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SCIENTIFIC AND METHODOLOGICAL APPROACHES TO THE DEVELOPMENT OF EXPERIMENTAL LAND MANAGEMENT PROJECTS FOR THE ORGANIZATION OF THE TERRITORY OF STATE SCIENTIFIC INSTITUTIONS AND ENTERPRISES FOR THE PRODUCTION OF ORGANIC PRODUCTS

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Abstract. *The expansion of organic production in Ukraine is in line with global trends in the agricultural sector in the direction of greening of agricultural land use, accompanied by reducing the level of anthropogenic pressure on land resources, ensuring high quality crop products and maintaining a clean environment.*

The only means of creating spatial conditions for the harmonious functioning of organic land use within the territories of state research institutions and enterprises is the appropriate land management mechanism, which is currently lacking. Therefore, it is important to solve this problem by its creation and implementation in the practice of economic entities.

The purpose of this study is to improve scientific and methodological approaches to the development of experimental land management projects for the organization of the territory for the production of organic products within the land use of state research institutions and enterprises. For this purpose the following tasks were solved: analysis of the current state of development of relevant land management projects and their legal support, determination of structural features and placement of relevant elements of the organization of the territory for

organic crop production, substantiation of ecological and economic optimization of agricultural land structure and crop rotation.

***Key words**: organic land use, buffer zone, crop rotation, experimental land management project.*

Formulation of the problem. Global trends in the development of the agricultural sector indicate the growing greening of agricultural land use, due to the need to obtain quality, safe for human health agricultural products and preserve the quality of land resources used and maintain the regulatory environment. At the same time, in Ukraine, despite the growing intensification of social movement to reduce the anthropogenic burden on the environment, profit is often the main goal of the national agricultural producer, accompanied by neglect of environmental safety and socio-economic needs of rural populations. Traditional agricultural production in our country is accompanied by significant degradation of land resources, the spread of erosion and deflation, reducing the content of humus and nutrients in the root layer of the soil, non-compliance with scientifically sound crop rotations, excessive use of synthetic plant protection products and minerals.

All this requires the civil society of Ukraine and the executive authorities and local governments to introduce the most promising world practices of environmentally safe land use, which aim to ensure sustainable development of the agricultural sector of the economy. One of the most progressive and innovative methods of agricultural activity is organic production, which allows not only to ensure the soil formation process, but also to form sustainable multifunctional agricultural systems, which will be the basis for balanced development of land resources in the short and long term.

The only way to solve these problems is land management, which provides a favorable environment for the functioning of various organizational and economic forms, including organic land use. However, there is currently no effective land management mechanism to ensure the formation and harmonious development of such land uses and land tenure. Therefore, the relevance of the formation of scientific and methodological approaches to the development of experimental land

management projects for the organization of the territory for the production of organic products in this context is obvious.

Analysis of recent research and publications. The works of such scientists as S.S.Antonets [1], V.M.Budziak [2], V.I.Kysil [5], O.H.Tarariko [13], A.H.Tykhonov [15], H.M.Shpak [16] are devoted to the study of the problems of ecologically oriented development of agricultural land use, theoretical and methodological and applied aspects of the organization of organic crop production. etc., whose developments provided the formation of a system of knowledge that is the scientific basis for the introduction of organic land use as a means of greening agriculture. sphere of Ukraine.

The works of B.O.Avramchuk, Y.M.Dorosh, Sh.I.Ibatullin, L.Ya.Novakovskyi and A.V.Tarnopolskyi [3, 7] are devoted to the organization of the territories of state scientific institutions and enterprises, in which various aspects are revealed. land management of research institutions and enterprises, but some issues, in particular, the main indicators and parameters that determine the assessment of the suitability of agricultural land for organic production, the establishment of buffer zones between areas of organic and inorganic land use, the formation of organic crop rotations in modern socio-economic conditions , to some extent are debatable, and therefore require further research and generalization.

The purpose of the article is to form scientific and methodological approaches to the development of experimental land management projects for the organization of the territory for the production of organic products within the land use of state research institutions and enterprises.

Presentation of the main material. Undoubtedly, experimental land management projects for the organization of the territory of organic land use "should be dynamic, characterize the land use of the economy and contain solutions that provide flexible management and use of land in market conditions [6]; to ensure ecologically safe use of lands through "introduction of anti-erosion measures of permanent action on the principles of contour-ameliorative organization of the territory, in particular forest and ameliorative, their

implementation with the support of the state within catchments of small rivers, and agrotechnical measures - at the expense of economic entities and land users". To minimize the risks associated with erosion of soil cover and desertification in the face of climate change [14]; and their development should be based on the provisions of current regulations with mandatory consideration of environmental and economic requirements for the organization of production of organic products in agricultural enterprises. The legal framework for the development of land management projects is formed mainly by the Land Code of Ukraine (LCU) [4] and the Law of Ukraine "On Land Management" [10], and technological requirements for the organization of organic production are formulated in the Law of Ukraine "On Basic Principles and Requirements for Organic production, circulation and labeling of organic products" of July 10, 2018 № 2496-VIII [11], as well as the Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure (detailed rules) of organic production and circulation of organic products" of October 23, 2019 70970 [9]. In particular, to the general requirements for the organization of organic production, defined by Article 14 of the Law of Ukraine of 10.07.2018. №2496-YIII, belongs to the "separation in time or space of production and storage of organic products from the production and storage of inorganic products and products of the transition period; the use of technologies that do not harm human health, plants, animal welfare, prevent environmental pollution or minimize it" [11].

At the same time, the Resolution of the Cabinet of Ministers of Ukraine of October 23, 2019 №970 stipulates that "operators must apply crop rotation schemes in accordance with the standards of optimal crop rotation in different natural and agricultural regions, approved by the Cabinet of Ministers of Ukraine of February 11, 2010 p. № 164 [8]; "crop rotation should have a positive effect on soil fertility, maintain a deficient balance of humus and nutrients, reduce weeds, prevent the spread of pests and plant diseases, and protect the soil from erosion and other degradation processes"[9]. Development of a system of measures to restore and increase soil fertility, protect lands from erosion, according to paragraph "e" of

Article 183 of the LCU, is one of the main tasks of land management, which should be carried out in the preparation of relevant land management projects [4]. However, firstly, in the exhaustive list of types of land management documentation enshrined in the Law of Ukraine "On Land Management", there are no land management projects for the organization of organic land use [10], and secondly, the closest in content and composition of land management projects ecological and economic substantiation of crop rotation and land management, do not take into account the specifics and environmental requirements for the organization of the territory for organic crop production, namely: the need to delimit areas of organic and traditional land use to prevent contact between their components. soil fertility parameters, etc. The above requirements were implemented in the process of developing an experimental land management project for the organization of organic land use on the example of the State Enterprise "Skvyrske Research Farm" and Skvyra Research Station of the Institute of Agroecology and Nature Management of NAAS of Ukraine.

At the preparatory stage in the systematization of land cadastral materials in relation to these enterprises considered and analyzed reports on the quantitative accounting of land; materials on the distribution of land by forms of ownership and by categories of land; documents certifying the right to land. According to the results of land inventory works of SE "DE Skvyrske" it was found that actually used 634.28 hectares of land, of which: 6 land plots with a total area of 327.64 hectares within Skvira City Council and 8 land plots with a total area of 306 63 hectares within the Damantivka village council. The Skvyra Research Station has a permanent use of land plots with a total area of 42.21 ha for conducting experiments on vegetable seed production: land plot №1 with an area of 27.55 ha and land plot №2 with an area of At the second stage, during the experimental work on the development of the land management project for the organization of the territory of organic land use within the territories of the studied enterprises, its composition and content were worked out. Such a land management project includes: a) tasks for drawing up a land management project; b) an explanatory

note; c) documents confirming the area of land tenure (land use); d) materials of geodetic and land surveying; e) materials of soil surveys; e) copies of agrochemical passports of fields (land plots); f) materials of the field history book for the last five years; g) a plan of the current state of land use in terms of land tenure and land use, land, restrictions and special conditions of land use; g) layout of crop predecessors; h) plan of agricultural groups of soils and slope steepness; i) plan of organization of land tenure (land use), arrangement of lands with allocation of buffer zones between territories of organic and inorganic plant growing, placement of industrial buildings and constructions with allocation of sanitary protection zones around objects of increased ecological danger, objects of engineering and social infrastructure and measures on land protection; i) plan of organization of the crop rotation territory (design of crop rotation fields with determination of their types and species taking into account the requirements for organic crop production); j) materials of transfer to nature (on the ground) of the designed crop rotation fields; j) materials for the transfer in kind (on the ground) of the boundaries of land.14.66 ha within the Skvyra City Council of the Skvyra district of Kyiv area.

A key element of the organizational structure of organic land use areas should be field protective forest plantations, as the level of pollution of adjacent agricultural lands largely depends on their construction and order. Thus, according to NA Ryazanov and others. (2003) soil contamination with heavy metals (Zn, Pb) at a distance of 50 m from the highway without a forest strip decreased 3 times, behind a 6-row forest strip with shrubs - 10-12 times [12]. The width of such forest belts can be determined by calculation or regulation.

Our project envisages the placement of a 2-row forest strip of impermeable structure along the perimeter of the production area for organic crop production, which provides a favorable microclimate and protection of soil cover from pollution: chemical plant protection products used on adjacent land uses and can be aerated in windy weather; heavy metals due to emissions from road transport, etc. The suitability of the studied arable lands for growing organic crop products was

determined using a set of indicators (sanitary, agrochemical and environmental stability of the soil) in accordance with the criteria by which these lands are divided into 3 classes: 1) suitable, agroecological condition which contributes to high production quality; 2) limited suitability, the parameters of soil fertility which do not correspond to the optimal level and require measures to improve them; 3) unusable, on which it is impossible to obtain products of proper quality (Table 1).

According to Table 1, according to all sanitary and hygienic indicators, the surveyed fields are classified as Class I. According to the content of humus and the content of mobile forms of manganese, the surveyed fields, except for the field №3, are referred to the II class of suitability. Field №3 in terms of the content of mobile forms of manganese is classified as class I.

suitability; by the content of humus, the reaction of the soil environment, the amount of absorbed bases and the content of mobile forms of boron - up to class II suitability.

Based on the assessment of the suitability of the studied agricultural lands for growing organic products and taking into account the requirements of the Standards of Organic Agricultural Production and Labeling of Agricultural Products and Food Products “BIOLAN” of the International Non-Governmental Organization 33% of legumes that are able to accumulate nutrients and stimulate the activity of soil organisms. In general, the scheme of crop rotation is made taking into account: soil and climatic conditions of the study area, placement of crops after the best predecessors to ensure proper aftereffect of each implemented measure, as well as profitability of growing these crops in the region.

As a result of a comparative analysis of different land use systems, it was found that in traditional agriculture without crop rotation the yield of crops according to the State Statistics Service of Ukraine is significantly lower than in traditional and organic farming with crop rotation (Table 2).

1. Assessment of the suitability of the fields of the Skvyra research station for organic production

Crop rotation	№ of field	Area of field, ha	Sanitary and hygienic indicators										Indicators of environmental sustainability					
			Density of cesium-137 pollution, Ki/km2		Content of mobile forms of heavy metals, mg/kg				Content of pesticide residues, mg/kg				The humus content in the arable layer,%		The reaction of the soil solution (pHkcl), from pH		The sum of absorbed bases (Ca + Mg), mg-eq / 100g	
					cadmium		plumbum		DDT and its metabolites		isomers of HCH							
			F	Pr	F	Pr	F	Pr	F	Pr	F	Pr	F	Pr	F	Pr	F	Pr
Crop rotation	1	6,1	0,0262	S	0,1	S	0,50	S	0,001	S	0,0001	S	2,74	L	5,6	S	18,5+3,3	S
	2	5,9	0,0262	S	0,1	S	0,50	S	0,003	S	0,0002	S	3,00	L	5,6	S	17,9+3,3	S
	3	6,5	0,0262	S	0,1	S	0,25	S	0,003	S	0,0003	S	2,74	L	5,5	L	16,9+3,0	L
	4	6,1	0,0262	S	0,1	S	0,25	S	0,002	S	0,0003	S	3,00	L	6,2	S	16,5+2,9	L
	5	5,5	0,0262	S	0,1	S	0,50	S	0,001	S	0,0002	S	2,74	L	5,6	S	18,0+3,3	S
	6	5,3	0,0262	S	0,1	S	0,50	S	0,003	S	0,0003	S	2,61	L	6,0	S	19,3+3,4	S

Crop rotation	№ of field	Area of field, ha	Agrochemical indicators											
			Content of mobile forms, mg/kg of soil											
			phosphorus by Chyrykov method		potassium by Chyrykov method		manganese		zinc		cuprum		boron	
			F	Pr	F	Pr	F	Pr	F	Pr	F	Pr	F	Pr
	1	6,1	161	S	119	S	41	L	6,0	S	8,0	S	0,7	S
	2	5,9	123	S	108	S	35	L	6,0	S	8,0	S	0,7	S
	3	6,5	150	S	83	S	85	S	5,0	S	6,6	S	0,6	L
	4	6,1	114	S	144	S	51	L	5,0	S	8,0	S	0,7	S
	5	5,5	178	S	115	S	39	L	6,0	S	6,6	S	0,8	S
	6	5,3	162	S	153	S	42	L	5,0	S	6,6	S	0,9	S

* S – suitable, L - limited suitable, U - unsuitable

This is due to the fact that the constant cultivation of crops in the same field or land is accompanied by depletion of the soil, increasing the risk of spreading diseases and pests of plants. On the other hand, observance of scientifically based crop rotation taking into account their mutual influence and aftereffect of each agrotechnical measure, as well as scientifically substantiated norms of organic fertilizer and in general agrotechnology of cultivation of the corresponding crop as in the case of organic land use, provides land productivity and agricultural yields. .

According to Table 2, the highest production costs are observed in traditional agriculture without crop rotation, because in order to increase yields and protect crops from pests and diseases, producers are forced to use a significant amount of synthetic fertilizers and chemical plant protection products. At the same time, the costs of chemical plant protection products together with fuels and lubricants account for the largest share of total costs, as their cost is constantly growing due to economic instability. Due to this, in traditional agriculture without crop rotation there is the highest total cost of production. In traditional and organic farming, with the use of crop rotation, the total cost of production is lower, because the observance of scientifically sound crop rotation allows to reduce weeds and the spread of diseases and pests without additional costs for chemical plant protection products.

2. Comparative characteristics of the effectiveness of the implemented measures for different land use systems

№ of P/p	Indicators	Units of measurement	Traditional production without crop rotation	Traditional production with crop rotation	Organic production with crop rotation
1	Crop capacity:				
	pea	c/ha	18,20	20,00	31,50
	buckwheat	c/ha	13,10	15,60	12,50
	soy	c/ha	25,80	27,30	28,40
	winter wheat	c/ha	39,30	42,30	65,00
	corn	c/ha	78,40	80,00	56,00
	oat	c/ha	23,40	26,90	28,00
2	Gross income	UAH/ha	19247,92	20700,30	27319,19
4	Direct costs	UAH/ha	11650,08	10114,25	13076,97
5	Indirect costs	UAH/ha	4791,47	3780,61	1824,21

6	Full cost	UAH/ha	16441,55	13894,86	14901,18
7	Чистий дохід	UAH/ha	2806,36	6805,43	12418,01
8	Profitability	%	17,07	48,98	83,84

* formed by the authors on the basis of statistical data of the State Statistics Service of Ukraine and initial data for determining the indicators of economic efficiency of organic production of Skvyra research station.

As a result, the level of profitability of crop production under traditional agriculture without crop rotation is 17%; in traditional agriculture with the use of crop rotation - 49; for organic land use - 84%.

For the ecological assessment of the projected crop rotation, the calculations of the average annual balance of humus according to the formula of G.Ya. Chesnyak are used, which has the following form:

$$B_g = \frac{(\sum A_1 + \sum A)}{t_p} - \frac{\sum p}{t_P},$$

where Bg - humus balance in the soil for crop rotation, t / ha; A1 - the amount of newly formed due to plant residues of humus under crops for crop rotation; t / ha; A2 - the amount of newly formed due to organic fertilizers humus for crop rotation; t / ha; A is the total amount of humus that is mineralized under crops during crop rotation; t / ha; tp - duration of crop rotation, years.

The results of the calculations of humus formation due to plant residues and its mineralization under crops for the rotation of the designed crop rotation are presented in table 3.

Since the amount of newly formed due to crop residues of humus under crops for crop rotation (ΣP1) is 5.22 t / ha, and the total amount of humus mineralized under crops for crop rotation (ΣR) is 4.82 t / ha, the average annual balance of humus, determined according to the above formula:

$$B_g = \frac{(5{,}22 + 0)}{6} - \frac{4{,}82}{6} = 0{,}07 \text{ t/ha}.$$

As shown by the results of calculations, the balance of humus in the projected crop rotation is positive, which confirms the projected favorable effect of crops on the main parameters of soil fertility, even without additional application of organic fertilizers.

3. Indicators for calculating the balance of humus

№ P/p	The name of the culture	Crop capacity, t / ha	Neoplasm humus due to crop and root residues (P1), t / ha	Mineralization humus under crops crop rotation (P), t / ha
1	Pea	3,15	0,58	0,80
2	Buckwheat	1,25	0,30	0,60
3	Soy	2,64	0,49	0,80
4	Winter wheat	6,50	1,79	0,70
5	Corn	8,60	1,38	1,10
6	Oat	2,80	0,68	0,82
			ΣA_1=5,22	ΣP=4,82

Conclusions. The first step in organizing the territory of organic land is to assess the suitability of the soil cover of a particular agricultural enterprise for organic production, which must comply with a number of rules developed by the International Federation of Organic Agriculture (IFOAM): permanent reproduction of soil fertility, production of quality crops , development and application of appropriate technology based on the principles of biologization of agriculture.

The development of experimental land management projects for the organization of the territory of state research institutions and enterprises for the production of organic products should include 2 stages: preparatory and experimental. On the example of the State Enterprise “Experimental Farm Skvyrske” and Skvyra Research Station of the Institute of Agroecology and Nature Management of NAAS of Ukraine, on the basis of which the relevant land management project was developed, the preparatory stage included: collection, systematization and analysis of materials characterizing the location of objects. by categories, owners and users, accounting and use of land, the availability of real estate and their ownership, etc.

At the second stage - in the process of experimental work on the development of land management was assessed the suitability of soil cover of the study area for growing organic crop products for sanitary, agrochemical and environmental sustainability indicators based on agrochemical certification of land (according to agrochemical certification of land). It is established that according to

all sanitary and hygienic indicators, indicators of ecological stability of soil and most agrochemical indicators (except for humus content and content of mobile forms of manganese) the surveyed agricultural lands are absolutely suitable for growing high-quality organic agricultural products.

To ensure highly efficient and environmentally safe use of arable land in the study area, a 6-field field crop rotation is proposed, which in accordance with the standards of organic agricultural production and labeling of agricultural products and food “BIOLAN” International NGO “Association of bioproduction” % of legumes that are able to accumulate nutrients and stimulate the activity of soil organisms.

Comparative forecast assessment of economic efficiency of growing crops in the designed crop rotation using the methods of organic and traditional agriculture showed a higher profitability (35-40%) of organic crop production. For the ecological assessment of the projected crop rotation, the calculations of the average annual balance of humus were used, which showed its positive values, even without additional application of organic fertilizers.

To improve the regulatory and legal support of the land management process for the formation of organic land use and land tenure, it is proposed to amend Article 25 of the Law of Ukraine “On Land Management” regarding a new type of land management documentation: land management projects for the organization of organic land use (land tenure).

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НАУКОВО-МЕТОДИЧНІ ПІДХОДИ ДО РОЗРОБКИ ЕКСПЕРИМЕНТАЛЬНИХ ПРОЕКТІВ ЗЕМЛЕУСТРОЮ ЩОДО ОРГАНІЗАЦІЇ ТЕРИТОРІЇ ДЕРЖАВНИХ НАУКОВИХ УСТАНОВ ТА ПІДПРИЄМСТВ ДЛЯ ВИРОБНИЦТВА ОРГАНІЧНОЇ ПРОДУКЦІЇ

Анотація. *Розширення виробництва органічної продукції в Україні відбувається в руслі світових тенденцій розвитку аграрної сфери в напрямі екологізації сільськогосподарського землекористування, що супроводжується зниженням рівня антропогенного навантаження на земельні ресурси, забезпеченням високої якості продукції рослинництва та збереженням чистоти довкілля. Єдиним засобом створення просторових умов для гармонійного функціонування органічних землекористувань в межах територій державних наукових установ та підприємств, є відповідний землевпорядний механізм, який наразі відсутній. Тому актуальним для вирішення цієї проблеми є його створення та запровадження в практику господарюючих суб'єктів. Мета даного дослідження полягає в удосконаленні науково-методичних підходів до розробки експериментальних проектів землеустрою щодо організації території для виробництва органічної продукції в межах землекористувань державних наукових установ та підприємств. Для цього вирішувались такі завдання: аналіз сучасного стану розробки відповідних проектів землеустрою та їх нормативно-правового забезпечення, визначення особливостей структури та розміщення відповідних елементів організації території для ведення органічного рослинництва, обгрунтування еколого-економічної оптимізації структури сільськогосподарських угідь і сівозміни досліджуваних землекористувань.*

Ключові слова: *органічне землекористування, буферна зона, сівозміна, експериментальний проект землеустрою.*

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НАУЧНО-МЕТОДИЧЕСКИЕ ПОДХОДЫ К РАЗРАБОТКЕ ЭКСПЕРИМЕНТАЛЬНЫХ ПРОЕКТОВ ЗЕМЛЕУСТРОЙСТВА ПО

ОРГАНИЗАЦИИ ТЕРРИТОРИИ ГОСУДАРСТВЕННЫХ НАУЧНЫХ УЧРЕЖДЕНИЙ И ПРЕДПРИЯТИЙ ДЛЯ ПРОИЗВОДСТВА ОРГАНИЧЕСКОЙ ПРОДУКЦИИ

Расширение производства органической продукции в Украине происходит в русле мировых тенденций развития аграрной сферы в направлении экологизации сельскохозяйственного землепользования, сопровождается снижением уровня антропогенной нагрузки на земельные ресурсы, обеспечением высокого качества продукции растениеводства и сохранением чистоты окружающей среды.

Единственным средством создания пространственных условий для гармоничного функционирования органических землепользования в пределах территорий государственных научных учреждений и предприятий, является соответствующий землеустроительный механизм, который сейчас отсутствует. Поэтому актуальным для решения этой проблемы является его создание и внедрение в практику хозяйствующих субъектов.

Цель данного исследования заключается в совершенствовании научно-методических подходов к разработке экспериментальных проектов землеустройства по организации территории для производства органической продукции в пределах землепользования государственных научных учреждений и предприятий. Для этого решались следующие задачи: анализ современного состояния разработки соответствующих проектов землеустройства и их нормативно-правового обеспечения, определение особенностей структуры и размещения соответствующих элементов организации территории для ведения органического растениеводства, обоснование эколого-экономической оптимизации структуры сельскохозяйственных угодий и севооборота исследуемых землепользования.

Ключевые слова: *органическое землепользования, буферная зона, севооборот, экспериментальный проект землеустройства.*