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Integral assessment of the sustainable development of agriculture in Ukraine

Abstract. *Introduction.* An integrated assessment of the accounting and analytical supplying indicators for the sustainable development of agricultural enterprises is the basis and starting point for the development of methodical and methodological background for the compilation of non-financial or expanded financial reports supplemented by social and environmental data of agricultural enterprises' external and internal activities.
The purpose of the article is to develop a cross-functional procedure for the integrated assessment of accounting indicators and analytical support of the sustainable development of agriculture at the micro and macro levels.
Methods. As a methodological basis of the study, the authors use the provisions of the statistical and structural system along with comparative analysis, as well as theories of agriculture growth.
Results. The need to use componential methodology for managing agricultural sustainable development is emphasised in the article. The relevant indicators are obtained in accordance with clear economic, environmental and social objectives and realistic requirements for data collection and calculations. After a detailed study of the methods for assessing the sustainable development of agriculture, we propose a diagnostic technique based on two methods. The first method involves the quantitative parameters of the development index and scores of economic, environmental and social factors. The second is based on the intuitive approach, in the situation where it is impossible to take into account impacts of many factors due to object complications, including social indicators of sustainable development. The authors of the article propose a number of indicators characterising the economic, ecological and social component of the management system for a comprehensive calculation of the agriculture sustainable development integral index.
Conclusions. The results of our analysis allow elucidating the advantages of the method of indicator standardisation for the integral indicator of agriculture sustainable development. The choice and justification of the indicators to characterise certain elements of sustainable development, i.e. economic, social and environmental elements, is the basis for an integral assessment of the level of sustainable development of agriculture in Ukraine. The importance of this method lies in its simplicity, unification, harmonisation and universality, which is achieved by using two completely different levels and objects of research: for the local level - the level of agricultural enterprises, and the unrestricted level, which is the level of the district, region or country. The purpose of the developed methodology is to determine the integral indicator of agricultural sustainable development without attracting additional knowledge and skills from the researcher in the presence of the necessary primary data. The calculations show that Ukraine there are three relevant groups in Ukraine: most regions of Ukraine have a medium level of the integral indicator of agriculture sustainable development; three regions in the western part of Ukraine (Ivano-Frankivsk, Chernivtsi, Zakarpattia) have a low level, while a capital Kyiv region has a level which is higher than the average level.
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Інтегральна оцінка сталого розвитку сільського господарства України
Анотація. У статті наведено методику оцінки та визначення інтегрального показника сталого розвитку сільського господарства на основі обліково-аналітичних показників результатів діяльності аграрних підприємств України та регіонів. Представлені оцінка й контент трьох складових сталого розвитку (економічного, екологічного, соціального), на основі яких розраховано інтегральний показник сталого розвитку.
Ключові слова: сталий розвиток; сільське господарство; інтегральна оцінка; обліково-аналітичне забезпечення; навколишнє середовище.

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Интегральная оценка устойчивого развития сельского хозяйства Украины

Аннотация. В статье приведена методика оценки и определения интегрального показателя устойчивого развития сельского хозяйства на основе учетно-аналитических показателей результатов деятельности аграрных предприятий Украины и регионов. Представлены оценка и контент трех составляющих устойчивого развития (экономического, экологического, социального), на основе которых рассчитан интегральный показатель устойчивого развития.

Ключевые слова: устойчивое развитие; сельское хозяйство; интегральная оценка; учетно-аналитическое обеспечение.

1. Introduction

The calculation of accounting and analytical indicators of agricultural sustainable development provides the basis for the development of economic activities and increasing the ability of agrarian enterprises to maintain sustainable development. Moreover, the criteria for their selection are recommended by the world community (UN Conference on Environment and Development in Rio de Janeiro in June 1992), determines enterprises' vector impact on social environment and generates possible options which may help to evade degradation. Such indicators are worth implementing because the voluntary system of regional ecological sanitation can supplement mandatory regulation. Meanwhile, agricultural enterprises, despite the competition, should use the indicators of green accounting with the subsequent improvement of the environmental situation. It is the encouragement of enterprises to control and manage their interaction with the environment that is more expedient than obligatory observance of general rules and regulations.

2. Brief Literature Review

The appropriateness of our research orientation towards the use of indicators as a tool for measuring sustainable development of agriculture is confirmed by the scientific interest of both Ukrainian and foreign authors. Researchers agree that the adequate indicators are rarely used in practice and recommend indicators that are aimed at quantifying the effect (action) of agricultural practices in relation to a specific goal (as opposed to indicators characterising economic practices or means of production) [1; 2, 62; 3-4].

On 25 September 2015, 193 member states of the United Nations adopted the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, with the global objectives which are expected to guide the actions of the international community over the next 15 years (2016-2030) [5]. The new agenda includes: 17 goals, 169 targets and 230 indicators. This methodology is very complicated for calculating and requires knowledge and skills in such area. Moreover, such calculations take a lot of time to get the result.

Along with an assessment of the sustainable development level, there must be a strategy. For example, G. B. Bunin and G. Zinoviev (2003) [6] define the aim of the sustainable development strategy as providing a way out of the crisis and creating conditions for a sustainable, that is socially, economically and environmentally balanced development. On the other hand M. Bastan at al. [7] evaluate sustainable development of agriculture as a system model that promotes saving water and land usage. This model comprises limited mathematical calculations and cannot be used to identify the sustainable development of agriculture for enterprises and agricultural areas. Another model of sustainable development of agriculture [8-9] may not be understandable for a typical economist or a bookkeeper working for an agricultural enterprise.

Problems of regional research in the context of sustainable development are highlighted by such scientists as A. V. Belov and L. Kirichenko (2011) [10], A. V. Litvinenko (2014) [11], A. N. Stasiuk (2012) [12], M. S. Filiak (2016) [3], V. Ya. Cibuliak (2014) [13], S. Azar (1996) [4], J. Lamberton (2000) [14], P. Mayerhofer (1996) [15], S. Schalteegger (1990; 1999) [16-17], G. Götz and A. Schäffler (2015) [18], Y. Vertakova (2016) [19] and others.

Peculiarities of the methods application for assessing sustainable development in agriculture have been studied in the works by V. D. Zalizko (2014) [20], M. M. Kocherha (2013) [21], Yu. M. Lopatinsky and S. I. Todoruk (2015) [1], O. L. Popova (2010) [2; 22], L. Solomkina, N. Sukhomlinova and V. Baranov (2005) [23], R. M. Chumak (2012) [24], K. A. Lewis and K. S. Bardon (1998) [25], T. Svenson (1998) [26] and others. They have examined and disclosed the main essence of the tools used to assess and define sustainable development, both comprehensively and separately in terms of the three components, including economic, social and environmental subcomponents.

Currently, there are many methods applied to assess, including those used to assess sustainable development in agriculture. Yet, most of them are not universal for determining the level of sustainable development of small or large enterprises in agriculture, or assessing sustainable development at the macro level for the agricultural region, district or country.

3. The purpose

The purpose of the article is to develop a universal methodology which can be used to assess the indicators of accounting and analytical support for sustainable development in agriculture at the micro and macro levels.

4. Results

Foreign systems for indicators of the sustainable development of regions and agricultural enterprises are developed to provide voluntary improvement of agricultural environmental indicators, grouped by ways of their using nutrients in feed and fertilizers, energy and pesticides [15]. Approaches and indicators vary depending on systems and agricultural practices as well as physical units using accounting systems [27]. Some systems cover all the three components of sustainable development, others specialise in one or two of them.

Most indicator systems calculate nutrient balances of agricultural enterprises, their usage of pesticides per hectare and energy consumption per kilogram of a product. These indicators are easy to calculate, however obtained information needs additional interpretation [26].

Modelling allows us to demonstrate a relationship between economic activity and environmental problems (for example, the calculation of the pesticide leaching effect is more significant than the calculation of their amount) and to easily interpret the results. However, modelling of emissions measurement and other losses gives uncertainty to the indicator, because the norm is set taking into account past experience.

Insufficient accuracy in measuring environmental and economic indicators due to the scientific uncertainty of some environmental actions and the complexity of controlling these actions on individual enterprises is the key problem in the findings by G. Lamberton (2000) [14].

Another difficulty is to use several units of measure, bearing in mind that the goals of sustainable development contain economic, social and environmental elements. L. Solomkina, N. Sukhomlinova and V. Baranov (2005) [23; 31] propose to determine the environmental and economic damage within the system of agriculture in terms of natural ecological indicators (loss of soil, humus, nutrients, products shortage) and cost (compensation costs relating to the use of fertilizers, the cost of lost crops due to a decrease in yields on erosive soils, etc.) [13, 31].

Socio-ecological and economic indicators increase the efficiency of calculations due to wider coverage of data than in the case of using only financial data.

Thus, M. M. Kocherha (2013) [21] proposes to measure the primary level of companies' environmental efficiency by the purchasing cost of noncurrent environmental asset within a separate account. Consequently, the grouping of environment-oriented investments will allow determining the financial result associated with environmental activities.

It is to be noticed that S. Schalteegger (1999) [16, 119] offers to determinate the main environmental performance indicator as a criterion of economic and environmental efficiency, or eco-efficiency.

In the opinion of A. V. Neverov (2005) [28, 134], eco-economic efficiency (E_E) can be determined at the regional level by the formula:

$$E_E = \frac{E_{SP} - P_P}{C + N_C \times E} , \quad (1)$$

where:

E_{SP} - environmental assessment of social production (production of waste-free or low-waste production), unit of money;

P_P - products produced with environmental standards violations (social damage from environmental pollution), unit of money;

C - current costs for the protection, restoration and exploitation of natural resources, unit of money;

N_C - normative coefficient of environmental and economic efficiency of natural resource use;

E - one-time expenses for the protection, restoration and exploitation of natural resources, unit of money.

N. N. Kocherha (2013) [21, 32] notes that one of the main functions of any industry should be ecologisation of production, which is characterised by the use of non-waste (low-waste) technology. In our case, the environmental and economic assessment of waste should be deducted from the value added at a particular enterprise, demonstrating the ecological purity of production.

S. Schaltegger and A. Sturm (1990) [17] determine ecological efficiency, first of all, according to the desired result of the applied environmental impact, where the added environmental action is a magnitude of all environmental interventions assessed in accordance with relative environmental action. So, economic and environmental efficiency, or eco-efficiency, is a correlation between the value-added and the induced added environmental action.

Social development emerges as a full-fledged source of sustainable development in agriculture, while being in resource dependence of economic development [11, 216]. That is, all components of sustainable development are interrelated and complementary (Figure 1).

Figure 1 presents the vector of agriculture sustainable development (SR) in the three-dimensional plane, which maximally contributes to the development of its three components (economic, ecological and social) at the end of vector - point P.

The author emphasises the need to use an integrated methodology for managing agricultural sustainable development.

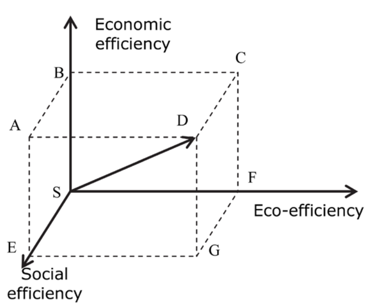

Fig. 1: **The vector of agricultural enterprises' sustainable development**
Source: Developed by the authors

Its indicators should be obtained in accordance with clear and precise economic, environmental and social objectives and realistic requirements for data collection and calculations.

Determinative methods were proposed after a detailed study of the agriculture sustainable development management, based on the use of two methods. The first supposes the development of indexes and scores quantitative parameters of economic, environmental and social factors. The second is based on the intuitive approach, in the situation when it is impossible to take into account the impact of many factors due to the complications of the research object, in particular, social indicators of sustainable development.

Thus, the assessment is carried out on the basis of the indicator system of sustainable development of agricultural enterprises and regions, formed from three subsystems (economic, ecological and organizational, and socio-territorial) characterised by certain properties and nomenclature indicators (Tables 1-3). Each indicator is given by definition score, taking into account the maximum possible, determined by the methodology. The methodology allows using the indices when calculating the dynamic indicator.

The determining characteristics of the agricultural economic development are vitality, independence, energy security and efficiency. The authors offer a number of indicators that characterise the economic component assessing the system of management in terms of agricultural sustainable development (Table 1).

Tab. 1: **Economic component of the assessment system of agriculture sustainable development management**

Characteristics	Indicators	Application		Definition score	
		Agricultural enterprise	Universal		
Vitality	Economic viability	+	+	20	Up to 30
	The level of economic specialisation	+	+	10	
Independence	Financial self-sufficiency	+	+	15	Up to 25
	Financial sustainability	+	+	10	
Energy Security	Energy security	+	+	20	Up to 20
Efficiency	Production profitability	+	+	25	Up to 25

Source: Compiled by the authors

Economic viability as an indicator of the economic component of a sustainable development system is defined as the ratio of the difference between the gross-result of operation and the needs for financial resources to the number of enterprise employees. The gross result of the operation is equal to the added-value lower taxes and fees (income tax is not taken into account), including the staff costs (wages, social deductions, qualification improvement, etc.). Value-added is defined as the sum of gross profit (proceeds from the sale of goods minus the cost of these goods) and the products of the enterprise (sold products, inventories and non-current assets), minus raw and outsourced materials, as well as other supplies.

The economic specialization indicator determines the diversification of an agricultural enterprise or a region in relation to the branching of its own activities, which makes it possible to create added value from various sources, thus protecting against external impact factors on a particular production type.

Independence combines financial sustainability and self-sufficiency, which determines the share of financial activity charges (liabilities) and various subventions received from the outside as a result of the operation. The ratio of the amount of capital and gross assets can be used to calculate the local financial self-sufficiency indicator.

Energy security indicates the number of energy capacities per one hectare of agricultural land. This indicator is important for assessing the economic component of sustainable development because of its impact on the final results of agricultural enterprises.

Production profitability is the final and decisive characteristic of the economic parameter of sustainable development in agriculture, which mainly depends on all the managerial decisions made during the production activity, and it is not only a result but also a goal.

A detailed calculating methodology of the system of economic components of managing sustainable development in agriculture can be provided by the reader's personal appeal. The next stage in determining the level of sustainable development is the ecological and organisational subsystem (Table 2).

The environmental and organisational component determines the opportunities and directions for achieving the goals of sustainable development in agriculture, contributing to the assessment of rural areas on the basis of the diversified types of entrepreneurial activities. The manifestation of the multiplier effect is the rational use of the resource potential.

The diversification perspectives in agriculture are the development necessity through a variety of activities aimed at achieving synergies at agricultural enterprises in terms of their sustainable operation, the increasing possibility of employment of the rural population and obtaining stable family budgets in conditions of seasonality of traditional agricultural activity, and a necessity of a fuller use of technical capacities [24, 45].

The spatial approach to the sustainable use of agricultural land should be considered as a process covering changes in the context of crop rotations, the size of land plots and the use of fertilizers in terms of increasing their efficiency subject to economic and environmental laws.

Agricultural practice is a key element in the assessment and management of sustainable development, including the use of mineral fertilizers and plant protection products, veterinary activities, land and water management and energy dependence.

O. L. Popova (2010) [22, 25-26] alludes to the lack of opportunities to direct the vector of sustainable development in Ukraine, because it is necessary to lay the economic foundation and establish a stable economy to ensure social progress and to solve environmental problems. In such a way the environmental and organisational component of the sustainable development in agriculture is a key to economic and social growth.

Tab. 2: **Environmental and organisational component of the assessment of sustainable development management in agriculture**

Characteristics	Indicators	Application: Agricultural enterprise	Application: Universal	Definition score	
Diversification	Annual crops variety	+	+	14	Up to 33
	Perennial crops variety	+	+	14	
	Animal variety	+	+	14	
	Level of territory cultivation	+	+	6	
Space organisation	Crop rotation	+	+	8	Up to 33
	Land size	+	+	6	
	Fertilized area	+	+	5	
	Environmental protection expenditures	+	+	12	
	Space usage	+	+	9	
	Feeding area management	+	+	3	
Agricultural practice	Fertilizer treatment	+	+	8	Up to 34
	Liquid organic waste	+	+	3	
	Pesticides (pollution pressure)	+	+	13	
	Veterinary treatment	+	+	3	
	Land management	+	+	5	
	Water resources management	+	+	4	
	Energy dependence	+	+	10	

Source: Compiled by the authors

Tab. 3: **Social and territorial component of the assessment system of agriculture sustainable development management**

Characteristics	Indicators	Application: Agricultural enterprise	Application: Universal	Definition score	
Products and territories quality	Products provision	+	+	8	Up to 33
	Land suitability	+	+	8	
	Labour resources provision	+	+	8	
	Workforce productivity	+	+	9	
Employment and services provision	Employment	+	+	8	Up to 33
	Services	+	+	8	
	Average salary	+	+	8	
	Labour intensity	+	+	9	
Social development	Structure of social expenditures	+	+	9	Up to 34
	The share of economically active population	+	+	8	
	Profit per person	+	+	8	
	Educational index	+	+	9	

Source: Compiled by the authors

A detailed calculating methodology of the economic components of the management system of sustainable development in agriculture can be provided by the reader's personal appeal. The next stage in determining of the level of sustainable development is the social and territorial subsystem (Table 3).

The next step is to determine the boundaries of regions grouping according to the integrated indicators of sustainable development in agriculture.

Let us consider existing grouping approaches in view of the research objects with a focus on the intensity of the main attribute, basing on the methodology developed by E. B. Alaev (1977) [29, 6]. It should be noted that the imperfection of clustering by the method of averages for these purposes, which consists in the data availability on the exact number of clusters given exogenously. In such a case, it is inappropriate to use Sturges' rule [30], because this is a method for determining the optimal number of intervals on which the measurement range of the test points is broken when constructing a histogram. Grouping based on the Sturges' method is worth paying attention to [12]. However, one has to agree with the author's approach to the formation groups by the maximum permissible value at the level of 10% of the national average, because the use of the method in crisis times and peaks of economic growth is debatable. In our opinion, the maximum permissible values should be determined at the stage of unification of indicators with their norm (optimal or limiting value).

The interval scale is used to interpret the assessments results. There are five separate groups defined to assess the level of regions' development: a critically low level, a low level, a medium level, a level which is higher than average and a high level of integrated assessment of sustainable development or the manifestation of its individual component (Table 4).

Characteristics the levels of sustainable development in agriculture are not always dependent on external factors or compared with other investigation objectives. Also, the use of economic, environmental and social opportunities and resources can have an impact.

Tab. 4: **Integral scale of agriculture sustainable development**

Integral scale, points	Interval characteristics
Critically low level (below 40)	Region or agricultural enterprises, working at a low level of their resource potential;
Low level (41-50)	Region or agricultural enterprises, carrying out economic activities below the average level of their economic resources potential;
Medium level (51-60)	Region or agricultural enterprises, working at the level of their economic opportunities;
Higher than average level (61-70)	Region or agricultural enterprises, carrying out economic activities beyond the average level of their natural and resource potential;
High level (above 70)	The region or agricultural enterprises using their social, natural and economic resource potential are beyond their ability.

Source: Compiled by the authors

The economic component of the integral indicator of sustainable development of agricultural enterprises was analysed by the authors under the usage of statistical data of the Ukrainian agriculture [31-32]. It was found that the following regions of Ukraine had the highest level in 2017: Kyiv - 53 (1st place), Ukraine as a whole - 49 (2nd place), Vinnytsia - 47 (3rd place), Kharkiv - 47 (3rd place), Odesa - 45 (4th place). Regions such as Ivano-Frankivsk - 19 (25th place), Chernivtsi - 23 (24th place), Zakarpattia - 26 (23rd place) are significantly inferior to the other country regions by the indicator of sustainable development in 2017 (Figure 2).

Undoubtedly, the profitability of economic activity is the determining factor of the economic component of sustainable development. The leading place is occupied by indicators such as economic viability and production profitability, according to which the regions, for example, Volyn, Zakarpattia, Ivano-Frankivsk and Chernivtsi, show the lowest results.

The average level of the environmental and organisational component of sustainable development in agriculture among the Ukrainian regions in 2017 exceeded the average results of the economic component (Figure 3).

Only Kyiv region (76 points) is characterised by a high level of the environmental component of sustainable development. Dnipro (75 points), Ivano-Frankovsk (70 points) regions and Ukraine as a whole (71 points) are relating to districts with a level which is above the average in terms of this indicator. Luhansk region has a critically low level of the environmental indicator (48 points). Among the 16 most significant indicators of the environmental subsystem of the sustainable development system there are the annual crops variety, the perennial crops variety, the fertilizer treatmentand the environmental protection expenditures.

The average level of the social and territorial component of sustainable development in agriculture among the Ukrainian regions in 2017 exceeded the average results of the environmental and organisationalcomponent (Figure 4).

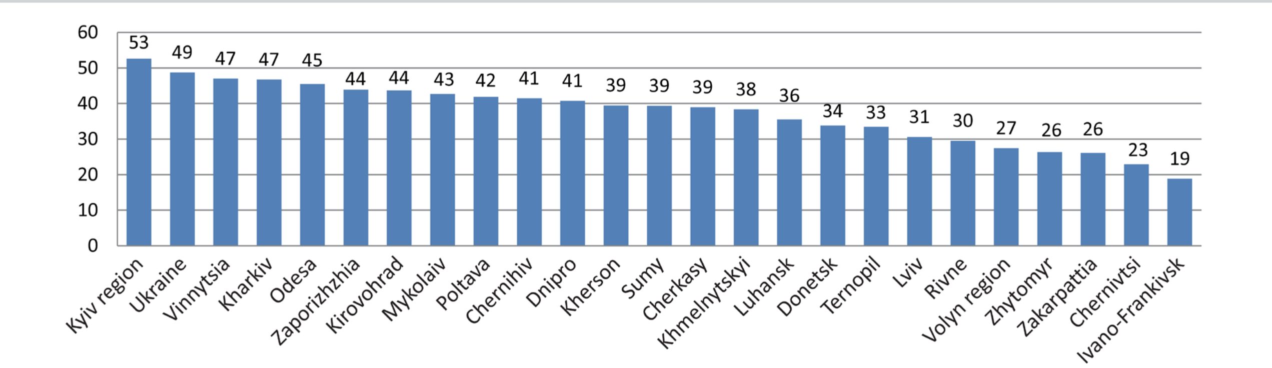

Fig. 2: **The level of economic component of agricultural enterprises' sustainable development by Ukrainian regions in 2017, points**
Source: Compiled by the authors based on [31-32]

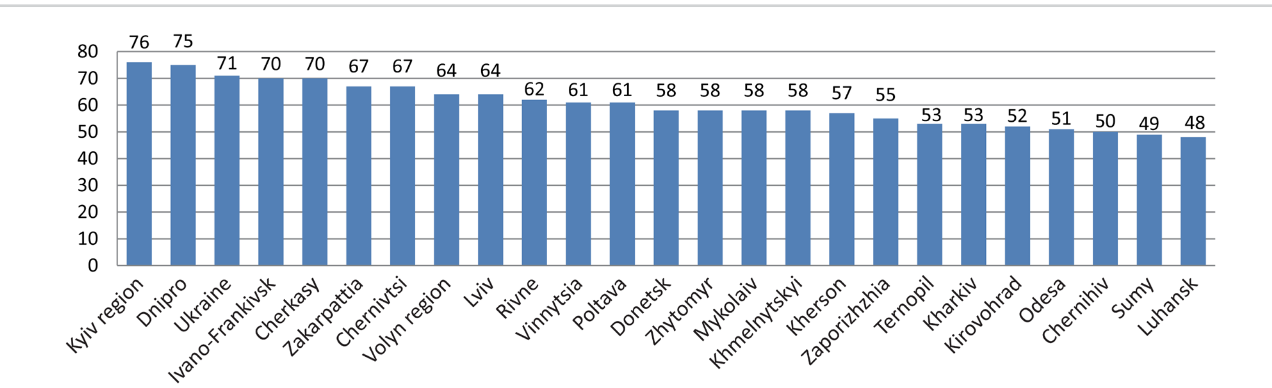

Fig. 3: **The level of the environmental component of agricultural enterprises' sustainable development by Ukrainian regions in 2017, points**
Source: Compiled by the authors based on [31-32]

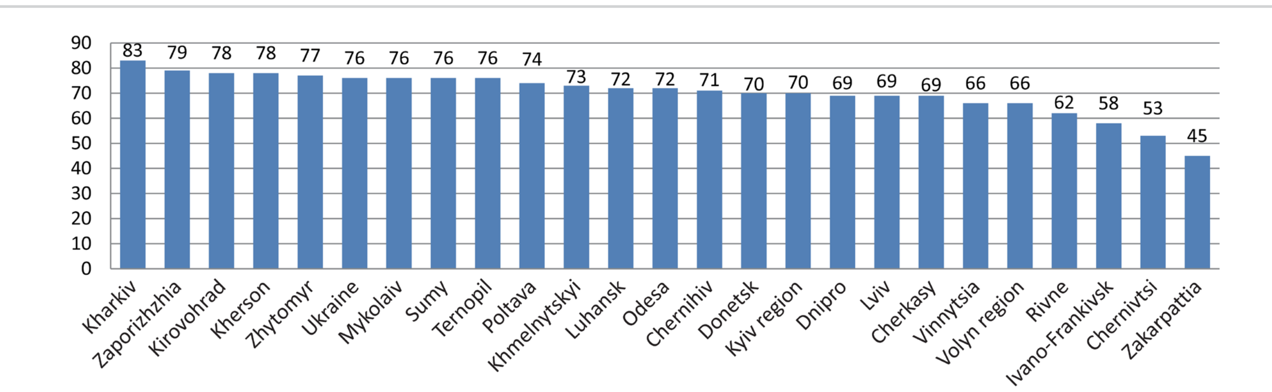

Fig. 4: **The level of social component of agricultural enterprises sustainable development by Ukraine regions in 2017, points**
Source: Compiled by the authors based on [31-32]

Fifteen regions of Ukraine have a high integral scale. They are Kharkiv (83 points), Zaporizhzhia (79 points); Kirovohrad and Kherson (78 points), Zhytomyr (77 points); Ukraine as a whole, Mykolaiv, Sumy and Ternopil have 76 points. Agricultural enterprises of Zakarpattia region (45 points) have the lowest indicator among the outsiders of social development, which corresponds to a low level. Social development indicators include 12 indicators based on comparison of economically territorial indicators. There are most significant indicators of social development, such as the provision of products, the labour intensity, the average salary and the profit per person.

The next stage of the investigation is the selection of a methodological approach to determine the integral index of agricultural development. One such approach is to find the average of the arithmetic or geometric group integral indices (for example, the integral group determining economic, ecological and social indices is obtained from the primary indicators) that are derived from the standardised primary indicators in a similar way [13; 20]:

$$I_i = \frac{\sum_{n=1}^{N} I_{gij}}{N} \quad \text{or} \quad I_i = \sqrt[N]{\prod_{n=1}^{N} I_{gij}}\ , \qquad (2)$$

where:
I_{gij} - the group integral index;
N - the number of indicators.

O. Belov and O. Stasyuk [10; 12] use the geometric-analytical approach to calculate the integral indicator which has the form of radar. The advantages of this approach are the clarity, calculation simplicity (the integral indicator is determined by the area of the figure formed by group indices, deferred on the radar axes) and the absence of a weight coefficient affecting the resulting indicator.

However, the purpose of calculating the integral indicator of agricultural sustainable development by the regions of Ukraine is to obtain additional information for management needs. It has a synthetic character, and we can calculate it by Formula (2) at two stages. Firstly, we define group indicators, and then the integral indicator resulting from them.

The results of group calculating and final integral indicators of sustainable development in agriculture in 2017 are given in Table 5.

The group indicators allow assessing the components of agricultural sustainable development in the regions and thus make it possible to identify the strengths and weaknesses of their development. Group indicators range from 19 points (the economic component of the development in Ivano-Frankivsk region) to 83 points(the social component in Kharkiv region).

The representation (Figure 5) of the regions based on the integrated indicator of agricultural sustainable development was carried out using the method of equal distribution values, basing on the proposed integrated assessment scale in Table 4.

The investigation results (Figure 5) show that most regions have a medium level of sustainable development in agriculture (51-60 points): Cherkasy, Zaporizhzhia, Poltava, Mykolaiv,

Tab. 5: **Group and integral indicators of sustainable development in Ukrainian agriculture in 2017**

Region (territory)	Group indicator, points			Integral indicator, points	Ranking of regions by integral indicator, rank
	Economic	Environmental	Social		
Kyiv	53	76	70	**66**	1
Ukraine	49	71	76	**65**	*2*
Dnipro	41	75	69	**62**	3
Kharkiv	47	53	83	**61**	4
Cherkasy	39	70	69	**59**	5
Zaporizhzhia	44	55	79	**59**	6
Poltava	42	61	74	**59**	7
Mykolaiv	43	58	76	**59**	8
Kherson	39	57	78	**58**	9
Vinnytsia	47	61	66	**58**	10
Kirovohrad	44	52	78	**58**	11
Khmelnytskyi	38	58	73	**56**	12
Odessa	45	51	72	**56**	13
Sumy	39	49	76	**55**	14
Lviv	31	64	69	**55**	15
Chernihiv	41	50	71	**54**	16
Ternopil	33	53	76	**54**	17
Donetsk	34	58	70	**54**	18
Zhytomyr	26	58	77	**54**	19
Volyn	27	64	66	**52**	20
Luhansk	36	48	72	**52**	21
Rivne	30	62	62	**51**	22
Ivano-Frankivsk	19	70	58	**49**	23
Chernivtsi	23	67	53	**48**	24
Zakarpattia	26	67	45	**46**	25

Source: Compiled by the authors based on [31-32]

Fig. 5: **Integral indicator of agricultural sustainable development by Ukrainian regions in 2017**
Source: Compiled by the authors based on [31-32]

Kherson, Vinnytsia, Kirovohrad, Khmelnytskyi, Odesa, Sumy, Lviv, Chernihiv, Ternopil, Donetsk, Zhytomyr, Volyn region, Luhansk an Rivne regions. The second group is related to the low level of development (41-50 points) is represented by Ivano-Frankivsk, Chernivtsi, Zakarpattia regions. The primary reason for the insufficient level of sustainable development for the abovementioned regions is the low indicators of the economic component of the integral indicator, namely the low gross operating result (defined as value added, net of staff costs, taxes and fees), insufficient energy supply and low, and sometimes negative, production profitability. Together with the calculation of the level of agricultural sustainable development by regions, we have determined the common integral indicator for Ukraine, which corresponds to the minimum value of the medium level with 65 points. This indicates that, along with the different trend of Ukrainian sustainable development by the regions, the general level of agricultural sustainable development in Ukraine is average, which not only proves permanent improvement of the social and environmental component, but also marks an opportunity to increase the level of sustainable development of the Ukrainian agro-industrial complex as a whole.

5. Conclusions

The results of our analysis allow us to elucidate the advantages of the method of isotropic indicators standardisation when calculating the integral indicator of agricultural sustainable development. It should be noted that weighted coefficients were not used on the basis of the assertion that the components of sustainable development are equivalent. The Ukrainian regions were grouped by the straight-line method (with the aim of maintaining the compliance of the regions with the level of development). The results are presented on the map-scheme (Figure 5).

The choice and justification of the indicators to characterise certain elements of sustainable development, i.e. economic, social and environmental elements, is the basis for an integral assessment of the level of sustainable development of agriculture in Ukraine. The importance of this method lies in its simplicity, unification, harmonisation and universality, which is achieved by using two completely different levels and objects of research: for the local level - the level of agricultural enterprises, and the unrestricted level, which is the level of the district, region or country. The purpose of the developed methodology is to determine the integral indicator of agricultural sustainable development without attracting additional knowledge and skills from the researcher in the presence of the necessary primary data. Integral assessment is the central component of accounting and analytical supplying and a basis for making informed operational and strategic management decisions, forming strategies for sustainable development in agriculture at the level of enterprises or at the regional level.

As a result of consideration of the diagnostics issues of the level of sustainable development, indicators of integrated assessment of the accounting and analytical support for the sustainable development of agricultural enterprises is the basis and the starting point for the development of methodical and methodological bases which are to be used for the compilation of non-financial or expanded financial reports supplemented by social and environmental data relevant to agricultural enterprises' external and internal activities.

Prospects for further researches in this area include the development of an accounting and analytical support concept for the reporting of sustainable development of agricultural enterprises as part of methodology and standardisation.

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