unproductive lands, reclamation of damaged lands.

To assess the state of the National Action Plan implementation [14], consider changes in the structure of land use (Table 1).

Table 1. Lands Structure in Ukraine for 2002 - 2020

Main types of land	% of the total territory of Ukraine					± in 2020 against 2002, %
	2002	2005	2010	2015	2020	
Agricultural lands, total	69.3	69.1	68.9	68.8	68.5	-0.8
• arablelands	53.9	53.8	53.8	53.9	54.3	+0.4
• perennial plantings	1.5	1.5	1.5	1.5	1.4	-0.1
• hayfields	4.0	4.0	4.0	4.0	3.8	-0.2
• pastures	9.2	9.1	9.1	9.0	8.7	-0.5
• fallows	0.6	0.7	0.5	0.4	0.3	-0.3
Forests, including:	17.3	17.4	17.6	17.6	17.7	+0.4
covered with forest vegetation	15.9	16.0	16.0	16.1	16.1	+0.2
Built-up land	4.1	4.1	4.2	4.2	4.1	0
Wetlands	1.6	1.6	1.6	1.6	1.6	0
Open lands with little vegetation	1.7	1.7	1.7	1.7	1.5	-0.2
Other lands	2.1	2.1	2.0	2.1	2.6	+0.5
Total land (upland)	96.0	96.0	96.0	96.0	96.0	0
Inland waters	4.0	4.0	4.0	4.0	4.0	0
Total	100	100	100	100	100	0

Source: designed using the data of 6-landform statistical reports of the State Land Cadastre and the National Report on the state of the environment of Ukraine.

Analysis of the table reveal that the adoption of the new current Land Code [9], starting from 2002, resulted in:

• the area of arable land and forests and other wooded areas in the country increased by 0.4%;

• the area of hayfields and pastures decreased by 0.4% and 0.5%, respectively.

However, the pace of changes in the structure of lands does not meet the objectives of the basic principles (strategy) of the state environmental policy of Ukraine for the period up to 2020 [11], which provided for the following tasks:

• reduction of arable land area by 5-10%, on average, by 2020;

• increase of afforestation area up to 17% of the country's territory by 2020;

• increase in the area of hayfields and pastures up to 15.8% of the country's territory by 2015.

In general, the land fund of Ukraine has an extremely high level of the living space

development with about 72.6% of lands involved in economic use and only 27.4 % of all lands of Ukraine classified as ecologically stabilizing lands in 2020.

The level of lands tillage of the territory of Ukraine is extremely high and it made 54.3% in 2020, while in industrial European countries this figure does not exceed 35%. The actual forest cover of the territory of Ukraine is 17.7%, which is not enough to ensure ecological balance, compared to the average figure of 25-30% for European countries [15].

It should also be noted that in Ukraine there are more than 1.1 million hectares of degraded, inefficient and anthropic contaminated lands subject to conservation. 143.4 thousand hectares of fault land need recultivation and 315.6 thousand hectares of unproductive land need reclamation. Water erosion is among the most significant factors reducing land productivity and increasing degradation of agricultural landscapes. The total area of agricultural land affected by water erosion is 13.3 million hectares (32%), including 10.6 million hectares of arable land. The eroded lands contain 4.5 million hectares with medium and heavily washed soils, including 68,000 hectares that have completely lost their humus layer. The quality of land resources is also affected by other negative factors, including salinity, solonetzicity, waterlogging, acidity, stoniness. In addition, intensive agricultural land use leads to reduced soil fertility due to the land (specifically chernozems) compaction, loss of lumpy structure, water permeability and aeration capacity with all the environmental consequences [15].

According to official data of the National Report on the state of the environment of Ukraine [5; 6], the coefficient of ecological stability for the territory of Ukraine in 2012 was 0.41 and land use was characterized as steady ecologically unstable, a similar situation is observed in the territory of Kyiv oblast where the coefficient makes 0.47. As of January 1, 2020, these indicators deteriorated and amounted to 0.40 and 0.43, respectively. The coefficient of ecological stability of land use on the territory of Ukraine and Kyiv oblast shows that the territory of the country and the oblast time has been unstable for a long and is deteriorating every year.

Therefore, the provisions of current legislation are not implemented in the context of the environmental component of sustainable (balanced) land use. The situation is also aggravated by the constant reduction of the funds for implementing a system of land protection measures in Ukraine. In addition, the form of statistical reporting has changed recently and these data are accounted for as components with different cost items, which complicates their assessment.

The analysis of the land use process introduced in Ukraine, especially the agricultural sector, reveals its unbalanced level. It is also confirmed by the volume of soil degradation processes. Ensuring an acceptable level of agri-environmental safety while maintaining the trend of increasing agricultural enterprises profits, namely crop profile, requires a considerate attitude to the use of agricultural land – the main resource potential [16, 18]. It can be assumed that the formation of financial and economic components of agricultural entrepreneurs profits should depend not only of yield and products quality, but on indicators of soil quality the agricultural land acquires due to its agriproduction use [17]. Since land is the basic resource in agriculture and crop production, [3], the characteristics of the agricultural land use and their agrochemical state have a direct impact on productivity. On the other hand, the restoration and preservation of land fertility and the implementation of measures to fertility increase contribute to the increase in both yields and productivity in agricultural production [4].

The structure of sown areas is an important characteristic of land use intensity level in crop production since it indicates the predominance of economic interests over environmental ones. In particular, according to official data from the State Statistics Service of Ukraine, the area under wheat increased from 5.3 million hectares in 2000 to 6.1 million hectares in 2010, and in 2020 this figure was 6.4 million hectares. The situation

is similar with the area under sunflower crops: in 2020 it amounted to more than 6.5 million hectares, in 2010 – 4.6 million hectares. Significantly higher growth rates are shown in the areas of rapeseed and corn crops for grain, which increased by about 4 times - from 0.2 million hectares in 2000 to almost 1.1 million hectares in 2020 and from 1.4 to 5.4 million hectares, respectively. Instead, the area under fodder crops underwent dramatic reductions during 2000-2020, as an example, the area under fodder maize crops decreased by more than 6 times from 1.9 million hectares to 0.3 million hectares, grass crops – by three times, from 3.0 million hectares to 0.9 million hectares. Also, the growing level of anthropogenic pressure in agroecosystems should be taken into account. The pressure is caused by increasing yields of most crops. In particular, wheat yields increased from 19.8 cwt/ha in 2000 to 38.0 cwt/ha in 2020 in Ukraine and respectively in the Kyiv oblast from 26.0 cwt/ha to 42.8 cwt/ha; corn for grain – 30.1 cwt/ha in 2000 to 56.2 cwt/ha in 2020 in Ukraine (in some years even more than 70 cwt/ha, namely in 2017 and 2018) and, respectively, in Kyiv oblast – from 43.0 to 48.5 cwt/ha; sunflower – from 12.2 to 20.2 cwt/ha in Ukraine, and, respectively, in Kyiv oblast from 11.7 cwt/ha to 24.5 cwt/ha; rapeseed from 8.4 to 23.0 cwt/ha in Ukraine, respectively, in the Kyiv oblast – from 10.0 to 24.6 cwt/ha in 2020 [8].

In addition, the increase in the amount of mineral fertilizers in the measurement of nutrients provided a significant impact on the results mentioned. It increased by 1.9 times at the national level and by more than 1.8 times in the Kyiv oblast in 2020 (Fig. 1).

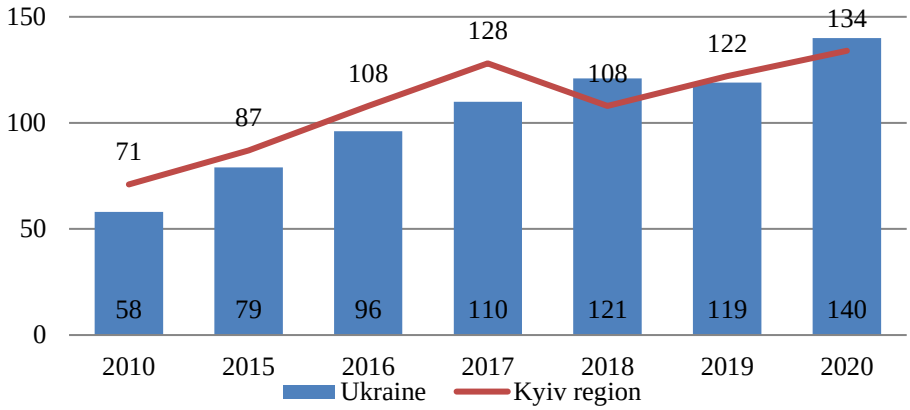

Fig. 1. Application of mineral fertilizers for crops per 1 ha of sown area, nutrient kg
Source: designed by the authors using statistical data of the State Statistics Service of Ukraine.

However, the volume of organic fertilizer application in Ukraine remains at a steady minimum level – 0.5 ton/ha introduced for crops. However, some positive dynamics of this indicator in the Kyiv oblast has been recorded over the past two years – 1.2 tons in 2019 vs 1.3 tons/ha of sown area in 2020 (+1 cwt/ha) (Fig. 2).

Due to high ploughing-up of agricultural lands, the erosion of arable lands increases every year and the humus content in the soils has significantly decreased due to the shortage of organic fertilizers.

The unbalanced way of using agricultural land in commodity crop production results in decrease in fertility and, consequently, in profits loss and economic losses for both modern and next generation due to soil depletion.

Determining indicators of sustainable (balanced) land use is an important trend in its formation. Indicators of sustainable development of land use are the figures extracted from the primary data of the state land cadastre, social and economic statistics, which are used to interpret the current situation and monitor the dynamics of change. On the one hand, the figures, should provide a quantitative description of the achievement of sustainable land use goals [14], on the other

hand, they should be used to generalize and clarify key aspects of its stability.

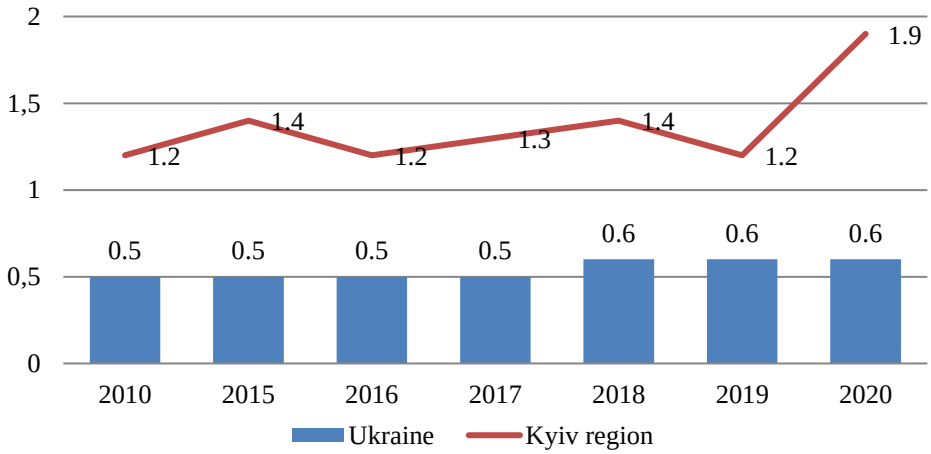

Fig. 2. Application of organic fertilizers for crops per 1 ha of sown area, nutrient t
Source: designed by the authors using statistical data of the State Statistics Service of Ukraine

The set of key factors of land use balance is comprised of factors that affect the indicators of the ecological state of land use and are characterized by both natural and cost indicators. Indicators of ecological efficiency of land use can comprise the coefficient of ecological stability of land use and the coefficient of ecological impact of lands on surrounding lands [21], indicators of land use, land use structure, degree of land use intensity [1] and others. Criteria for economic efficiency of land use often include their profitability, the structure of management (land use) forms and ownership, the coefficient of economic stability of land use [1]. Addressing the issue of resistance measuring is the key issue of research on sustainable (balanced) land use.

Accurate measurement of stability is impossible due to the specifics of the dynamic concept, which considers the facts under specific conditions of place and time [2]. However, the lack of tools for accurate measurement of sustainable land use does not prevent the choice of special parameters or criteria that allow to draw certain conclusions about the development patterns, its downward or upward trend [7].

Although the coefficient of ecological stability can be used as the main indicator for measuring the ecological sustainability of agricultural land use, these indicators need to be substantiated for economic and social sustainability.

Yield per unit area, characterizing the intensity of land use isa key indicator of economic stability, while the gross value added indicates social stability. The value added obtained in land use consists of the components that correspond to the division of economic resources into four types? namely natural (land); capital (capital goods); work (ability to work); entrepreneurial skills. The components of value added according to the four economic resources include land rent and lease (contribution of natural resources, «land»); depreciation (estimation of the consumed capital in the process of product creation), wages (labor contribution) and profit (estimation of the contribution of the business factor). Accordingly, its growth is a social indicator and is characterized by the creation of additional jobs, budget revenues, and partly by the financial condition of the population and local communities.

Calculations of the actual economic and social efficiency of land use by agricultural enterprises in 2020 were made by the example of Kyiv oblast, using the official statistical data of the State Statistics Service of Ukraine (Table 2).

Table 2. Calculation of the actual economic and social efficiency of land use by agricultural enterprises of Kyiv oblast in 2020

Crop	Actual yield, t/ha	Actual sown area, k/ha	Gross production, k tons	Crops growing cost in 2020, UAH/ha	Average price in 2020, UAH/ ton	Gross production cost, thousand UAH	Total costs, thousand UAH	Gross income, thousand UAH	Income per unit area, UAH / ha	Labour pay 2020, UAH / ha	Gross value added, UAH / ha
Winter wheat	4.28	181.2	776	14,583	4,975	3,858,524	2,642,408	1,216,116	6,711	961	7,672
Barley	3.79	66.3	251	6,793	4,552	1,143,888	450,387	693,501	10,460	562	11,023
Corn	4.85	381.4	1850	21,217	4,575	8,462,974	8,092,181	370,793	972	1,159	2,131
Sugar beet	40.61	20.0	812	54,148	884	717,579	1,082,957	-365,379	-18,269	1,650	-
Sunflower	2.45	185.4	454	17,437	10,473	4,757,015	3,232,898	1,524,117	8,221	1,069	9,290
Total		834.3	4143	114,178	25,459	18,939,980	15,500,831	3,439,149	4,122	1,060	5,182

Source: designed by the authors using statistical data of the State Statistics Service of Ukraine

Given the thriftless agricultural land use by enterprises, the optimal ratio of the structure of sown areas for Kyiv oblast was calculated (Table 3), according to the Resolution of the Cabinet of Ministers of Ukraine of February 11, 2010 № 164 [12]. Analysis of the table data shows non-compliance with the norms of sunflower sown areas. In particular, actual sunflower sown areas makes 185,4 thousand hectares with the optimal sowing area of 834.3 thousand hectares that is inadmissible from the agroecological point of view. It should also be noted that according to the scientifically substantiated crop rotation, sunflower should be sown at the previous place not earlier than in 7 years to avoid crop-specific weeds, diseases, as well as deterioration of nutrient and water regimes of the soil [12].

Table 3. Standards for the optimal crops ratio in crop rotations in different natural and agricultural regions

Crop	Actual sown area, k/ha	Norms for optimal sown areas structure ration of the total area		
		%	Min, thousand ha	Max, thousand ha
Winter wheat	181.2	25-95	208.6	792.6
Barley	66.3			
Corn	381.4			
Sugar beet	20	3-30	25.0	250.3
Sunflower	185.4	0.5-9	4.2	75.1
Total	834.3			

Source: calculated by the authors using the source [12].

The calculation of economic and social efficiency of land use by agricultural enterprises according to the norms of the optimal ratio of crop structure in Kyiv oblast is presented in table 4. It is worth noting that the calculation used the maximum 75.1 thousand hectares of sowing area of sunflower calculated in Table 3, and the area that was exceeded (110.3 thousand hectares) was transferred for grain crops (barley). Tables 2 and 4 data show that, reduce in the area under sunflower does not worsen economic and social sustainability, but rather improves it. In particular, the obtained data on the crop yields according to actual data is 4,122 UAH/ha, while changing the structure of sowing results in 4,418 UAH/ha, which 296 UAH/ha more. The calculations of gross value added have a similar situation and show that the social efficiency of land use by agricultural enterprises in changing the structure of sunflower sown area improves gross value added by 229 UAH/ha, namely from 5,182 UAH/ha to 5,412 UAH/ha.

Table 4. Calculation of potential economic and social efficiency of land use by agricultural enterprises according to the standards of optimal ratio of crop structure in Kyiv oblast

Crop	Potential yield, t/ha	Crops sowing area, according to the norms for optimal ratio of the crop [12], thousand ha	Gross production, thousand tons	Crops growing cost in 2020, UAH/ha	Average price in 2020, UAH/ ton	Gross production cost, thousand UAH	Total costs, thousand UAH	Gross income, thousand UAH	Income per unit area, UAH / ha	Labour pay 2020, UAH / ha	Gross value added, UAH / ha
Winter wheat	4,28	181,2	776	14,583	4,975	3,858,524	2,642,408	1,216,116	6711	961	7,672
Barley	3,79	176,6	669	6,793	4,552	3,047,142	1,199,761	1,847,381	10,460	562	11,023
Corn	4,85	381,4	1,850	21,217	4,575	8,462,974	8,092,181	370,793	972	1,159	2,131
Sugar beet	40,61	20,0	812	54,148	884	717,579	1,082,957	-365,379	-18,269	1,650	-
Sunflower	2,45	75,1	184	17,437	10,473	1,926,591	1,309,323	617,267	8,221	1,069	9,290
Total		834,3	4,291	114,178	25,459	18,012,810	14,326,631	3,686,179	4,418	993	5,412

Source: calculated by the authors using statistical data of the State Statistics Service of Ukraine and the source [12].

Also, according to some previous studies [19], other crops, in particular non-traditional ones, should be introduced into the crops structure as it will increase not only the profitability of land use and added value, but will improve environmental sustainability as well. According to research [19] some cereals such as buckwheat and peas are niches crops, some are technical - soybeans, vegetable and berry crops and others make non-traditional land use. Given that Kyiv oblast is the capital region, it has a demand for fruit and berry crops products, and Table 5 presents the calculation considering the increase in these crops area as components of non-traditional land use.

Table 5. Calculation of potential economic and social efficiency of land use by agricultural enterprises using crops of non-traditional land use

Crop	Potential yield, t/ha	Crops sowing area, according to the norms for optimal ratio of the crop [12],	Gross production, thousand tons	Crops growing cost in 2020, UAH/ha	Average price in 2020, UAH/ ton	Gross production cost, thousand UAH	Total costs, thousand UAH	Gross income, thousand UAH	Income per unit area, UAH / ha	Labour pay 2020, UAH / ha	Gross value added, UAH / ha
Winter wheat	4.28	181.2	776	14,583	4,975	3,858,524	2,642,408	1,216,116	6,711	961	7,672
Barley	3.79	66.3	251	6,793	4,552	1,143,888	450,387	693,501	10,460	562	11,023
Corn	4.85	381.4	1,850	21,217	4,575	8,462,974	8,092,181	370,793	972	1,159	2,131
Sugar beet	40.61	20.0	812	54,148	884	717,579	1,082,957	-365,379	-18,269	1,650	-
Sunflower	2.45	75.1	184	17,437	10,473	1,926,591	1,309,323	617,267	8,221	1,069	9,290
Fruit and berry	9.37	110.3	1,034	3,887	19,372	20,023,948	428,739	19,595,209	177,633	525	178,158
Total		834.3	4,906	118,065	44,831	219,960,244	98,501,534	121,458,709	145,582	988	208,273

Source: calculated by the authors using statistical data of the State Statistics Service of Ukraine and the source [12].

Tables 4 and 5 data show that the increase in the area of fruit and berry crops will increase the profitability by 141,459 UAH/ha and reach 145,582 UAH/ha; gross value added will increase by 203,091 UAH / ha, and make 208,273 UAH/ha.

The integrated index (I_{INT}) of balanced land use can be calculated by the formula using

indicators of environmental, economic and social sustainability:

$$I_{INT} = I_{ecol.st.} \times I_{econ.st} \times I_{soc.st} = 1.08$$

where $I_{ecol.st}$ – index of ecological sustainability of land use calculated by the formula:

$$I_{ecol.st.} = C_{ecol.st.act} / C_{ecol.st.norm} = 0.43/0.47 = 0.97$$

where $C_{ecol.st.norm}$ – normative coefficient of ecological sustainability, equal to 0.67;

$C_{ecol.st.act.}$ – the actual environmental sustainability in the current state of land use.

$I_{econ.st.}$ – index of economic sustainability of land use calculated by the formula:

$$I_{econ.st.} = P_p / P_a = 4{,}243/4{,}122 = 1.07$$

where P_p – profitability of potential economic efficiency of land use;

P_a – profitability of the actual economic efficiency of land use.

$I_{soc.st.}$ – index of social sustainability of land use calculated by the formula:

$$I_{soc.st.} = GVA_p / GVA_a = 5{,}236/5{,}182 = 1.04$$

where GVA_p – gross value added of potential social efficiency of land use;

GVA_a – gross value added of the actual social efficiency of land use.

If the obtained indices of ecological, economic and social sustainability exceed 1, the land use is considered as sustainable (balanced). However, if one of these indices is under 1, the component has a negative impact on the balance of land use.

CONCLUSIONS

The formation of sustainable (balanced) land use is an important current issue, both for Ukraine and the world countries.

Nevertheless, the study found that there is excessive depletion of agricultural resources in Ukraine, which in turn contributes to high plowing, intensification of soil degradation and inefficient land use due to non-compliance with legislation. As of 2021, the pace of changes in the structure of lands does not meet the objectives of the basic principles (strategy) of the state environmental policy of Ukraine developed for the period up to 2020. In particular, the objectives provided for a reduction of the area of arable land by 5-10% on average of while the actual increase has made by 0.4%. The area increase of hayfields and pastures increased to 15.8% of the country's territory, however, it actually decreased by 0.7%. Ecological sustainability of land use on the territory of Ukraine is referred to as characterized by steady ecologically unstable.

Given that, sustainable (balanced) land use is a system of organization of land and other natural resources, biodiversity and related land relations use and protection that is in line with social development relations it achieves the optimal relationship between social, environmental and economic factors of land use. In addition, it can normalize the quality of land and other natural resources (neutral degradation); meet the material and spiritual needs of present and next generations. Therefore, the authors proposed a methodological approach to assessing the formation of sustainable agricultural land use. In particular, key efficiency indicators were proposed to assess the effectiveness of measures to form a sustainable agricultural land use, namely the environmental stability factor – to assess the environmental sustainability, economic and social sustainability to be assessed through the yield per unit area and gross value added which characterizes the creation of additional jobs, budget revenues, as well as partially financial condition of the population and local communities.

In particular, on the example of Kyiv oblast, calculations of the actual and potential economic and social efficiency of land use by agricultural enterprises were made. Also calculation of land use with the use of non-traditional land use crops. The result of such calculations was that reducing the area under sowing resource-saving sunflower does not worsen economic and social sustainability, but rather improves it. In the process of calculated indicators of economic and social sustainability of agricultural land use, an integrated index (I_{INT}) of balanced land use was determined, which allowed to establish that Kyiv oblast needs to comply with the structure of crops and increase areas under niche crops, such as fruit and berry crops.

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