UDC 332.3:63 http://dx.doi.org/10.31548/zemleustriy2024.02.02

TO THE RULES FOR DEVELOPING WORKING LAND MANAGEMENT PROJECTS TO IMPROVE THE CONDITION OF AGRICULTURAL LAND

A. KOSHEL,
Doctor of Economics
National University of Life and Environmental Sciences of Ukraine
e-mail:koshelao@gmail.com
I. KOLHANOVA,
PhD in Economics
National University of Life and Environmental Sciences of Ukraine
e-mail: kolganova_i@ nubip.edu.ua
O. KEMPA,
Dr inż. (PhD)
Wroclaw University of Environmental and Life Sciences
e-mail:olgierd.kempa@upwr.edu.pl
A. STACHERZAK,
Dr inż. (PhD)
Wroclaw University of Environmental and Life Sciences
e-mail:agnieszka.stacherzak@upwr.edu.pl

Abstract. *The article proposes scientific and methodological approaches to the development of measures to improve the condition of agricultural land in modern land management documentation. The article focuses on agroecological, agrochemical and agrotechnical approaches aimed at ensuring sustainable development of the agricultural sector. The article discusses the rules for developing working land management projects to improve the condition of agricultural land, which are key to increasing land productivity and ensuring its sustainable use. In particular, the article analyses methodological approaches, regulatory and legal requirements, as well as practical aspects related to land management on agricultural land.*

The focus is on the structure and content of working land management projects, including detailed analysis and characterisation of land, qualitative assessment of soil condition, identification of erosion and degradation processes, as well as development of specific agrotechnical, land reclamation and soil protection measures to improve the condition of land, and integration of environmental aspects into the design, which contributes to the conservation of biodiversity and improvement of ecosystem functions of agricultural land.

The article describes the key stages of creating working projects: preparatory stage, development of a working land management project, approval and implementation. The article also focuses on the legal framework regulating the land management

process in order to improve the efficiency of land management. The article provides an example of a successful working land management project in one of the regions of Ukraine, which demonstrates positive results in preserving soil fertility, increasing productivity and environmental sustainability of land.

The article summarises current knowledge and practices in the field of land management, offering a comprehensive approach to the development of working projects aimed at ensuring sustainable development of agricultural land. The proposed rules and recommendations can serve as a basis for professionals involved in land management, agronomy and ecology.

Key words: *protection of agricultural land, land management, improvement of agricultural land, land management, land management documentation.*

Actuality

Land is one of the most important natural resources. Rational and efficient use of land resources is an important means of ensuring high rates of agricultural development. The issue of rational use and protection of land is very acute. Ukraine has no reserves for expanding agricultural land with a relatively high level of land development. It is now absolutely clear that it is impossible to use land rationally without taking into account the properties of the soil cover. The latter, as established, is determined by the natural properties of soils, due to their genesis, acquired as a result of agricultural use. Under current conditions, the anthropogenic impact on soils is growing, expanding and increasing the impact on their natural properties.

Therefore, it is only by simultaneously taking into account the natural characteristics of soils and those acquired as a result of agricultural use that it is possible to scientifically substantiate measures to preserve, improve and increase their use.

Analysis of the latest scientific research and publications

Such scientists as P.F. Kulinich, A.G. Martyn, I.O. Novakovska, S.O. Osypchuk, I.M. Shkvyr and others have dealt with the development of scientific and methodological approaches to the implementation of measures to improve the condition of agricultural land and land protection. At the same time, the issue of developing land management documentation for improving the condition of agricultural land is relatively unexplored.

The purpose of the article is to highlight scientific and methodological approaches to the development of working land management projects to improve the condition of agricultural land in Ukraine.

Materials and methods of scientific research

The theoretical and methodological basis of the study is the provisions and principles of the modern concept of sustainable development of rural areas, the results of research by domestic and foreign scientists, which reveal the nature of the development of working land management projects to improve the condition of agricultural land. In the course of the study, the author used general scientific and special research methods, namely: dialectical – to identi-

fy the conditions under which the development of working land management projects is carried out, their focus, efficiency and effectiveness; analysis – to highlight the role and place of working land management projects for improving the condition of agricultural land in the system of land relations; structural and functional analysis – to determine the main stages and components of the development of working land management projects for improving the condition of agricultural land..

The results

The development of a working land management project to improve the condition of agricultural land and forest land is aimed at creating a sustainable, cost-effective and environmentally friendly system of land use that ensures increased productivity of agricultural land, conservation and restoration of forest land, and promotes the long-term sustainable development of agricultural and forest ecosystems.

In accordance with the Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Rules for Developing Working Land Management Projects" of 2 February 2022 No. 86, a working land management project for the improvement of agricultural land [6].

A working land management project to improve the condition of agricultural land and forest land may include measures to: improve the productivity of agricultural land, conserve and restore forest land, introduce technologies and practices that increase the economic efficiency of agricultural and forest land while maintaining environmental standards, implement measures to conserve, restore and rationally use forest resources, including reforestation of degraded land [1].

The object of this study is a land plot that requires measures to improve the condition of agricultural land.

The land plot has an area of 0.9480 hectares, in terms of configuration – it has an irregular elongated rectangular elongated shape (Fig. 1.).

The surface of the land plot is a gently undulating and slightly hilly forest plain, gently sloping in the south-western direction towards the valley of the Ikva River. The absolute elevations are 275-285 m, the horizontal surface is quite significant, the height differences

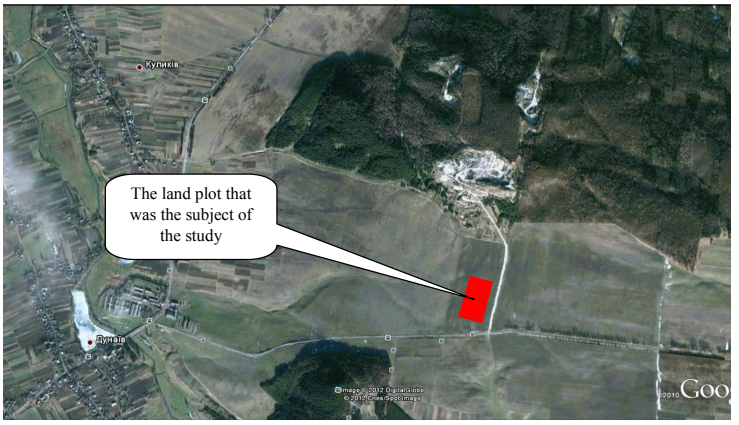

Figure 1 - Location of the land plot that is the object of design

Source: authors' development based on the use of the Google Maps web service

Figure 2 - The nature of the surface of the land plot that was the object of the study

Source: photo by the authors

reach 5-6 m, and the slopes are up to 3º (Fig. 2).

Soil cover of the land use is represented by crushed medium loamy chernozems on the eluvium of dense carbonate rocks (code of agricultural soil group 99d) with the area of 7.3794 ha and crushed medium loamy chernozems with the area of 2.6206 ha.

The particle size distribution of the soils and their agrochemical properties are shown in Tables 1-2.

1. Particle size distribution of soils

Soil type code	Sample depth, cm	Particle size in mm, their content in %							Granulometric warehouse
		sand		dust			sludge < 0,001	sum of the parts < 0,01	
		> 0,25	0,25-0,05	0,05-0,01	0,01-0,005	0,005-0,001			
99d	0-20	6,17	24,82	24,72	11,33	15,79	17,17	44,29	medium loamy
101d	0-20	6,49	21,92	30,90	7,21	16,49	16,99	40,69	- « -

2. Agrochemical properties of soils

Soil type code	№ of the section	Sample depth, cm	Humus content, %.	pH of the water extractor	Content of mobile forms of nutrients, mg/kg			Humus stock, t/ha
					nitrogen of easily hydrolysable compounds	phosphorus	potassium	
99d	1	0-20	3,40	7,65	175,0	59,0	35,0	91,12
	4	- « -	3,43	7,65	168,0	31,5	45,0	91,92
	5	- « -	3,36	7,66	194,6	40,0	51,0	90,05
101d	2	0-20	2,96	7,81	140,0	30,0	55,0	76,96
	3	- « -	2,83	7,65	168,0	35,0	45,0	73,58

The density of the arable layer of crushed medium loamy chernozem on the eluvium of dense carbonate rocks is 1.34 g/cm3, which is estimated as dense according to the Kachinsky scale. The density of the arable layer of crushed gravelly slightly washed medium loamy chernozem on the eluvium of dense carbonate rocks is 1.30 g/cm3, which is assessed as dense according to the Kachinsky scale.

According to physicochemical analyses, the humus content in the upper layer of 0-20 cm of the studied soils is within 2.83-3.43%, which is assessed as a low level of the indicator. The humus reserves (t/ha) in the 0-20 cm soil layer vary between 73.58-91.95 t/ha, which is assessed as low according to the scale of humus condition of soils (according to Grishina-Orlov).

The analytical studies of the soil reaction show that within the boundaries of land use, it is medium alkaline, since the pH of the water extract is 7.65-7.81. The content of nitrogen indicators of easily hydrolysable compounds (according to Kornfield) varies from 140.0 to 194.6 mg/kg, which is in the range from low to medium.

Accordingly, the content of mobile phosphorus (according to Machigin) varies from 30.0 to 59.0 mg/kg of soil and is in the range of high to high, the content of potassium (according to Machigin) – from 35.0 to 55.0 mg/kg and is in the range of very low to low nutrient supply.

Regarding the content of trace elements, in particular mobile forms of copper and zinc, it should be noted that the established concentration of copper is 0.84-0.94 mg/kg, i.e. this indicator does not exceed the maximum permissible concentration (MPC) of mobile forms of copper in soil (MPC is 3.0 mg/kg according to V.I. Kisil). Accordingly, the content of zinc is 1.02-1.34 mg/kg, which also does not exceed the MPC (23 mg/kg).

The concentration of mobile cadmium is 0.11-0.20 mg/kg. The content of the mobile form of lead is 0.38-1.03 mg/kg, which does not exceed the MPC (Pb $\leq$ 2 mg/kg).

Among the hazardous geological processes in the north-eastern part of the land use, erosion processes are developing slightly. As a result, poorly washed soils have been formed here.

A special compost production facility will be located within the land plot. The latter is used as a substrate for growing mushroom mycelium, as mycelium grows much faster in compost than in any other substrate (Fig. 3).

The main raw materials for composting are straw and water; "rough" hay, corn cobs, etc. are also used.

Straw is the main source of hydrocarbons in compost and the raw material that determines its water-holding capacity. To improve the properties of the main raw material, "rough" hay is used.

The properties of rough hay are influenced by the following factors: timing of harvesting, height of grass cutting, storage time, use of chemical plant protection products, etc. Gypsum, soya flour, sugar production waste, etc. are used as additives.

According to the current legislation of Ukraine, hayfields are agricultural lands where meadow vegetation is systematically used for hay, and such use is the main one. The Nomenclature of Natural Grasslands divides all natural grasslands into three groups based on environmental conditions: steppe pastures and hayfields; meadow hayfields and pastures; and marsh hayfields and pastures. Each group of natural fodder lands is divided

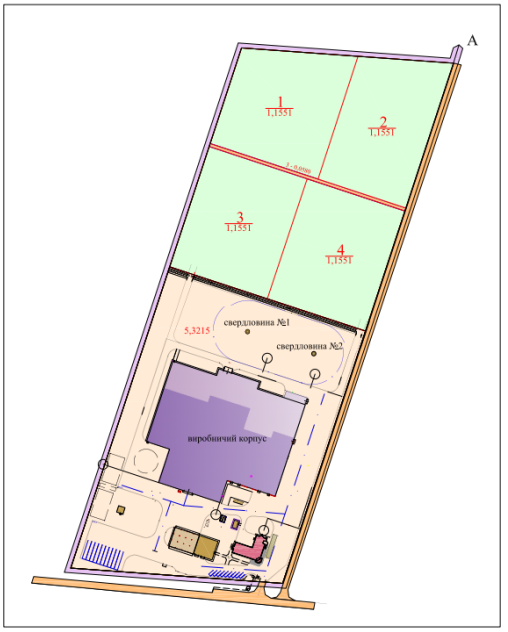

Figure 3 - Scheme of design activities within the research object.

Source: photo by the authors

into classes depending on their location on the relief elements and the associated nature of water supply. Further, classes are divided into types, and the latter into varieties [2, 7, 8].

Types are divided into varieties by the nature of vegetation cover. The names of the varieties are given according to the dominant economic groups of plants (cereals, legumes, herbs). If the grass stand consists of several economic groups, the dominant group is placed at the end of the class name. According to the degree of moisture, hayfields are divided into dry and fresh, wet and boggy.

The hayfield is planned to be located in the northern part of the land use (hayfield) on relatively poor and slightly leached soils. The total area of the hayfield is 4.6785 hectares, including 4.6205 hectares under hayfields.

According to the Nomenclature, these hayfields are classified as: group – meadow hayfields; class II – hayfields and pastures on outcrops of loess, loess-like, clay or rocky rocks; type II-6 – hayfields on outcrops of loess, loess-like and clay rocks; difference – poorly sodded grass and grass-grass.

A hayfield is managed by a hay crop rotation for periodic improvement. The introduction of hay rotation is based on the premise that hay quality and yield depend not only on the botanical composition of the grass stand, but also on the timing of mowing, the height of cutting, and the technology of drying and storage. The best time to mow is during the early stages of growth: budding, flowering and earing. However, annual mowing of grass at these stages irreversibly leads to the depression and degeneration of the part of the grass stand whose species reproduce by seeds.

As a result, the value of the botanical composition of the meadow vegetation and the yield of green mass decreases. Therefore, it is necessary to alternate the mowing periods in each hayfield in the appropriate sequence.

According to the technology of special compost production, it is planned to produce "rough" hay, so the hay rotation includes 4 plots with homogeneous conditions in terms of grass stand and timing of development phases. The area of the hayfield is 4.6205 hectares, with an average plot size of 1.1551 hectares.

The following use order is established for the 4-patch hayfield: 1 – surface improvement with sowing of perennial grasses, 2-4 – 2-fold haying in the stage of insemination. Thus, the plan for the transition to the adopted hay crop rotation includes: Year 1 – sowing of perennial grasses on all plots; years 2-4 – 2-fold haying; year 5 – sowing of perennial grasses on plot 1; year 6 – sowing of perennial grasses on plot 2; year 7 – sowing of perennial grasses on plot 3; year 8 – sowing of perennial grasses on plot 4.

The mown grass is dried into rough hay and transported to the farmyard and further used as an additive to improve the properties of the main raw material (straw) in the manufacture of special compost.

Grass mixtures recommended for alkalising hayfields include: 1 option. Red clover – 10 kg + meadow fescue – 8-10 kg + awnless bromegrass – 8-10 kg per 1 ha; 2. Blue alfalfa – 6-7 kg + awnless bromegrass – 8-10 kg + tall ryegrass – 8-10 kg per 1 ha.

These measures include the following set of works: 1) peeling of grass stubble with disc harrows; 2) ploughing to a depth of 15-20 cm; 3) early spring loosening of the fallow land with disc harrows; 4) pre-sowing tillage with a cultivator; 5) sowing of grass mixture seeds with simultaneous application of mineral fertilisers; 6) rolling of the areas.

When growing perennial grasses, it is not allowed to use chemical plant protection products – pesticides, herbicides, etc. The yield of hay from perennial grasses will be 24-30 cwt/ha (for two mowings). A 3-metre-wide dirt road has been designed to provide access to the hayfields for machinery.

Conclusions and perspectives

The development of measures to improve the condition of agricultural land requires a systematic approach based on scientific and methodological principles and taking into account various aspects of ecology, economics and agricultural technology.

The main such measures should include improving soil fertility, preventing soil degradation, and developing sustainable agriculture. This includes the use of organic fertilisers, rational water management and biodiversity conservation. The rational use of resources and the introduction of modern technologies help to reduce production costs and increase efficiency. Reducing the use of chemical fertilisers and pesticides, implementing water conservation technologies and improving waste management help to reduce the negative impact on the environment. This includes protecting water resources, reducing air pollution and preserving natural ecosystems.

Improving the condition of agricultural land helps farmers to better adapt to climate change, reducing their vulnerability to extreme weather events such as droughts and floods.

Increasing the yield and sustainability of agricultural production contributes to food security at the national and global levels, reducing the risk of hunger and food shortages.

In general, the implementation of measures to improve the condition of agricultural land is critical to ensuring the sustainable, productive and environmentally sound development of the agricultural sector, which in turn contributes to the overall well-being of society and the preservation of natural resources for future generations.

References

1. Novakovskyi, L. Ya. ed. (2015). Dovidnyk iz zemleustroyu [Handbook of land management]. 4th type processing and additional Kyiv: Agrar. science. 516.
2. Land Code of Ukraine. (2001, October 25). Vidomosti Verkhovnoyi Rady Ukrayiny. Kyiv. [in Ukrainian].
3. Konstytutsiya Ukrayiny vid 28.06.1996 r. № 254k/96-VR. URL: https://zakon.rada.gov.ua/laws/show/254%D0%BA/ 96% D0% B2%D1%80#Text
4. Kulynych, P.F. (2011). Pravovi problemy okhorony i vykorystannia zemel silskohospodarskoho pryznachennia v Ukraini. Kyiv: Lohos [in Ukrainian].
5. Novakovska, I. O. (2022). Suchasni problemy zemleustroyu v konteksti okhorony zemel' [Modern problems of land management in the context of land protection]. *Land management, cadastre and land monitoring*, 3, 4-17. doi: http://dx.doi.org/10.31548/zemleustriy 2022.03.01
6. On the approval of the Rules for the development of working projects of land management: Resolution of the Cabinet of Ministers of Ukraine № 86-2022-p (2022, February 02). Vidomosti Verkhovnoyi Rady Ukrayiny, 86. [in Ukrainian].
7. Law of Ukraine On Land Management from May 22 2003, № 858-IV. (2003, July 8). *Holos Ukrainy,* № 124. [in Ukrainian].
8. Law of Ukraine On Land Protection from June 19 2003, № № 962-IV. (2003, July 29). *Holos Ukrainy,* № 139. [in Ukrainian].
9. Lesya Perovich, Oleksandra Hulko. Monitoring the actual ecological end economic situation of agricultural land use in Ukraine. *GEODESY AND CARTOGRAPHY*. Vol. 68, No. 2, 2019, pp. 349–359 DOI: https://doi.org/10.24425/gac.2019.128464.
9. 10. Lichen Chou, Jie Dai, Xiaoyan Qian, Aliakbar Karimipour, Xuping Zheng, Achieving sustainable soil and water protection: The perspective of agricultural water price regulation on environmental protection. *Agricultural Water Management. Volume*, February 2021, DOI: https://doi.org/10.1016/j.agwat.2020.106583.

Кошель А.О., Колганова І.Г., Кемпа О., Стачерзак А.

ДО ПРАВИЛ РОЗРОБЛЕННЯ РОБОЧИХ ПРОЕКТІВ ЗЕМЛЕУСТРОЮ ЩОДО ПОЛІПШЕННЯ СТАНУ СІЛЬСЬКОГОСПОДАРСЬКИХ УГІДЬ

ЗЕМЛЕУСТРІЙ, КАДАСТР І МОНІТОРИНГ ЗЕМЕЛЬ 2'24: 18-26
http://dx.doi.org/10.31548/zemleustriy2024.02.02

Анотація. *Запропоновано науково-методичні підходи щодо розроблення заходів поліпшення стану сільськогосподарських угідь в сучасній документації із землеустрою. Основна увага приділяється агроекологічним, агрохімічним та агротехнічним підходам, які спрямовані на забезпечення стійкого розвитку аграрного сектору.*

У статті розглядаються правила розроблення робочих проектів землеустрою щодо поліпшення стану сільськогосподарських угідь, які є ключовими для підвищення

продуктивності земель і забезпечення їх стійкого використання. Зокрема, аналізуються методологічні підходи, нормативно-правові вимоги, а також практичні аспекти, пов'язані з проведенням землеустрою на сільськогосподарських угіддях.

Основна увага приділяється структурі та змісту робочих проектів землеустрою, що включають детальний аналіз та характеристику земель, якісну оцінку стану ґрунтів, визначення ерозійних та деградаційних процесів, а також розробку конкретних агротехнічних, меліоративних і ґрунтозахисних заходів для покращення стану угідь а також інтеграції екологічних аспектів у проєктуванні, що сприяє збереженню біорізноманіття та поліпшенню екосистемних функцій сільськогосподарських угідь.

У статті описуються ключові етапи створення робочих проектів: підготовчий етап, розробка робочого проекту землеустрою, затвердження та впровадження.

Стаття також акцентує увагу на нормативно-правовій базі, що регулює процес землеустрою з метою підвищення ефективності управління земельними ресурсами. Наводиться приклад успішного робочого проекту землеустрою в одному із регіонів України, що демонструє позитивні результати у збереженні родючості ґрунтів, підвищенні продуктивності та екологічної стабільності земель.

Стаття узагальнює актуальні знання та практики у сфері землеустрою, пропонуючи комплексний підхід до розроблення робочих проектів, що спрямовані на забезпечення стійкого розвитку сільськогосподарських угідь. Пропоновані правила та рекомендації можуть служити основою для фахівців, зайнятих у сфері управління земельними ресурсами, агрономії та екології.

Ключові слова: *охорона земель сільськогосподарського призначення, землеустрій, поліпшення стану земель сільськогосподарського призначення, управління земельними ресурсами, документація із землеустрою.*