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**10-12 May 2023, Jelgava,
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No 57 Circular Economy: Climate Change, Environmental Aspect,
Cooperation, Supply Chains

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New Dimensions in the Development of Society

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Time schedule of the conference

Preparation of the proceedings and organization: January 2023 – May 2023

Conference: 10-12 May 2023

Researchers from the following higher education institutions, research institutions, and professional organizations presented their scientific papers at the conference:

Baltic Studies Centre	Latvia
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Bila Tserkva National Agrarian University	Ukraine
Celteh Ltd	Latvia
CIRAD (French Agricultural Research Centre for International Development)	France
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Editors, authors, and reviewers, within the International Scientific Conference „**Economic Science for Rural Development**“ are to be fully committed to good publication practice and accept the responsibility for fulfilling the following duties and responsibilities, as set by the *COPE Code of Conduct and Best Practice Guidelines for Journal Editors of the Committee on Publication Ethics (COPE)*.

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Foreword

The international scientific conference „Economic Science for Rural Development“ is organized annually by the Faculty of Economics and Social Development of Latvia University of Life Sciences and Technologies.

The proceedings of the conference are published since 2000.

The scientific papers presented in the conference held on 10–12 May 2023 are published in one thematic volume:

No 57 Circular Economy: Climate Change, Environmental Aspect, Cooperation, Supply Chains
Efficiency of Production Process and Competitive of Companies
Integrated and Sustainable Regional Development
New Dimensions in the Development of Society
Rural Development and Entrepreneurship
Sustainable Bioeconomy

The proceedings contain scientific papers representing not only the science of economics in the diversity of its sub-branches, but also other social sciences (sociology, political science), thus confirming inter-disciplinary development of the contemporary social science.

This year for the first time the conference includes the section on a new emerging kind of economy—bioeconomy. The aim of bioeconomy is to use renewable biological resources in a more sustainable manner. Bioeconomy can also sustain a wide range of public goods, including biodiversity. It can increase competitiveness, enhance Europe's self-reliance and provide jobs and business opportunities.

The Conference Committee and Editorial Board are open to comments and recommendations concerning the preparation of future conference proceedings and organisation of the conference.

Acknowledgements

The Conference Committee and editorial Board are open to comments and recommendations for the development of future conference proceedings and organisation of international scientific conferences.

We would like to thank all the authors, reviewers, members of the Programme Committee and the Editorial Board as well as supporting staff for their contribution organising the conference.

On behalf of the conference organisers

Anita Auzina

Professor of Faculty of Economics and Social Development
Latvia University of Life Sciences and Technologies

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ENVIRONMENTAL SAFETY OF AGRICULTURAL BUSINESS IN UKRAINE: ACCOUNTING AND ANALYTICAL SUPPORT

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Abstract. Delimitation of the environmental component of national and corporate economic activity is one of the ways to present information on environmental activities in the accounting and reporting system. An important problem of this system of accounting for natural resource and environmental indicators is the lack of methods for the formation of such business transactions. Only if environmental indicators are taken into account in the economic activities of enterprises, an objective assessment can be given and a competitive agricultural business can be formed.

The purpose of the study is to find out the importance of environmental safety of the agrarian business of Ukraine and its accounting and analytical support. It is determined that the primary role in the process of environmental management is designed to perform accounting as a system that reflects the events of economic life, including the impact of the enterprise on the environment.

The article discloses the role of accounting in ensuring environmental safety of business. The volume of expenses of business entities for the implementation of environmental measures, including waste management, is investigated. The costs of environmental protection of agriculture, forestry and fisheries in Ukraine are analysed.

It is revealed that the main objects of accounting for environmental activities are assets, liabilities and results of the enterprise. The article reveals the essence and methodology of environmental accounting of these objects: natural resource potential, production waste, non-current assets of environmental purpose, environmental liabilities, environmental costs, environmental income and financial results from the environmental activities of the business entity.

Key words: environmental safety, accounting, agricultural business.

JEL code: M 40, M 41, Q 15

Introduction

Environmental safety is one of the most important problems of the modern world. Climate change, air and water pollution, biodiversity loss and other environmental problems are becoming increasingly serious. In other words, ensuring environmental safety is becoming an increasingly important task for the whole world.

Environmental safety can be described as the process of ensuring the protection of the vital interests of not only the individual, but the society as a whole, as well as the state and nature from threats created by anthropogenic or natural impact on the environment.

Successful results of environmental activities of enterprises depend on the continuity of making balanced and consistent decisions of its managers, each of which is based on the existing information base and ultimately causes a better or worse impact on the environment. A positive factor in this is the inclusion of environmental activities in the accounting system.

The purpose of the research is to clarify the importance of environmental safety of agrarian business in Ukraine and its accounting and analytical support, which is specified by the following tasks: studying the role and place of environmental activity of a business entity in the environmental safety system; studying environmental safety in the agrarian business of Ukraine, substantiating the relevance of introducing

environmental accounting in agriculture, as well as studying the objects of accounting for environmental activities in the agrarian business and organization of their accounting.

During the research, the method of scientific knowledge, analysis of scientific research, definition of the main categories of the theory of environmental activity were used, methods of analysis, systematization, comparison, synthesis and generalization were applied in the formulation and scientific substantiation of research results.

Research results and discussion

The modern model of economic relations demonstrates the inconsistency of their mechanism in overcoming the global scale of environmental and social problems and the limited idea of mankind about the methods of solving them. In this regard, there is a need to rethink the processes of safe functioning of economic systems of different levels and the introduction of sustainable development provisions as an alternative direction for their formation and application. The above-mentioned determines the intensification of scientific research on the role of the accounting system in the information support of environmental safety of enterprises.

The development of accounting in the context of the formation of the information space for managing the environmental safety of enterprises is a rather complicated and disordered process. This is due, first of all, to the fact that today neither in science nor in practice it is determined in which direction the main theoretical and methodological provisions of accounting should be formed and developed. Formation of theoretical and methodological design of accounting as an information subsystem of management economic and environmental safety of the agro-industrial enterprise will determine the fundamental tenets of the development of the science of accounting in modern economic conditions in ensuring the provisions of the theory of sustainable development.

The ecological activity of the enterprise is an appropriate segment of its operational activity, which should ensure a balance between the public interests and the interests of the enterprise, as a result of which the natural environment should be preserved as much as possible in the state in which it was until recently. Environmental activities of the enterprise related to the implementation of certain activities and works that would ensure the balance of interests of people living nearby, with a balance of interests of its owners (tenants, shareholders) (Deriy, 2015, p. 195).

Each type and subspecies of economic sectors has its own specific directions for the formation of environmental activities and environmental factors that must be taken into account when forming a development strategy for a particular enterprise or a group of enterprises of the same type.

The main directions of ecological activity include: the development of natural resources, their extraction (or extraction of minerals), use, reproduction and protection; greening of production technology; actually, environmental activities of the enterprise as a complex of environmental measures.

According to the Law of Ukraine "On Environmental Protection", environmental safety is a state of the environment in which the prevention of deterioration of the ecological situation and the emergence of a danger to human health is ensured ("On Environmental Protection", 1991).

Environmental safety is the goal and at the same time the task of the activities of all interested actors, and the process of its provision or activity in this area does not mean the result. That is – a business entity must carry out proper environmental activities to ensure the environmental safety of business, region and state.

It is known that agricultural production is one of the largest polluters of the environment. Methods of its management are characterized by extensive use of natural resources, the active involvement of various

techniques and the use of chemicals that have a negative impact on the environment, life and health of people.

The development of various forms of ownership and management of land without strict and reliable state environmental and customs control over the import of hazardous waste, the lack of an appropriate legal framework lead to a consumer attitude to land. The use of a large amount of mineral fertilizers, pesticides and other chemicals together with industrial and radiation pollution can further complicate the environmental situation in Ukraine, reduce the reproductive capacity of the biosphere and the environmental sustainability of agricultural landscape.

Business perceives natural resources as a practically free production resource, which in the process of carrying out production activities are not only excessively polluted and exhausted, the state of the environment deteriorates, obstacles to its self-reproduction are created (Trinko, 2014, p. 117).

The reason for the environmental crisis in the agricultural sector is mainly economic factors, namely:

- 1) extensive development of agricultural production, which is not able to provide the population of the state in sufficient quantities with environmentally friendly food products;
- 2) lack of environmental justification of plans and projects of economic development developed by the relevant departments of ministries and departments on the basis of departmental methods and instructions, regulatory and technical documentation for the placement, construction and operation of economic facilities and complexes, for the creation of new equipment, environmentally safe technologies for the production of agricultural products;
- 3) there are almost no effective administrative and economic mechanisms for environmental protection; low moral level of society and lack of environmental management thinking (Voronovska, 2010, p. 294).

The rapid development of organic production in Ukraine and the world is a response to the desire and growing opportunities of the population to consume healthy food and public awareness of the real threat and harm of industrial agriculture due to negative environmental, social and economic consequences. Organic agriculture itself is one of the key factors in solving global environmental and social problems and in achieving the goals of sustainable development (Ishchenko, 2021).

Greening is the main activity of agricultural enterprises and is based on the development of ecological and economic methods of management to ensure the expanded reproduction of natural resources through the formation of sustainable ecological and economic systems, increasing the production of competitive environmentally friendly products, creating agricultural systems using environmental management methods (Lepetan, 2021).

In the course of the study of environmental safety, a number of negative trends that agriculture has faced can be identified: violation of crop rotations; giving preference to growing crops for which there is an increased demand; increasing the load on pastures; expanding the use of agrochemicals; narrowing the specialization of agricultural production and land concentration, consolidation of farms; the structure of supply and demand is formed without taking into account the most complete reflection in the composition of costs production of all types of goods of "objective" economic assessments of natural resources and environmental actions (Sokolskaya, 2012, p. 58).

Organic production is based on the principles of health, ecology, justice and care, uses the principle of biological synergy. The main methods of organic agriculture include: refusal to use herbicides, pesticides, fungicides, fertilizers; use of biological plant protection products; use of animal and vegetable waste as fertilizers; application of crop rotation to restore the soil; the use of manual labour in the care of crops;

organization of a closed cycle agriculture livestock (crop production – fodder, livestock – fertilizers); in animal husbandry – grazing, refusal to use synthetic feed additives, hormones, antibiotics (Kaletnik, 2023).

The European choice of national economic development opens up not only new opportunities for expanding foreign economic activity, attracting foreign investment, participating in large European scientific and technical programs and projects, but also requires strengthening the impact on the efficiency of environmental activities of enterprises, regions, and the country as a whole. In this regard, the urgent issue is not so much the complete reform of the regulatory mechanism of environmental safety, but rather its direction towards the coherence of the state's environmental policy and the environmental policy of individual enterprises. It is this format of cooperation that will allow to objectively and timely identify the most significant threats and risks in this area, which is an important prerequisite for making effective management decisions in the system of ensuring environmental safety.

Accounting is one of the most important management functions, identifying and systematizing data on economic activity, while ensuring the adoption of informed management decisions. Accounting information should allow timely determination of external and internal conditions, provide an opportunity to investigate, analyse and take measures to eliminate significant differences between the potential capabilities of the enterprise and the requirements of the processes that take place in the environment.

Timely and accurate information support of the management system through efficiency of high-quality accounting and control functions is an integral part of agribusiness activities (Gutsalenko L., Marchuk U., Hutsalenko O. & Tsaruk N., 2020).

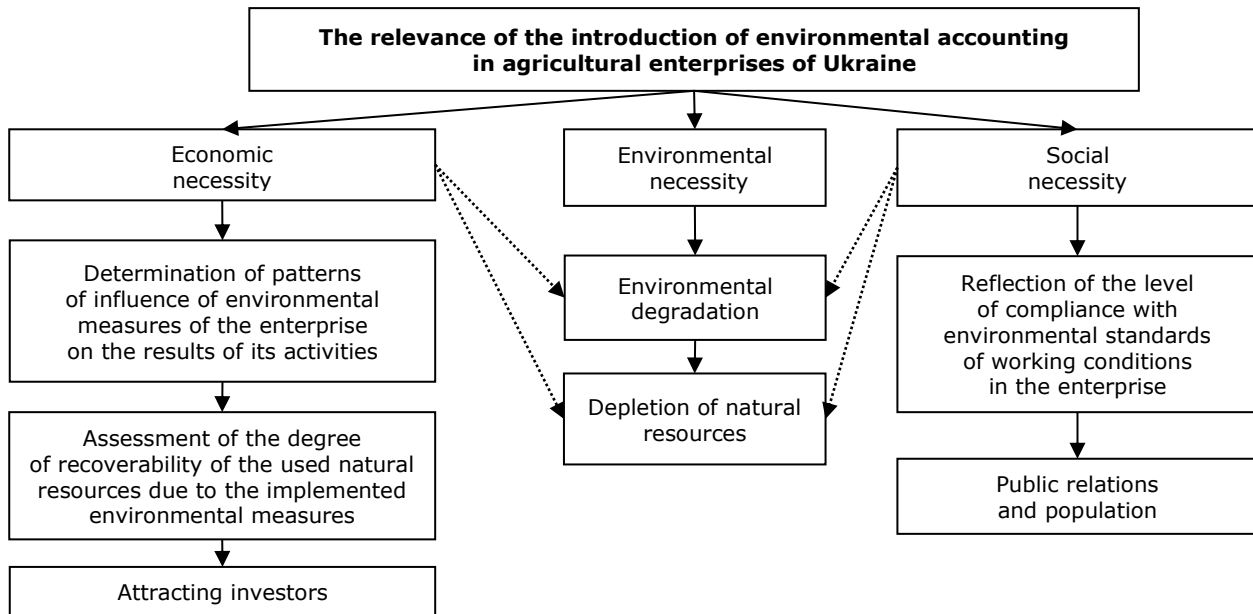
Information formed in the accounting system relating to the environmental activities of the enterprise or the environmental consequences of its functioning is the basis for the information revolution. Such an information breakthrough is necessary for the owner of capital in the activities of preserving the state of the environment, and, accordingly, for their own safety.

Environmental safety is designed to ensure the integrity of ecosystems through the preservation of their abilities for self-healing. The information source on the quantity and quality of natural systems is called upon to serve as environmental accounting data.

Environmental accounting can be a driving method of accounting for the costs of environmental protection and determining the approach to the phenomena of economic activity of enterprises, considering all means and processes in their direct movement and development, unity, interconnection and mutual agreement.

The main prerequisites for accounting for environmental activities are: 1) operations related to interaction with the environment, as well as their impact on financial results, should be reflected in the accounting system; 2) creditors and investors need information about the environmental activities of the enterprise to make decisions on building partnerships; 3) obtaining competitive advantages in the condition of production of environmentally friendly products; 4) accounting of environmental activities is a means of achieving sustainable economic development (Zamula, 2010, p. 60).

The importance of environmental accounting is due to economic, environmental and social challenges (Fig. 1).

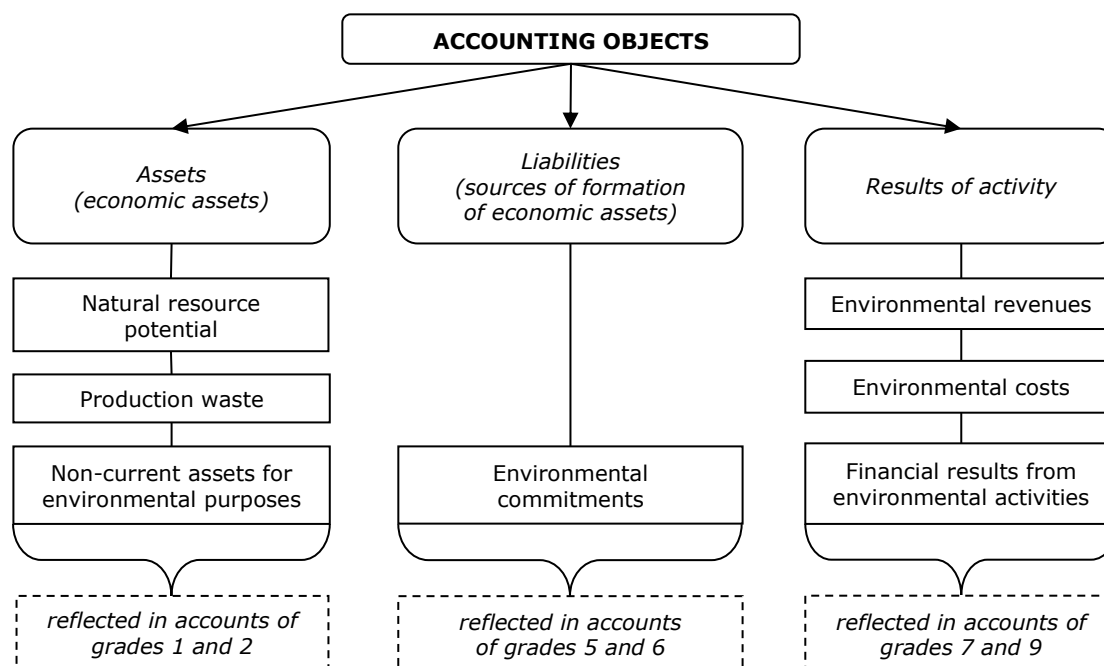


Source: created by the authors based on Gangal (2015)

Fig. 1. The relevance of the introduction of environmental accounting in agricultural enterprises of Ukraine

Environmental accounting of the enterprise should form information on: the availability of natural resources (in quantitative and cost meters), the degree of development and the ecological state (quality) of natural resources; the presence of impacts (positive and negative) of the business entity on the natural environment; measures taken by the business entity to protect the environment, as well as their effectiveness.

We consider it necessary to single out three main objects of accounting for environmental activities: assets, liabilities and results of the enterprise. The group of objects that are economic means (assets) includes natural resource potential, production waste, non-current assets for environmental purposes. The sources of formation of economic assets (liabilities) include environmental obligations. The results of the activity are environmental revenues, environmental costs and financial results from the environmental activities of the business entity. We propose to combine the objects of accounting of environmental activities into three groups for the purpose of their accounting reflection (Fig. 2).



Source: Tomchuk, Lepetan, Zdyrko & Vasa (2018)

Fig. 2. Objects of accounting of environmental activities

Reflection in the accounting of the enterprise of operations related to its environmental activities will allow to form information on the environmental management of the enterprise and publish it in order to inform the public about the results of such activities, which is one of the factors in the formation of a business image and contributes to strengthening economic security at the local and global levels (Lepetan, 2019).

Let us consider in more detail the accounting support of individual objects of accounting for environmental activities.

The natural resource potential of agricultural enterprises is a set of natural resources, conditions and processes that are used by enterprises to conduct effective, environmentally safe, socially oriented economic activities. Its main components include: land resources; water resources; forest resources; faunal resources; mineral resources; natural and recreational resources.

We consider it appropriate to reflect the components of the natural resource potential in the context of business transactions proposed by I. V. Zamula.

- 1) The presence and movement of natural resources (if they are the property of this subject).
- 2) Operations on the lease of natural resources.
- 3) Operations on the protection of natural resources: the activities of the enterprise to prevent pollution; the impact of the enterprise on the environment; activities of the enterprise to eliminate pollution.

The basis of the natural resource complex of Ukraine, as rightly noted by Kaletnik G. M., Kozlovsky S. V. and Tsikhanovskaya V. M. – the potential of land resources (agricultural land), which is about 2/5 of the total natural resource potential of the state. Land belongs to a category that covers a certain set of natural as well as socio-economic objects and their properties. Due to its unique characteristics, land is an important means of production in many branches of the national economy (Kaletnik, Kozlovsky, Tsikhanovskaya, 2012, p. 2).

Agriculture of Ukraine is the most environmentally intensive industry with a powerful natural resource potential, which includes 41.31 million hectares of agricultural land (68.5% of the territory of Ukraine),

including 32.75 million hectares of arable land (54.3%), 7.53 million hectares of natural forage land - hayfields and pastures (12.5%).

According to the Land Code of Ukraine, land protection includes:

- 1) justification and ensuring the achievement of rational land use;
- 2) protection of agricultural land, forest lands and shrubs from their unreasonable removal for other needs;
- 3) protection of land from erosion, villages, flooding, waterlogging, secondary salinization, re-drying, compaction, pollution by production waste, chemical and radioactive substances and from other adverse natural and man-made processes;
- 4) conservation of natural wetlands;
- 5) prevention of deterioration of aesthetic condition and ecological role of anthropogenic landscapes;
- 6) conservation of degraded and unproductive agricultural land (Land Code of Ukraine, 2001).

In order to ensure the preservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems, promote sustainable forest management, restore degraded lands and soils using innovative technologies, the Ministry of Economic Development and Trade of Ukraine approved the State Environmental Policy Strategy for the period up to 2030 (Ministry of Economic Development and Trade of Ukraine, 2017).

The data in Figure 3 indicate that by 2030 it is positive to plan a decrease in arable land by 4170.3 thousand hectares, increase in the area of agricultural land of extensive use – by 1695.5 thousand hectares and an increase in the area of organic land – by 2589.4 thousand hectares.

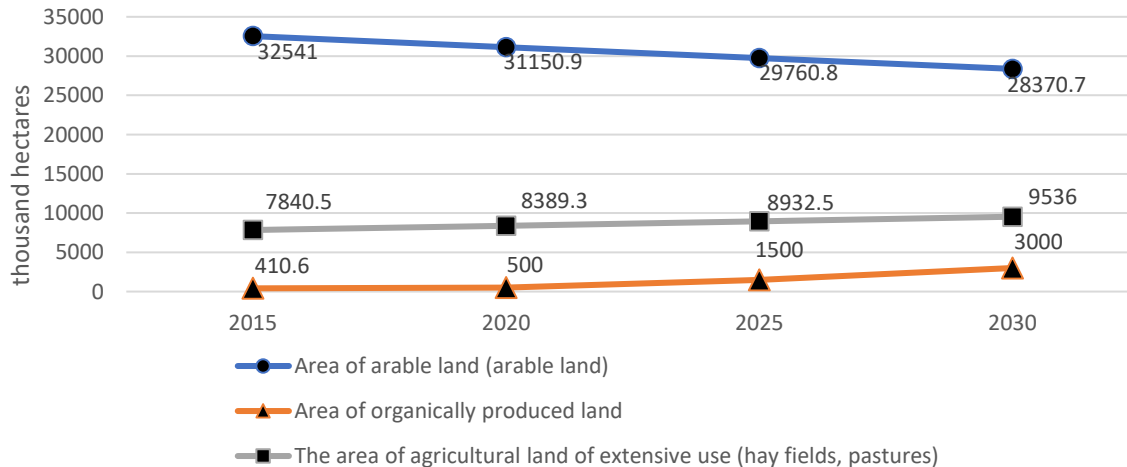


Fig. 3. Planned indicators for the protection and restoration of land resources of Ukraine during 2015-2030

The accounting system that exists in Ukraine at the present stage reflects the following objects of land relations:

- 1) land plots;
- 2) rights to use land plots;
- 3) capital expenditures for land improvement.

Among the main directions of ensuring environmental safety of business is the management of production waste, which requires the implementation of certain regulatory activities in this area, namely a properly organized system for accounting for the formation, collection, processing, placement, disposal

of waste; establishing control over the material balance of production in order to stimulate the introduction of low-waste technologies; implementation of qualification monitoring control of waste movement at all stages of their life cycle; creating conditions for the development of entrepreneurial activity in the field of waste management, etc. (Rudenko, 2019).

Today, unfortunately, not enough attention is paid to the problem of waste, and especially to their accounting reflection.

The results of the analysis of Table 1 make it possible to conclude that the largest share of waste generation from all types of economic activity is occupied by the mining industry and quarrying. Waste generation in 2020 in Ukraine has increased significantly compared to 2018. In general, waste generation for all activities in 2020 increased by 31.2% compared to 2018. However, the generation of agricultural, forestry and fisheries waste decreased by almost 11%.

Table 1

Waste generation by type of economic activity of enterprises and households of Ukraine, thousand tons

Types of economic activity	2018 year	%	2019 year	%	2020 year	%	Deviation, +/-
All types of economic activity	352333.9	100	441516.5	100	462373.5	100	110039.6
Agriculture, forestry and fisheries	5968.1	1.7	6750.5	1.5	5315.4	0.1	-652.7
Mining and quarrying	301448.9	85.6	390563.8	88.5	391077.9	84.6	89629.0
Processing industry	31523.2	8.9	30751.8	7.0	52311.0	11.3	20787.8
Supply of electricity, gas, steam and air conditioning	6322.7	1.8	5959.2	1.3	5333.7	1.2	-989.0
Water supply, sewerage, waste management	397.4	0.1	411.8	0.1	338.3	0.1	-59.1
Construction	378.8	0.1	188.7	0.01	14.5	0.003	-364.3
Other economic activities	751.3	0.2	994.0	0.2	2033.0	0.4	1281.7
Households	5543.5	1.6	5896.7	1.4	5949.7	1.3	406.2

Source: State Statistics Service of Ukraine

Analysis of waste management costs (Fig. 4) showed their annual fluctuation. Thus, in 2020, the share of waste management costs in total costs increased by 5% compared to 2018, and in 2020 compared to 2019 it decreased by 2.43% and amounts to 34.11%.

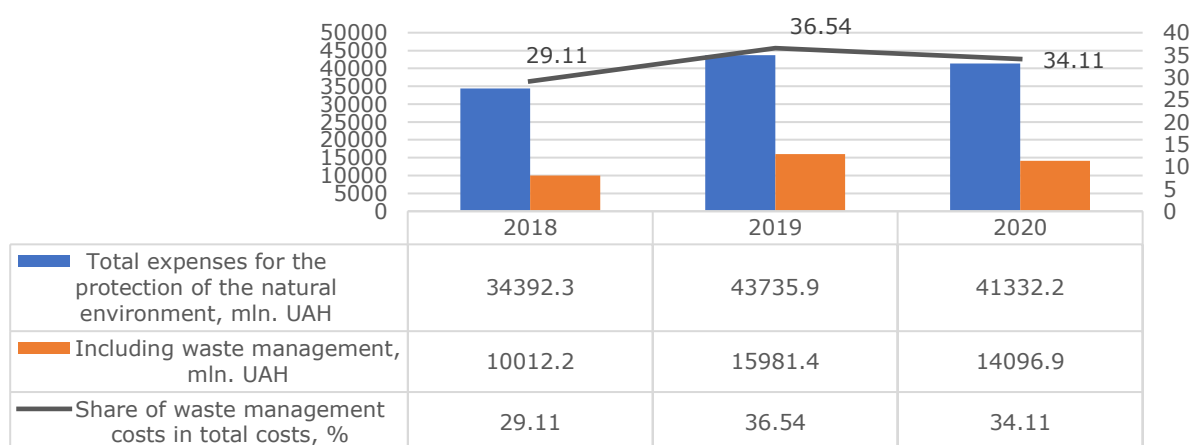


Fig. 4. Waste management costs for 2015-2020

Accounting of industrial waste will allow you to form information about their presence, condition and movement in order to manage them; to promote their complete and safe processing through the detailing of information on the composition and toxicity of such waste; monitor the availability, movement and composition of industrial waste.

Taking into account the specialization of agriculture in Ukraine, the main waste of crop production includes straw formed after the processing of wheat, corn and sunflower stalks, residues of fruits and vegetables, etc. Livestock waste includes manure of cattle, pigs, sheep (provided that it is unsuitable for use as organic fertilizer) and poultry, etc. However, not all manure can be considered waste, because if it is properly prepared, it is a valuable scarce organic fertilizer instead of mineral fertilizers, the use of which significantly pollutes the earth with chemical elements. Therefore, the question arises, which manure can be considered a valuable raw material for agriculture, and which – waste, which must be handled carefully without polluting the environment.

We agree with the position of Zamula I. V. and Bondarchuk V. V. on the reflection of waste on subaccount 208 "Agricultural Materials" (Zamula, Bondarchuk, 2013).

The third component of environmental assets that are reflected in accounting are non-current assets for environmental purposes. In order to manage, control, finance and account for expenses, non-current assets for environmental purposes can be proposed to be accounted for on separate analytical accounts in the relevant subaccounts of accounts 10 "Fixed Assets", 11 "Other Non-Current Tangible Assets", 12 "Intangible Assets". Depreciation of these objects must be recorded on analytical accounts to the subaccounts of account 13 "Depreciation (depreciation) of non-current assets".

The next object of accounting for environmental activities is environmental costs. Of particular importance for improving the level of environmental safety of the country are the volume of expenses of business entities for the implementation of environmental measures and the ability to attract capital investments. In Fig. 5 shows the share of costs for environmental protection of agriculture, forestry and fisheries of Ukraine in 2018-2020. According to the analysis, it can be concluded that the share of these costs tends to decrease in different ways. Thus, in 2020, the share of expenditures on environmental protection of agriculture, forestry and fisheries of Ukraine in total expenditures amounted to only 0.01%, which is 1.21% less than in 2018.

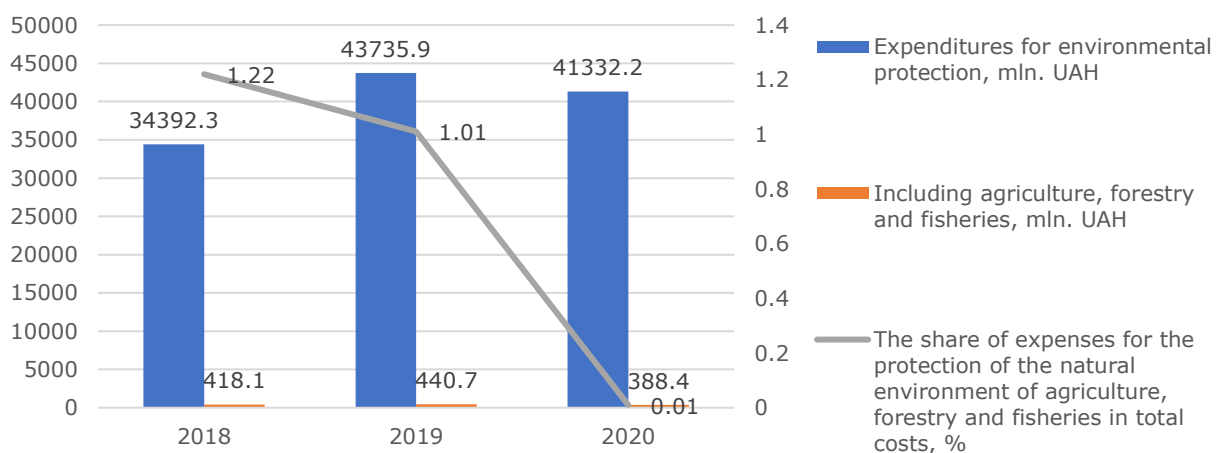


Fig. 5. **Costs of environmental protection of agriculture, forestry and fisheries of Ukraine in 2018-2020, mln. UAH**

Environmental costs are a reduction in the economic benefits of an enterprise or an increase in obligations related to the reproduction and rational use of natural resources, maintaining in a normal state

and improving the quality characteristics of the environment, preventing its pollution or other damage, as well as paying for the use of resources of natural ecosystems or compensation for damages caused to them.

At agricultural enterprises, it is worth dividing the environmental costs into those related to specific types of crop or livestock products, and general production environmental costs.

NR(S)A 16 "Costs" the costs of environmental protection are supposed to be included in the overhead costs. We believe that depending on the type of environmental costs, they should be accounted for in accounts 15 "Capital investments", 23 "Manufacturing", 91 "Overhead costs", 92 "Administrative expenses", 93 "Sales costs", 94 "Other operating expenses".

Environmental income as an object of accounting is less obvious than expenses, which is associated with the probabilistic, according to capital owners, nature of such income.

Sources of environmental income are: the introduction of waste-free, environmentally friendly production (effect as saving raw materials and natural resources, economic incentives); production of environmentally friendly products (the effect is formed by pricing); revenues in the form of economic incentives (tax, credit benefits, compensation from the budget).

The implementation of environmental activities by enterprises leads to the emergence of environmental obligations.

In our opinion environmental obligations should be understood as obligations arising from the activities of business entities that affect the state of the environment, and for non-compliance with environmental legislation entail compensation for damage, payment of fines.

Environmental obligations may arise as a result of: the implementation of core activities (payment for the use of natural resources, including as a reservoir for the disposal of production waste); non-compliance with environmental legislation, which entails compensation for damage, payment of fines, etc.; voluntary actions of the enterprise to eliminate negative impacts on the environment based on considerations of concern for its reputation and competitive position in the market.

Conclusions, proposals, recommendations

Thus, the conducted research allows us to draw the following conclusions.

- 1) Ensuring environmental safety is one of the key tasks of national policy, an important factor in the successful development of any country. Actually, such security personifies the state of protection of the vital interests of the individual and society from internal and external threats.
- 2) The conducted analysis of the level of environmental safety of Ukraine indicates the existence of problems associated with both the lack of necessary funds for financing environmental programs and the lack of a system for coordinating the interests of the state and domestic enterprises to consolidate efforts in solving urgent environmental problems.
- 3) The accounting of environmental activities is a subsystem not only of accounting, but also of part of the environmental management system, the information basis for conducting environmental audits, insurance and evaluation of investment projects.
- 4) In accounting and reporting, any economic activity, including environmental activity, is reflected with the help of indicators of costs, income and the order of their formation. Nevertheless, the system of accounting for the environmental activities of enterprises in Ukraine is only in its infancy.

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