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ASSESSMENT OF EFFICIENCY OF THE ORGANIC PRODUCTION DEVELOPMENT IN WESTERN POLISSIA REGIONS

Purpose. *The purpose of the article is to assess the socio-ecological and economic efficiency of the organic land-use through the economic substantiation of the organic production development in the Western Polissia regions and its impact on the population health.*

Methodology / approach. *We used general scientific and special research methods for the study. With methods of comparisons, extrapolations, correlations and the regression analysis, we could give an ecological and economical estimate for costs using for the organic land-use engineering and for the feasibility evaluation of the organic production development. The synthesis method was useful in determining the socio-economic efficiency of growing organic products. The State Statistics Service data, collections of health indicators and the activities of medical institutions in the Rivne region became the initial basis for the present study.*

Results. *We made the scientific rationale for the organic production development in the Western Polissia, namely, in Volyn, Rivne, Zhytomyr and Kyiv regions, determined the stabilizing costs for the quality condition of 1 hectare of agricultural land. Moreover, the absence of a direct and close relationship between the agro-ecological indicators of soils and the rate of land certification was proved. It was proposed to use the economic criteria for the agricultural land suitability relative to the organic production, as they are defined as informational rather than restrictive. Mathematical modeling helped to evidence the existence of a relationship between the volume of mineral fertilizers applied per hectare of sown area and the level of the population oncological morbidity exemplified by Rivne region, resulting in mathematical models obtained and applied for the predictive estimates of health problems among the population in Rivne region for the coming years.*

Originality / scientific novelty. *For the first time, the assessment of the socio-economic efficiency of the organic land use was carried out with the involvement of economic justification for the development of organic production in Western Polissia regions and its impact on the population health.*

Practical value / implications. *Key results of the study are primarily actionable for determining the ecological and economic substantiation of the development advisability of the organic production through the implementation of the ecological and economic appraisal of costs using for the organic land-use engineering. In addition to it, another key result is to set the level of reduction in the population morbidity due to a decrease in mineral fertilizers applicable per hectare of sown area.*

Key words: *agrarian nature management, costs, organic production, economic efficiency, organic production market.*

Introduction and review of literature. Analyzing the organic product market for over the past two decades, we can prove that it has become the most dynamic market in the world and alternative to the consumption of traditional products. The production of rapidly developing organic products directly affects the economic, environmental and social development in the country. Therefore, the problem of the formation of the domestic organic market is extremely urgent.

Today, organic production is developing in almost all countries of the world and is promising for further development in Ukraine as well. Constantly growing consumer demands for organic products, as well as the global trends towards sustainable farming, allow Ukraine to be the active participant in the world organic market. The organization of the effective output of organic products in the management system of the agrarian nature remains relevant and is considered as one of the major ways of the agricultural production ecologization. To calculate the ecological and economic efficiency values and estimate the effective introduction and development of the organic production in the regions of Ukraine, the economic criteria, involving IT developments and geo-information technologies, are used besides traditionally-oriented ecological and agrochemical ones.

Foreign and domestic scientists conducted a comprehensive systematic scientific substantiation of the development of organic production in the agricultural sector of Ukraine. In particular, J. Rana, J. Paul, E. Meemken, M. Qaim, L. Pileliene, V. Tamuliene, O. Yatsenko et al., E. Gavaza, N. Andrusenko, L. Gorbach [1–7], studied the problems of market formation and promotion of organic products; T. Chaika, R. Bezus, V. Chudovska et al., A. Skrypnyk et al., O. Bazaluk et al. [8–12], studied the organizational, economic, environmental reasons and preconditions of the organic production at different stages of its development; A. Was et al., P. Skrypchuk et al., O. Shkuratov, P. Skrypchuk et al., O. Khodakivska, A. Kucher et al., A. Ickowitz et al. [13–19] consider the ways of the agriculture ecologization, environmental and food security. Developments made by V. Savchuk, V. Khyzhniak, V. Aranchiy et al., R. Redlichová et al., J. Rockstrom et al., W. Willett et al., R. Charles et al. [20–27] are aimed at improving the economic efficiency of organic production and sustainability assessment using a multi-criteria decision aid method (MCDA) and a framework based on the FAO Sustainability Assessment of Food and Agricultural Systems (SAFA) guidelines.

New research on organic land use consider the efficiency in terms of the cost of growing organic and traditional products in order to balance better the resources used and the yields (profits). The peculiarity of such studies is the balancing of demand for organic products, their yield and markup. Such comparisons are made for organic and intensive land use. However, some problematic issues, associated with the calculation of the organic land-use socio-economic profitability values remain unresolved. In particular, the further studies are required to assess the impact of organic production on the socio-economic development of the region and communities therein.

The purpose of the article is to assess the socio-ecological and economic efficiency of organic land use by economically justifying the development of organic production in Western Polissia regions and its impact on the population health.

To achieve the set goals, it is necessary to solve the following tasks: to carry out an ecological and economic assessment of costs for the organization of the organic land-use and output of products; to determine the impact of the production and consumption of organic products on the socio-economic development of the region; to calculate socio-economic impact from the implementation of organic land use.

Results and discussions. One of the promising ways to develop the market for environmentally friendly goods in Ukraine is to intensify the production and consumption of organic products. The global market for organic products, growing every year, is characterized by a tendency for the demand excess over supply. The output of organic products and raw materials for its manufacture is promising for Ukrainian farmers, since this allows expanding sales markets [28].

The global market for organic products continues to grow steadily over the past 10 years; it has doubled (from 50.9 bln USD in 2010 to 101 bln USD at the beginning of 2019). Over the same period, the Ukrainian domestic market has grown tenfold (from 2.4 to 22 mln Euros). However, due to the low solvency of the demand and the lack of awareness of consumers, Ukrainians consume significantly less organic products (about 0.5 Euros/capita) than the EU residents (up to 300 Euros/capita) [29]. The organic production, for more than 10 years of its development in Ukraine, has proved not only its potential and investment attractiveness, but also its environmental and social significance. Currently, Ukraine ranks the 20th in the world and the 11th in Europe in terms of organic land areas, which is about 467 thsd hectares (about 1.1 % of the total area of agricultural lands). As of 2019, there are about 600 officially certified organic operators on the market (470 of them are agricultural producers) [30–32].

Within the framework of the draft Strategy for a Sustainable Development of Ukraine by 2030, the area of the organic agricultural lands is planned to increase to 3 mln hectares (i.e. from 1.1 % to 7 % of the area) and, starting from 2020, to ensure an annual increase at least 5 % in the production and sales of organic products [33]. The European Union intends to increase the organic farming area up to 25 % by 2030 (Now, this figure is 8 %). Simultaneously, at least 10 % of agricultural land should be converted into "living areas" with a high biological diversity [34].

Ukraine has implemented the method of determining the normative monetary valuation of the land [35], which does not disclose the mechanism for determining the value of the "capitalized rental income ratio", which deprives stakeholders to verify the validity of decisions on organic land use. This methodological approach effectively undermines the authority of local governments to control the quality of grants in agribusiness and deprives them of the opportunity to influence community development with economic instruments. The importance of the objective price is conditioned by the binding to it of the payment of taxes for use or resale, the use of the plot as collateral in the bank.

H. M. Shpak has tested the proposed methodology for the ecological and economic assessment of agricultural lands suitable for the organic land-use. She implemented it studying Rivne region lands. Her methodology provides the use of not only traditional ecological and agro-chemical criteria, but also economic ones, in particular, the cost of the complex, implementing for the stabilization measures per 1-hectare of agricultural land. The key task of such measures is to ensure that soils meet the requirements of the organic land- use, to stabilize (improve) their agro-ecological nature, to increase fertility, to eliminate the negative consequences of the previous land- use in order to reduce economic damage due to a decrease in crop yields during the transition period [36].

Using the methodology, determining the amount of costs to restore the soil fertility [37], we calculated such costs for the stabilization of the qualitative state of 1 hectare of agricultural land for Western Polissia, namely for Volyn, Rivne, Zhytomyr and Kyiv regions (Table 1). These costs include the cost for the soil deoxidation, optimal reclamation of the phosphorus and potassium minimum, and the humus content recovery. According to our calculations, taking into account the fertilization (bio- humus – 4 t/ha, granular phosphorites – 2 t/ha, potassium chloride – 0.2 t/ha) annual rates, the stabilization period will last for 3–4 years.

Table 1

Measures planning to restore the soil fertility and costs distributing for their implementation in time, thsd UAH/ha

Measures		Volyn region	Rivne region	Zhytomyr region	Kyiv region
The first year of the stabilization period	Liming	-	6.32	6.32	6.32
	Humus	16.2	-	-	21.6
	Phosphorous	3.85	4.94	5.62	-
	Potassium	2.05	1.95	2.2	0.82
	Total	*22.1*	*13.2*	*14.13*	*28.74*
The second year of the stabilization period	Humus	-	-	-	21.6
	Phosphorous	3.85	4.94	5.62	-
	Potassium	2.05	1.95	2.2	-
	Total	*5.9*	*6.89*	*7.82*	*21.6*
The third year of the stabilization period	Humus	-	-	-	21.6
	Phosphorous	-	-	5.62	-
	Potassium	2.046	1.95	2.2	-
	Total	*2.046*	*1.95*	*7.82*	*21.6*
The fourth year of the stabilization period	Humus	-	-	-	-
	Phosphorous	-	-	-	-
	Potassium	2.046	1.95	2.2	-
	Total	*2.046*	*1.95*	*2.2*	-
Total for the stabilization of the quality state of soils, thsd UAH/ha		32.088	19.058	31.971	71.94

Note. The cost is calculated under prices as of 01.01.2020.

Source: made by the authors based on [37].

Thus, Rivne region, due to a decrease in the intensive use of most of the agricultural lands (the possibility to reduce the transition period) and the soil fertility restoration (by natural processes) is suitable for growing organic products, but for a limited list of (niche) crops. The absence of a direct and close relationship among the agro-ecological indicators of soils and the rate of the land certifications is evidenced by the fact that Zhytomyr region, classified only as conditionally suitable for the organic farming, is one of the leaders of the organic movement in Ukraine in terms of certified areas and the number of operators. The same situation is with Rivne region, although it is classified as an unsuitable territory, but in terms of the area of the certified organic lands, it is not inferior to the regions that are considered the most suitable for organics.

Calculations of the volume of costs to stabilize the soil quality show the potential investor (farmer) possible additional capital investments, the size of which will depend on the adoption of future management decisions.

In Ukraine, since 2000, there has been a general trend towards an increase for agrochemicals applied to the soil, the residues of which remain in the surrounding nature environment, food and organisms for a long time, and can spread over thousands of kilometers. A person, in the case of the accumulation of pesticides in the body, is subject to the threat of various kinds of diseases, including oncological ones [38]. Thus, the organic food production has a number of documented and potential benefits for the human body, which, in turn, will significantly reduce oncological diseases among the population in the future.

To establish the impact of technologies, currently used in the agricultural sector, on the population health, we have studied the statistical data on the number of oncological diseases in Rivne region for the period of 2003–2021. The reason to assert that one of the main factors, prompting the appearance of this disease, is the use of mineral fertilizers, which tend to grow (Figure 1).

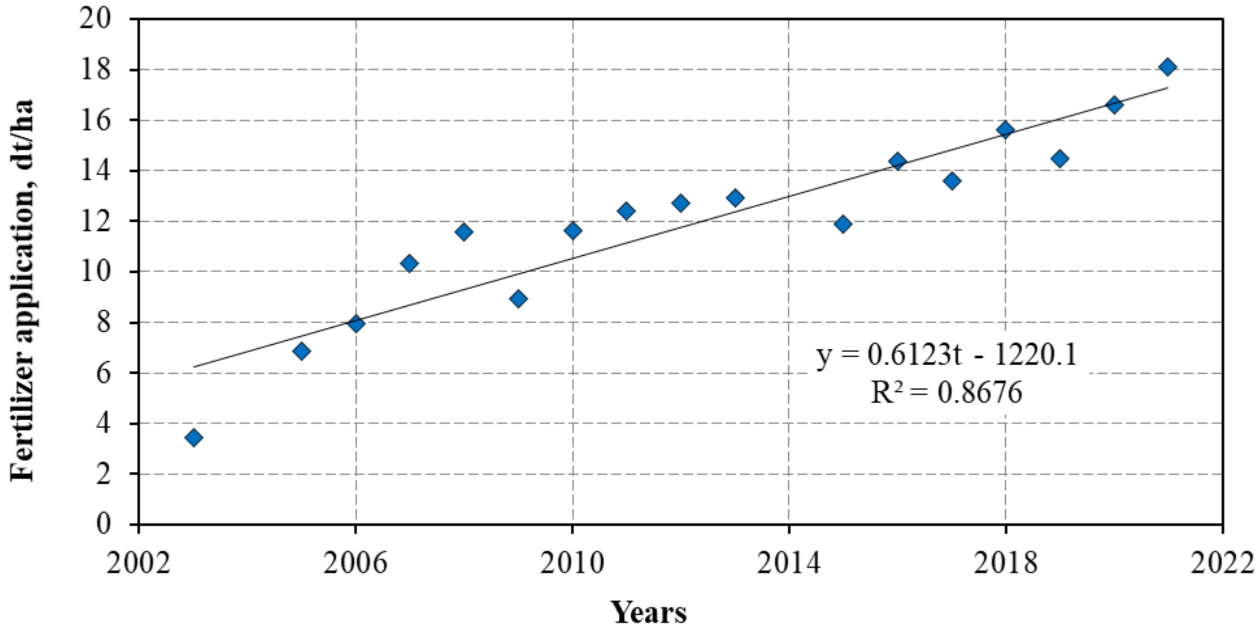

Figure 1. Application of mineral fertilizers per 1 hectare of sown area in Rivne region

Source: made by the authors based on [39].

To prove the existence of a connection (correlation) between the dressing of mineral fertilizers per one ha of sown area (the variable factor *x*) and oncological diseases among the citizens of the present region (the effective (resultant) factor *y*), the method of the correlation and regression analyses has been used.

The adequacy criterion of the model is the determination coefficient. The actual values of *y* and the values, obtained from the equation of the straight line, are compared, based on the comparison results and the determination coefficient is calculated, normalized from *0* to *1*. If it is equal to *1*, then there is a complete correlation with the model, that is, the differences between the actual and estimated values of *y*. Otherwise, if the determination coefficient is *0*, then the regression equation fails to predict the values of *y*. It also shows how much of the variations in the dependent (y_1) in the model is due to the variations in the independent variable (*x*).

Since the determination coefficient of the regression model showing the dependence of cancer on the volume of mineral fertilizer dressing is 0.0034 (Figure 2), the significance of the model is very low, which can be explained by the presence of data that can be characterized as emissions. It is customary to call an object of such a class as an outlier, the value of its features significantly differs from the values of the features of other objects of the same class.

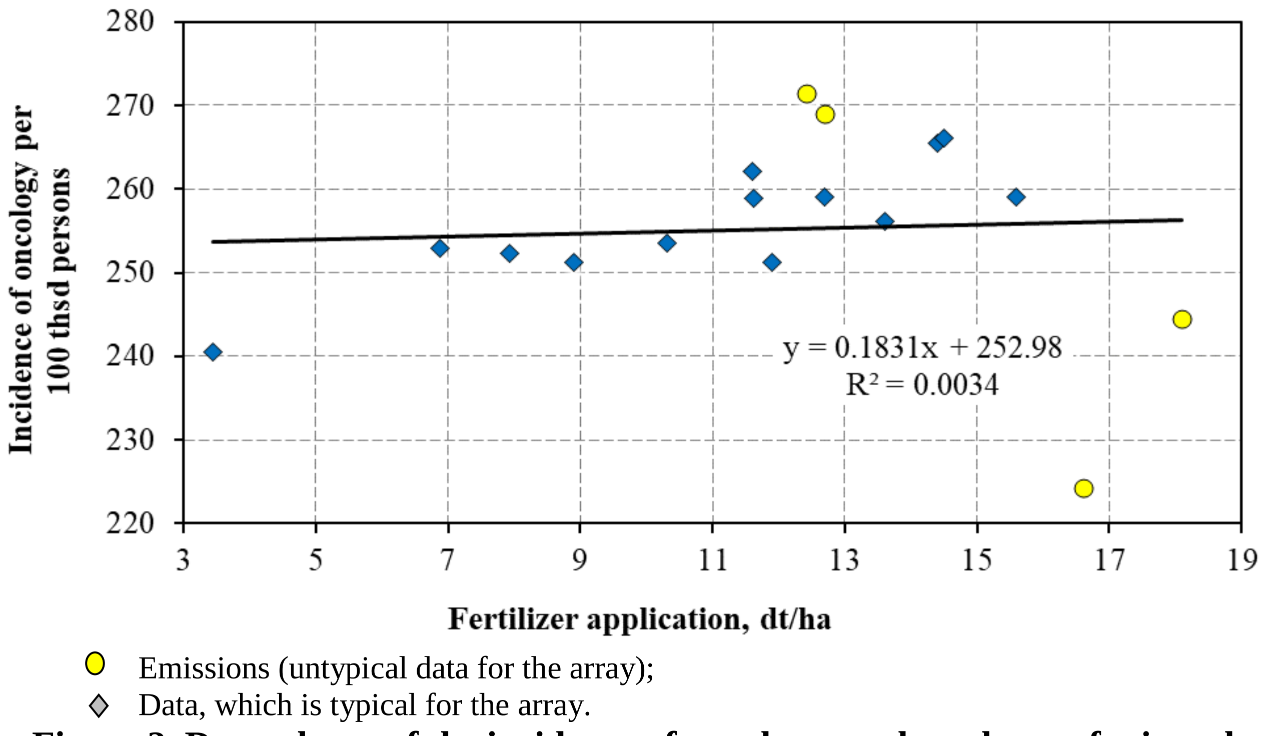

Figure 2. Dependence of the incidence of oncology on the volume of mineral fertilizers applied in the Rivne region in 2004–2021

Source: made by the authors based on their own calculations.

A visual outlier identification criterion allows identifying ejection as a data point that is significantly distant from the main dataset. The R^2 criterion allows us to consider some data elements as an outlier, if after its removal the value of the coefficient of determination R^2 significantly increases. When extracting outliers from a sample, remember that outliers should not exceed 25 % of the entire sample. A large number of outliers indicates a poor quality of statistical data or the independence of the considered parameters. Pursuant to the results of the correlation analysis, the correlation coefficient between the volume of mineral fertilization and oncology for the period 2004–2021 after extracting uncharacteristic data is $r = 0.84$ (Figure 3), which indicates a close relationship between these indicators.

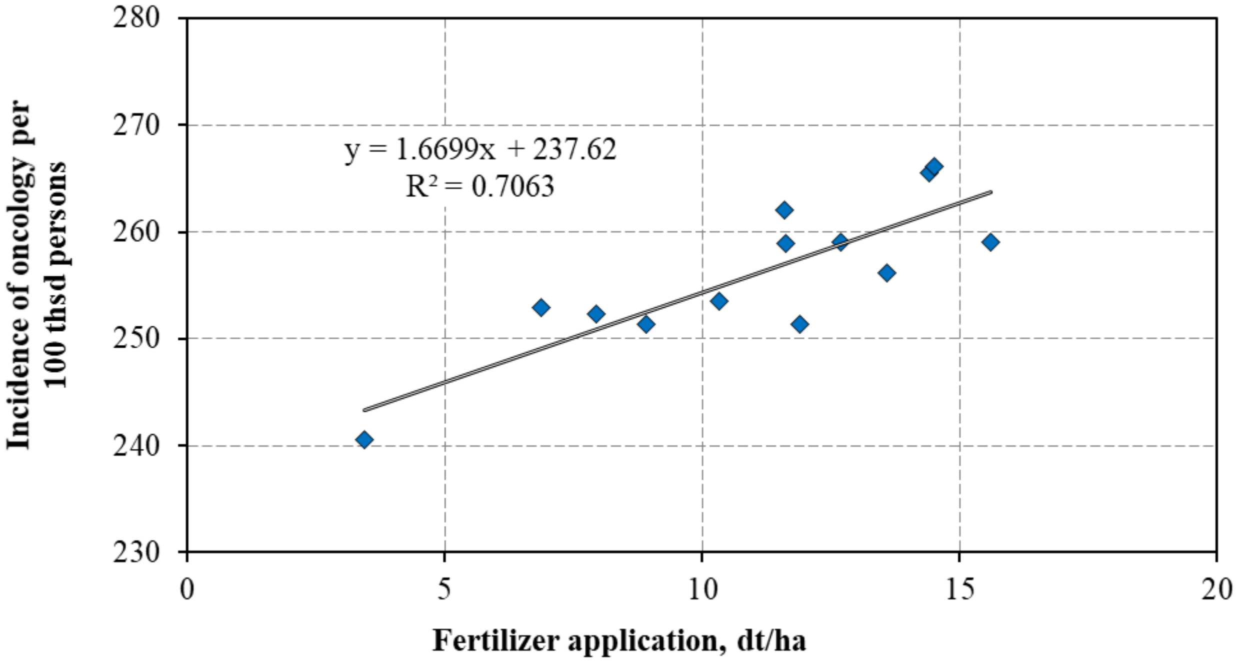

Figure 3. Dependence of the incidence of oncology on the volume of mineral fertilizers applied (after removing non-characteristic data) in the Rivne region in 2004–2021

Source: made by the authors based on their own calculations.

Using the method of the regression analysis, the one-factor linear regression model of the dependence of oncology in Rivne region (factor y_1) on the mineral fertilization volume (factor x) is built, and has a general form:

$$y = a_0 + a_1 x, \quad (1)$$

where a_0 is the free term of the equation;

a_1 is the regression coefficient.

To estimate the parameters of the paired regression equation, the least squares method is used. It consists in determining the parameters a_0, a_1, at which the sum of the squares of the deviations of the actual values of the result (y_i) is minimized from the theoretical ones. The paired linear regression coefficient a_1 characterizes the degree of the connection between the variations of the factorial and effective indicators. The regression coefficient shows how much, on average, the value of the effective indicator will change, when the factor is changed by one. Microsoft Excel software is used to build the regression model. As a result, we get a linear regression model that looks like this:

$$y_1 = 1.67x + 237.62 \quad (2)$$

Hence, we can conclude that with a decrease in the fertilizer dressing per unit (x), the level of cancer incidence per 100 thsd population (y_1) will decrease by an average of 1.67.

The significance of the linear correlation coefficient is based on the Student's t-criterion: the hypothesis of the absence of a relationship among the factorial and effective values is tested. To do this, it is necessary to compare the actual (calculated) value of the Student's criterion with the tabular value determined at a given significance level α and degrees of freedom $k_1 = m$ and $k_2 = n – m – 1$.

Moreover, if the actual value of the F-criterion is greater than the tabular $F_{fact} > F_{theor}$, then the model is significant in terms of parameters.

Table 2 shows the results of the parameters concerning an equal factor regression model of the morbidity dependence through oncology (y_1) on the fertilizer dressing volume (x), made with Microsoft Excel functions.

Table 2

Parameters of the one-factor regression model of the dependence of the incidence of oncology (y_1) on the volume of use of mineral fertilizers (x)

One-factor regression model parameters	Conventional marks	Meanings	
Model parameters	a	a_1	a_0
		1.67	237.62
The standard error in determining the regression coefficient of a_1	m_a	0.32	3.74
The actual value of the Student's criterion	t_{a1}	t_{a1}	t_{a0}
		5.14	63.51
The critical (tabular) value of the Student's criterion	t_{cr}	2.2	
The determination coefficient	R^2	0.703	
The correlation coefficient	R	0.840	
The actual value of the Fisher's criterion	F_{fact}	26.45	11.00
The critical value of the Fisher's criterion	F_{table}	4.84	

Source: made by the authors based on their own calculations.

According to calculations, the statistical significance of both model coefficients is high a_1 (5.14 > 2.2) and a_0 (63.51 > 2.57). Consequently, this model can be used when making management decisions.

To test the correlation significance, we determine the critical value of the F-criterion. The actual value of the F-criterion is calculated by the formula (3) and compared with the tabular value for the degrees of freedom $n – m$ and $m – 1$ as well as the selected confidence level. If $F_{fact} > F_{table}$, then the hypothesis about the significance of the relationship between the dependent and independent variables of the econometric model is confirmed, otherwise it is rejected.

$$F = \frac{R^2/(m-1)}{(1-R^2)/(n-m)} \tag{3}$$

In our case, the tabular value of the F-criterion with a probability of $P = 0.95$ is $F_{table} = 4.84$. Since the calculated F-criterion = 26.45 exceeds its critical value, that is, there are grounds with a probability of 0.95 to assert the likelihood of the influence of the factor under study on incidence of oncology in the population. Thus, everything points to the high adequacy of the model as a whole.

We used the resulting model to calculate predictive estimates of morbidity in Rivne region for the coming years (Figure 4).

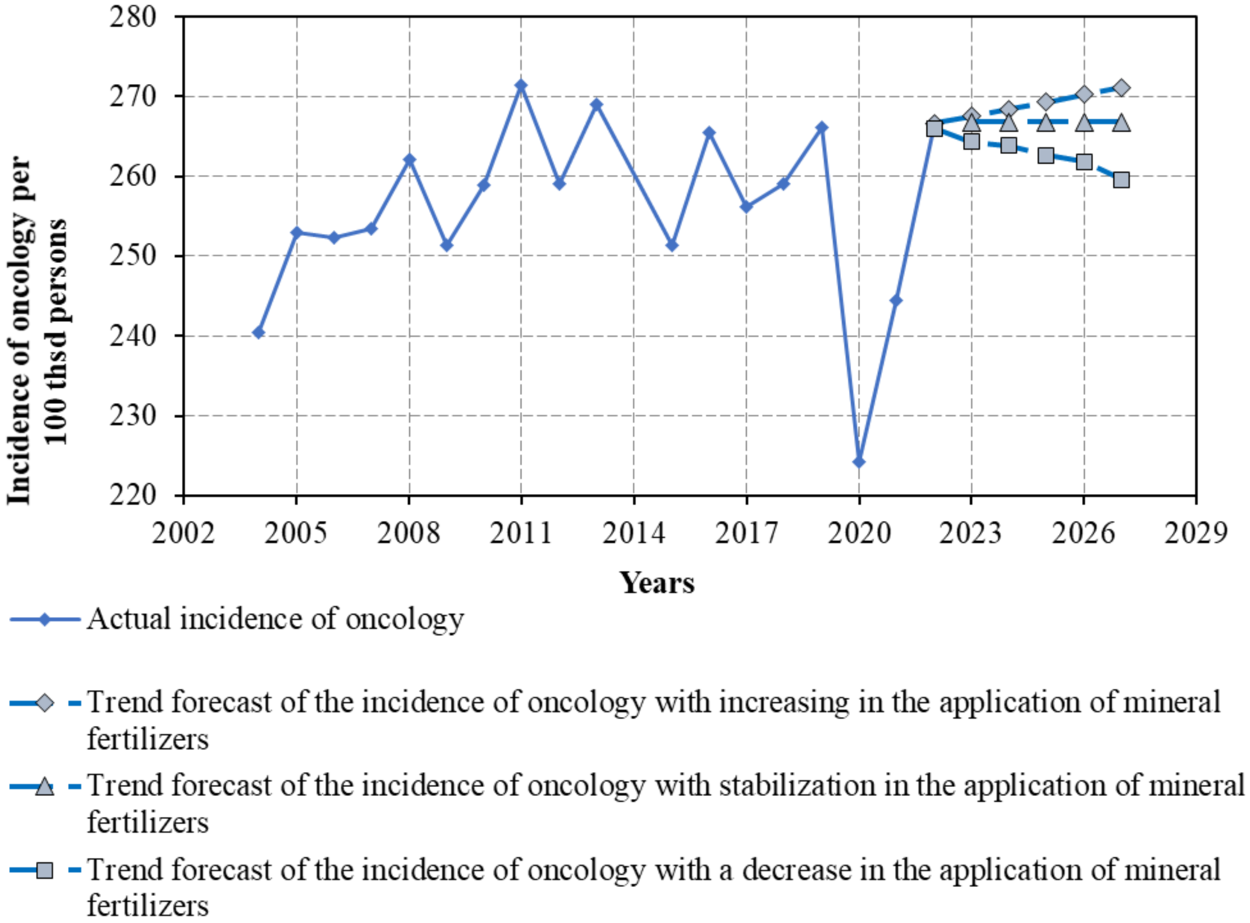

Figure 4. Forecast of the dynamics of the incidence of oncology depending on the change in the volume of mineral fertilizers applied per 1 ha of sown area in the Rivne region

Source: made by the authors based on [39].

According to the forecast indicators, at the current rate of increase in the use of mineral fertilizers, there will be an increase in the level of cancer incidence in 2027 by 5 %. This indicates the need for a transition to alternative green farming methods, which will reduce or stabilize the use of mineral fertilizers to improve public health. It was found that with a decrease in the use of mineral fertilizers in Rivne region by 10 % in 2027 the level of the cancer incidence of the population decreases by 5 % (Table 3).

The socio-economic effect of the idea to use organic lands (*E*), that is, a decrease in the incidence of the population due to a decrease in the mineral fertilization per 1 ha of sown area is determined by the formula:

$$E = E_{treatment} + E_{social} + E_{total\ output}, \quad (4)$$

where $E_{treatment}$ is a reduction in healthcare costs to treat the population from diseases;

$E_{treatment}$ – the decrease for payments from the social insurance fund for the period of the temporary disability of patients;

$E_{total\ output}$ – the prevention of gross output losses during the illness of workers employed in material production.

Table 3

Predicted incidence of oncology among the population of Rivne region for the next 5 years

Indicators	Units of measurement	Value		Deviation (+ growth, - reduction)
		organic land use	traditional land use	
Oncology, morbidity among the population	per 100 thsd people	259.61	266.84	-7.23
Population of Rivne region (01.01.2022)	people	1141800		
Number of cancer patients	people	2964	3047	-83

Source: made by the authors.

We calculate the reduction in healthcare costs for the treatment of diseases in the population using the formula:

$$E_{treatment} = B \cdot K_{ill\ persons}, \quad (5)$$

where B – expenses in the field of health care for the treatment of 1 patient in a hospital or an outpatient clinic, UAH;

$K_{ill\ persons}$ – the decrease in the number of patients treated for these diseases during the year, people.

Since 2020, the Medical Guarantee Program has been in effect in Ukraine, which provides for a certain amount of medical care that the hospital must provide to the patient free of charge. The state will finance such services according to the tariffs determined and approved by the Government. In total, 38 packages of medical services are provided, including “Diagnosis and chemotherapeutic treatment of oncological diseases”, “Diagnosis and radiological treatment of oncological diseases” and “Surgical operations for adults and children in hospital conditions”.

Given the complexity of the diseases, the period of the compulsory stay of patients in inpatient or outpatient treatment is on average 3–5 years (10–15 % of patients survive up to 5 years). According to statistics, 27–30 % of cancer patients die in the first year of the treatment. Depending on the scenario, we will divide the treatment of all the patients into 3 subgroups: 1 – surgical treatment; 2 – conservative treatment (without surgery); 3 – palliative care. Simultaneously, about 1/3 of patients will need the surgical intervention; at least the same number will require only the palliative care.

In 1 year of treatment, out of 83 patients, about 25 will need only palliative care, the rest are divided between three possible treatment options. Only 58 patients will continue treatment for 2 years. A more detailed calculation of budget savings in the healthcare sector, for the treatment of cancer patients due to the introduction of organic land use is given in Table 4.

Consequently, according to preliminary estimates, the decrease in the number of patients with cancer by 83 people per year in Rivne region will reduce costs spending for the health care up to 3281.897 thsd UAH.

Table 4

Saving budget funds in the field of health care

Treatment period	Package of medical services	Number of cancer patients	Tariffs for medical services, UAH	Amount, thsd UAH
1st year	**In just year**	**83**	**-**	**1563.149**
	Diagnosis and chemotherapeutic treatment of cancer	29	30.327	879.483
	Diagnosis and chemotherapeutic treatment of oncological diseases (including drugs)	14	25.529	357.406
	Surgical operations for adults and children in the inpatient settings	15	8.634	129.510
	Services related to the palliative care for adults and children in the inpatient settings	25	7.870	196.750
2nd year	**In just year**	**58**	**-**	**911.488**
	Diagnosis and chemotherapeutic treatment of cancer	11	30.327	333.597
	Diagnosis and chemotherapeutic treatment of oncological diseases (including drugs)	11	25.529	280.819
	Surgical operations for adults and children in the inpatient settings	18	8.634	155.412
	Services related to the palliative care for adults and children in the inpatient settings	18	7.87	141.660
3rd year	**In just year**	**35**	**-**	**564.666**
	Diagnosis and chemotherapeutic treatment of cancer	7	30.327	212.289
	Diagnosis and chemotherapeutic treatment of oncological diseases (including drugs)	7	25.53	178.703
	Surgical operations for adults and children in the inpatient settings	11	8.634	94.974
	Services related to the palliative care for adults and children in the inpatient settings	10	7.87	78.700
4th year	**In just year**	**13**	**-**	**242.594**
	Diagnosis and chemotherapeutic treatment of cancer	3	30.327	90.981
	Diagnosis and chemotherapeutic treatment of oncological diseases (including drugs)	4	25.529	102.116
	Surgical operations for adults and children in the inpatient settings	3	8.634	25.902
	Services related to the palliative care for adults and children in the inpatient settings	3	7.865	23.595
Total		**-**	**-**	**3281.897**

Source: made by the authors based on their own calculations.

Oncological diseases are included in the list of diseases for which you can apply for the disability registration. Factors that increase the likelihood of the disability prescribing involve the complete or partial removal of the organ; radiation and chemotherapy undergoing; tumor growth that cannot be slowed down; metastasis;

and the disease relapse.

Saving payments from the social insurance fund is determined by the formula:

$$E_{social} = K_{ill\ persons} \cdot S \cdot D + P, \tag{6}$$

where $K_{ill\ persons}$ – the decrease in the number of patients treated for these diseases during the year, people;

D – the average number of days (months) of incapacity for work, days;

S – the average daily (average monthly) wages of one worker, UAH;

P – the social pension, UAH.

E_{social} = 4 months · 13.5 thsd UAH/month + 8 months · 2.393 thsd UAH/month = 54 thsd UAH + 19.144 thsd UAH = 73.144 thsd UAH/year.

Therefore, basically, payments, for a year of illness, from the pension fund and the social insurance fund will amount to 73.144 thsd UAH. From the second to the fourth year, the social pension is calculated.

Table 5

Saving payments from the pension fund and the social insurance fund

Treatment period	Payments	Number of cancer patients receiving benefits, people	Amount, thsd UAH/year	
			for 1 person	total
1st year	hospital + social pension	83	73.144	6070.952
2nd year	social pension	58	28.716	1665.528
3rd year	social pension	35	28.716	1005.060
4th year	social pension	13	28.716	373.308
Total	-	-	-	9114.848

Source: made by the authors based on their own calculations.

The prevention of the gross output losses during the illness of workers, employed in the material production, is calculated by the formula:

$$E_{total\ output} = V_{addl\ total\ output} \cdot K_{ill\ persons} \cdot D, \tag{7}$$

where $V_{addl\ total\ output}$ is the average amount of added gross production (or net production) per 1 person/day;

$K_{ill\ persons}$ – the decrease in the number of patients treated for these diseases during the year, people;

D – the average number of days of illness per patient per year, days.

During the illness of workers, employed in the material production, the labor productivity decreases at enterprises and, accordingly, leads to a gross output loss. The gross value added is defined as the difference between the output of goods and intermediate consumption (costs of raw materials, fuel, energy, maintenance, transportation services, etc., used for the production needs). According to statistical data, the gross added value of products in the Rivne region is almost 63 thsd UAH/person per year (as of 2021). When calculating, we assume that patients who need palliative care are treated for 12 months a year, the rest – 6 months.

Calculation data relative to the socio-economic effect of growing organic products are summarized in Table 6.

Thus, a relationship between the volume of the fertilizer dressing and the level of cancer diseases in Rivne region was established with the help of mathematical modeling.

Table 6

Calculation data of the socio-economic effect resulting from the reduction in the burden of the population disease after the organic land use

Treatment period	Cost savings on cancer treatment, thsd UAH	Savings on social insurance costs, thsd UAH	Losses of the gross value added, thsd UAH	Total, thsd UAH
1st year	1563.149	6070.952	3400.468	11034.569
2nd year	911.488	1665.528	2392.922	4969.938
3rd year	564.666	1005.060	1416.862	2986.588
4th year	242.594	373.308	503.773	1119.675
Total	3281.897	9114.848	7714.025	20110.770

Source: made by the authors based on their own calculations.

It was proved that the number of patients with cancer decreased by 83 people in the region over 5 years due to the gradual decrease in the fertilizer dressing volume by 10 %. Then, the saving of state budget expenses for their treatment within 4 years will amount to 3281.897 thsd UAH. Savings in payments for patients from the pension fund and the social insurance fund will amount to 9114.848 thsd UAH. The loss of the added value of products in the region due to the increase in the number of people unable to work will amount to 7714.025 thsd UAH. In general, from the reduction in the incidence of oncology in the population by 83 people per year, savings of 20110.770 thsd UAH are expected.

Conclusions. As a result of the conducted research, it was established that the organization of the effective production of organic products within the management system of the agrarian nature remains relevant and it is considered as one of the main ecologization ways of the agricultural production. For the purpose of the ecological and economic substantiation relative to the effective introduction and development of the organic production in a particular region, the traditional ecological and agrochemical criteria are used in combination with economic ones, using IT developments and geo-information technologies.

It is established that at the current rate of increase in the use of mineral fertilizers there will be an increase in the incidence of oncology by an average of 5 %. Instead, given the reduction in the use of mineral fertilizers in the Rivne region by an average of 10 %, by 2027 the incidence of the population will decrease by 83 people (5 %).

Among the strategic directions for the organic land-use development as well as the market for organic products in Ukraine, we should highlight the growth of the certified organic land area; an increase in the number of certified organic farms, involved in the cultivation of fruit and vegetables. This list is also involves some increase in the production of organic products in the country; a guarantee of the environmental labeling as one of the tools for achieving the regional environmental safety; establishing the environmental management system. Moreover, it includes the product environmental certification in accordance with the requirements of international standards, and with the harmonization of the domestic legislation in the organic production field with the EU legal framework.

Thus, further research should focus on determining the environmental benefits of organic land use and assess the impact of organic production on the socio-economic development of the region and communities.

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