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Economic Dominance of Resource Opportunities of Hunting Farms in the Environmental Policy of Ukraine

Abstract. Introduction. *In the article the economic dominance of the resource opportunities of hunting grounds in the environmental policy of Ukraine is formed. The structural placement of hunt-ing grounds between the subjects of their use, the recreational value of which takes into account the hunting and plant origin in the countries of Europe and Ukraine, is presented.*

Results. *A methodical approach to the reproduction of hunting natural resources with a high level of environmental sustainability of natural capital in order to evaluate the effectiveness of its use in the practical activities of hunting farms on the basis of the existing environmental policy of the country, integrated in the space of public-private partnership is justified. A block diagram of the re-productive process and a matrix of impacts of the ecosystem of hunting farms on the resource poten-tial of natural capital have been constructed. The toolkit and the complex methodology of economic evaluation of the level of environmental sustainability of natural capital in the ecosystem of hunting farms are substantiated. The economic indicators of effective development of hunting farms in Ukraine are analyzed.*

Conclusions. *The ecological and economic effect of reproduction of natural resources of hunting in the countries of Europe and Ukraine was evaluated. The amount of budgetary investment costs for reproduction of resource potential of natural capital of hunting farms of Ukraine was deter-mined. The methodology of assessment of the level of security of ecological sustainability of the natu-ral capital of hunting farms under the influence of stimulating and inhibiting factors is proposed. The safety criteria of the ecological sustainability of the natural capital of the hunting farms of Ukraine are determined on the basis of the additive and multicative form of its manifestation.*

Keywords: *natural capital; hunting grounds; hunting farms; ecosystem; biomass; wildlife; medicinal herbs.*

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Економічна домінанта ресурсних можливостей мисливських господарств в екологічній політиці України

Анотація. *У статті сформовано економічну домінанту ресурсних можливостей мис-ливських господарств в екологічній політиці України. Представлено структурне розміщення мисливських угідь між суб'єктами їх користування, рекреаційна цінність яких враховує мис-ливське та рослинне походження в країнах Європи та України. Розроблено методичний під-хід до відтворення мисливських природних ресурсів з високим рівнем екологічної стійкості природного капіталу з метою оцінки ефективності його використання в практичній діяльно-сті мисливських господарств на основі існуючої екологічної політики країни, інтегрованої в простір державно-приватного партнерства. Побудовано блок-схему відтворювального про-цесу та матрицю впливів екосистеми мисливських господарств на ресурсний потенціал природного капіталу. Обґрунтовано інструментарій та комплексну методику економічної оцінки рівня екологічної стійкості природного капіталу в екосистемі мисливських госпо-дарств. Проаналізовано економічні показники ефективного розвитку мисливських госпо-дарств України. Оцінено еколого-економічний ефект від відтворення мисливських природ-них ресурсів країн Європи та України. Визначено обсяг бюджетних інвестиційних витрат на відтворення ресурсного потенціалу природного капіталу мисливських господарств України. Проведено чутливий аналіз ефективності господарського циклу комбінованих мисливських господарств України, які на засадах державно-приватного партнерства забезпечують відтво-рення рекреаційної цінності мисливських угідь рослинного походження. Запропоновано методику оцінки рівня забезпеченості екологічної стійкості природного капіталу мисливсь-ких господарств під впливом стимулюючих і дестимулюючих факторів. Визначено критерії безпеки екологічної стійкості природного капіталу мисливських господарств України за адитивною та мультикативною формою їх прояву.*

Ключові слова: *природний капітал; мисливські угіддя; мисливські господарства; еко-система; біомаса; дикі тварини; лікарські трави.*

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Formulation of the problem. In the public perception the hunting industry appears as a type of activity connected with the organization of one of the ex-treme types of recreation of a certain social stratum. In fact, this branch performs a much more important public function - promotion of protection of the natural environment, development of local territories, reproduction of resource opportu-nities, regulation of the population of hunting animals and birds, provision of services to participants of hunting, filling of the state budget. The hunting indus-try provides the participants of economic relations with the formation and im-plementation of socio-economic, ecological and recreational processes in the country through organizational measures to increase the efficiency of its function-ing. This enables the process of greening the economy by achieving a balance be-tween natural and economic resources of hunting enterprises, focused on the eco-nomic and ecological feasibility of management.

Analysis of recent research and publications. The introduction of ecologi-cal and economic tools regulating the ecological aspects of the activity through the implementation of methods of protection of hunting grounds from pollution relieves the subjects of hunting farms from problems of functional, institutional and organizational nature and substantiates the efficiency of the activity as a whole. Reforming and state regulation of environmental policy in hunting farms are considered in scientific works of K. Deininger, B. Minten [3], L. Dobrianska, L. Zharova, Ye. Khlobystov [4], R. Ewers, A. Rodrigues [6], M. Jonsson, D. Wardle [7], P. Hawken, A. Lovins, H. Lovins [8], J. McCormick [12], I. Panova [18], O. Safonova [19], R. Solow [20]. Despite the significant scientific achieve-ments of scientists in this field, the issue of monitoring the current state of devel-opment of hunting farms in Ukraine remains relevant, as there is an urgent need to solve economic and environmental problems.

Purpose of the study. The study is the substantiation of the economic dom-inance of the resource potential of hunting farms, which is based on a methodical approach to the reproduction of hunting natural resources with a high level of environmental sustainability of natural capital based on the existing environmen-tal policy of the country.

Summary of the main research material. DDetermination of the resource potential of hunting farms takes into account the presence of an economic domi-nant that mobilizes the elements of reproduction of hunting natural resources with a high level of ecological sustainability of natural capital, which are deter-mined: according to a quantitative approach - as an arithmetic sum of sources of investment provision of hunting natural resources; qualitatively - as a turnover of investment sources aimed at greening of natural capital [21]. In order to substan-tiate the economic dominance of resource reproduction with a high level of eco-logical sustainability of natural capital, it is necessary to consider each of its elements for the purpose of identifying functional characteristics inherent only in the potential of resource opportunities of hunting farms. This approach allows to use the developed methodological base, which is used in practical activities for the greening of natural capital objects determined in regulatory acts for the character-ization of individual ecological and economic instruments [25], which lay the foundation for ensuring the resource potential of natural assets, the price of which is determined by the structure of hunting natural resources in the ecosys-tem [8; 18]. That is, from the point of view of the effectiveness of the develop-ment of hunting farms, a part of hunting natural resources through the ecological and economic tools of the ecosystem, which have qualitative characteristics, take an individual form of manifestation regarding the determination of the level of ecological sustainability of natural capital.

Potentially, every natural resource in the hunting industry has the ability to store value. However, most of them lose part of their resource potential under the influence of the environment or require additional costs for their preservation [13]. A qualitative characteristic of investment resources for the reproduction of natural capital is their ability to preserve the accumulated value. At the same time, the value of natural capital is determined by the price of its investment sources, as well as the operating costs of hunting enterprises for the greening of hunting natural resources. At the level of the value dimension, it is necessary to allocate natural capital to hunting natural resources according to ecological and economic tools with different levels of their investment capacity. Hunting natural resources should be considered, on the one hand, as resources with a high level of ability to ensure the movement of added value and compliance with the necessary cost proportions at all stages of the reproduction process, and, on the other hand, as resources, the formation, placement and use of which is carried out on the basis of payment. The last property of the value aspect of natural capital is closely related to its qualitative characteristic as the average level of the ability to exploit natural resources, which provides additional income [20; 26].

The source of income, as a qualitative sign of the economic dominance of the reproduction of hunting natural resources with a high level of ecological sus-tainability of the natural capital of hunting enterprises, ensures the efficiency of the economic cycle of hunting enterprises and is considered as an ecological and economic effect of the orientation of investment sources to the reproduction of hunting natural resources in the ecosystem [5]. The use of other resources "gener-ates" the ability of investment sources to provide additional income from the ser-vices of hunting enterprises associated with the organization of one of the ex-treme types of recreation of a certain social stratum of the population.

The source of risk as a qualitative sign of economic dominance of the re-production of hunting natural

resources with a high level of environmental sustainability of the natural capital of the hunting industry provides a link between the generation of all ecological and economic tools by the level of ability and risk. In addition, an increase in additional income is accompanied by a higher level of risk [4]. Therefore, tactical and strategic methods of assessment of risk factors of the operational and investment chain are of great importance in the process of sustainable provision of resource capabilities of hunting enterprises. Carrying out risk measures in the ecosystem, the subjects of hunting farms try to integrate their own mechanism of ecologically oriented management with the existing envi-ronmental policy in the country in a public-private partnership with the aim of harmonizing the movement of investment sources in natural capital, and thus del-egate the functions of the economic system to an individual form of manifestation of the ecosystem for reproduction of biomass in hunting natural resources [10; 12].

Investment sources for greening of natural capital allow to partially accu-mulate its additional value in the short-term business cycle [23]. From this posi-tion, the investment portfolio is formed to reproduce the resource capabilities of hunting farms, in the process of assessing the level of environmental sustainabil-ity of natural capital, the ability of investment resources to potentially form eco-logical and economic resources for their placement in hunting natural resources is partially fulfilled. However, for investment resources the change of the level of ability is unique. This allows, first, to stabilize the limits of their change in time space, since during the period of changes in the value of natural capital assets, additional income does not necessarily lose its accumulation capacity [24]. Sec-ondly, in the period of a prolonged business cycle, ensuring the liquid capacity of natural capital assets with the lowest operating costs for the preservation of hunting natural resources makes it possible to attribute a certain type of them to economic resources, and over time to transform them into ecological resources [5].

Based on the World Bank results, a matrix of potential market and non-market ecosystem effects occurring within and outside the boundaries of the hunting area is constructed to identify the externalities of the natural capital of hunting operations and their valuation (Table 1).

Table 1 **Matrix of effects of the ecosystem of the hunting farms on the resource potential of natural capital**

Nature of influences			
The place of influence	within the boundaries of the site	Valued by the market	Undervalued by the market
		biomass production (food, raw materials, energy, health)	increasing the attractiveness of hunting landscapes
		development of hunting	spiritual and cultural value of hunting grounds
		improving conditions for recreation	preservation of biodiversity
			impact on the microclimate
			absorption of pollution
	outside the boundaries of the site	weakening of erosion processes	strengthening the water protection and water regulation capacity of the hunting ecosystem
		regulation of the hydrological regime	increasing the release of oxygen into the atmosphere, reducing environmental pollution
		flood protection	impact on climate

Source: developed by the author based on data [2; 11; 14]

Taking into account the above, for the integrated assessment of the high level of environmental sustainability of the natural capital of hunting farms, not the market, but the ecological and economic value of costs and benefits [17] is used. From the point of view of the impact of the ecosystem on the resource po-tential of hunting natural resources and offer a comprehensive methodology for assessing the level of environmental sustainability (effectiveness of greening) of natural capital in the ecosystem of hunting farms (Table 2). The given method of calculating the level of ecological sustainability of the natural capital of hunting farms can be modified using the configuration of mathematical tools on the basis of an ecologically oriented management mechanism integrated into the existing environmental policy of the country through a public-private partnership. The tools combine both the analysis of options for reproduction of hunting natural resources and the calculation of correlation-dispersion deviations between the ecological and economic components of the ecosystem of the studied area.

Table 2 **Comprehensive methodology for economic assessment of the level of environmental sustainability of natural capital in the hunting farm ecosystem**

Calculation algorithm	Legend
Economic evaluation of resources of hunting origin according to the method	
$W_m = \sum_{i=1}^{I} \sum_{t=1}^{T} (G_{it} - C_{it} - P_{it}^{H}) \times a_t \times M_{it}$	W_m – economic evaluation of 1 ha of hunting plot for hunting, EUR/ha; i – the number of types of economic availability of the population of wild animals, birds, mammals for hunting (i=1,2…I); T – the duration of the calculation period, which is determined by the reproduction period of the population of wild animals, birds, mammals for hunting (t=1,2…T); G_{it} – the price of 1 kg of products of hunting origin of the *i*-th species of the population of wild animals, birds, mammals in the *t*-th year, EUR/kg; C_{nt} – the full cost of 1 kg of products of hunting origin of the *i*-th species of the population of wild animals, birds, mammals in the *t*-th year, EUR/kg; P_{it} – normative profit of 1 kg of products of hunting origin of the *i*-th species of the population of wild animals, birds, mammals in the *t*-th year, EUR/kg; a_t – discount factor; M_{it} – economically available resources of non-hunting origin, kg.
Economic evaluation of resources of plant origin according to the method	
$J_n = \sum_{l=1}^{L} \sum_{r=1}^{R} (G_{it} - C_{it} - P_{it}^{H}) \times a_t \times M_{it}$	J_n – economic evaluation of 1 ha of hunting grounds under resources of plant origin, EUR/ha; l – the number of types of economic availability of medicinal herbs, harvesting of mushrooms, wild fruits and berries, haystacks, beekeeping resources (l =1,2…L); R – the duration of the calculation period, which is determined by the period of reproduction of medicinal herbs, harvesting of mushrooms, wild fruits and berries, haystacks, beekeeping resources (r =1,2…R); G_{it} – the price of 1 kg of products of plant origin *l*-th species in the *r*-th year, EUR/kg; C_{nt} – full cost of 1 kg of products of plant origin of the *l*-th species in the *r*-th year, EUR/kg; P_{it} – normative profit of 1 kg of products of plant origin of the *l*-th species in the *r*-th year, EUR/kg; a_t – discount factor; M_{it} – economically available resources of non-plant origin, kg.
Economic evaluation of the recreational value of hunting grounds according to the method	
Proposition $\sum_{i=1}^{I} (Q_i - C_i - p_i + F_i) \times K_{\partial}^{i} \geq 0$	I – the duration of the turnover of investment sources in the recreational value of hunting grounds, which are spent on the cultivation of medicinal herbs, harvesting of mushrooms, wild fruits and berries, beekeeping resources in the business cycle of enterprises in the hunting industry; Q_i – income from the sale of products in the *i*-th year, harvested in the process of growing medicinal herbs, harvesting mushrooms, will fruits and berries, in the economic cycle, EUR; C_i – expenses for medicinal herbs, harvesting of mushrooms, will fruits and berries, haystacks, beekeeping resources in the *i*-th year of the economic cycle, EUR; p_i – the amount of taxes paid by hunting industry enterprises for harvested products in the *i*-th year of the business cycle, EUR; F_i – state financial aid for recreation value of hunting growing medicinal herbs, gathering mushrooms, will fruits and berries, haystacks, beekeeping resources in the *i*-th year, within the framework of international aid, EUR; K_{∂}^{i} – is the discount factor for the flow of investment sources for the *i*-th year.
$EO_b = H \times Q_b$	EO_b – economic assessment of water protection services in the ecosystem of the hunting industry, EUR/ha; H – payment standard for special use of surface water resources, EUR/m^3; Q_b – is the maximum productivity of the water protection service in the ecosystem of the hunting industry, i.e. the additional amount of water resources formed per 1 ha of the catchment of hunting grounds, m^3.

Economic assessment of the level of environmental sustainability (effectiveness of greening) of the natural capital of the hunting farms	
Proposition $E_{ef} = \frac{\sum_i G_{ni} \times B_{ni} - \sum C_{pi} \times B_{pi}}{\sum_i B_{pi} \times (C_{pi} + E_n \times K_i)}$	E_{ef} – effective coefficient of added value from environ mentalization of natural capital in the business cycle of enterprises in the hunting industry; G_{ni} – the cost the work (services) of hunting enterprises based on the results of the *i*-th component of ecological and economic efficiency from the reproduction of hunting natural resources in the economic cycle, EUR/ha; B_{ni}, B_{pi} – coefficients of discounting investment costs associated with the use of the *i*-th component of ecological and economic efficiency from the reproduction of hunting natural resources in the economic cycle; C_{pi} – the cost of works (services) and components of ecological and economic efficiency from the reproduction of hunting natural resources in the economic cycle;, EUR/ha; E_n – regulatory ratio of investment investments; K_i – is the specific weight of investment investments when the *i*-th component of ecological and economic efficiency is introduced for the reproduction of hunting natural resources in the economic cycle, EUR/ha.

Source: developed by the author based on data [9; 14; 16; 17; 26]

The reproduction of hunting natural resources in the hunting ecosystem al-lows to assess the high level of ecological sustainability (greening efficiency) of natural capital, to determine the benefits for hunting enterprises and to choose an effective method of restoration of hunting grounds, taking into account the inter-ests of both the state and private individuals interested in investing funds in the development of ecological environment.

Thus, the area of hunting grounds in Ukraine, which have recreational val-ue, taking into account the conditions of its hunting and plant origin, in 2014 amounted to 37.5 million hectares (66.9% of the total territory of Ukraine), in 2021 - 46.7 million hectares (83.3% of the total territory of Ukraine). Most of the hunting grounds in Ukraine, the recreational value of which takes into account its hunting and plant origin before the reform in 2017, were used by the public hunt-ing organizations - the Ukrainian Association of Hunters and Fishermen (UAHF) - 23.7 million hectares, the enterprises of the State Agency of Forest Resources of Ukraine (SAFRU) - 4 million hectares and users of other forms of ownership - 10.7 million hectares. After the reform in 2021, the total area of hunting grounds increased by 20.4%, i.e. to 46.7 million hectares. Accordingly, this led to signifi-cant changes between the subjects of the structure of distribution of hunting natu-ral resources. Thus, the specific weight of the area of hunting grounds secured by the Ukrainian Hunters and Fishermen Association increased by 12% and amounted to 26.6 million hectares, the share of the area used by other forms of ownership, the share of hunting grounds for the cultivation of medicinal herbs, mushrooms, wild fruits and berries increased by 50.6% and amounted to 16.1 million hectares, the area of hunting grounds of enterprises of the State Agency of Forest Resources of Ukraine did not change, but their specific weight in the over-all structure decreased by 1.7% (Fig. 1).

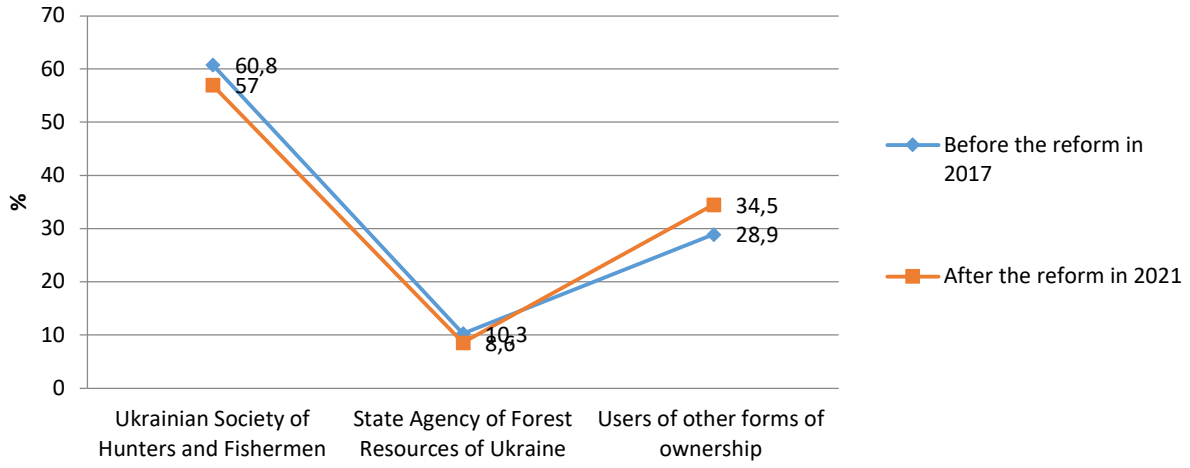

Figure 1 – **Structural distribution of hunting grounds by subjects of their use, the recrea-tional value of which takes into account hunting and plant origin in Ukraine in 2021**

Source: compiled by the author according to reference data [1; 15; 22]

In European countries, one of the main factors of effective greening of natu-ral capital and reproduction of hunting grounds, the recreational value of which takes into account hunting and plant origin, is their use on the area of 3-7 thou-sand hectares [37]. In 2021, in Poland, Hungary and Slovakia, the specific weight of hunting areas in the total area of the countries was 82.1%, 84.9% and 89.8%, respectively. As a result, the number of wild animals in Ukraine is several times lower than in European countries; the number of animals hunted per 1 hunter is hundreds of times lower. The reason for this is the flourishing of poaching. In particular, the amount of established fines for violation of hunting rules does not have a deterrent effect (average fine in 2018 - 7 EUR, in 2021 - 14 EUR). At the same time, criminal liability for violations and causing environmental damage to natural capital in the regions of Ukraine involves a fine of more than 8 thousand EUR (Fig. 2).

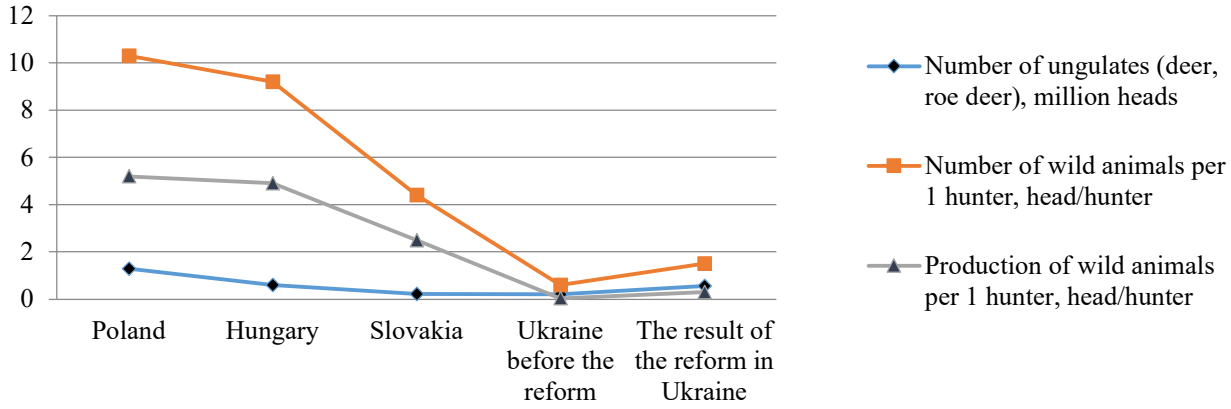

Figure 2 –**Possibilities of the natural capital of the hunting farms by the resource com-ponent of hunting origin in the countries of Europe and Ukraine for 2021**

Source: compiled by the author according to reference data [1; 15; 22]

In the European countries, the effectiveness of regeneration of hunting re-sources is profitable, with a developed market both for hunting (meat of wild an-imals) and for cultivation of medicinal herbs, harvesting of mushrooms, wild fruits and berries. However, unfortunately, in Ukraine the ecological and econom-ic effect of reproduction of hunting natural resources is unprofitable due to the fact that 72% of hunting grounds, the recreational value of which takes into ac-count their hunting and plant origin, are not provided with investments for their reproduction. Thus, in 2018, the revenues of the enterprises of the State Forestry Agency of Ukraine covered the investment costs only by 36.8%, and the enter-prises of the Ukrainian Union of Hunters and Fishermen - only by 38.3%. In 2021, their share will be only 41.7% and 43.4%, respectively. In Ukraine, with such potential of the industry and sufficient number of participants, the environ-mental policy of the state is not able to increase the GDP (Fig. 4).

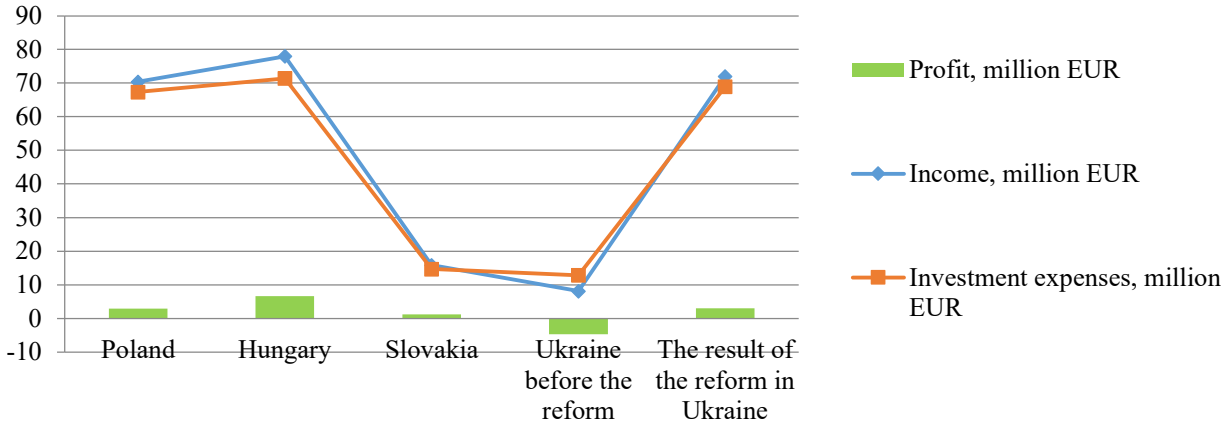

Figure 4 – **The ecological and economic impact of the increase of hunting natural re-sources in the countries of Europe and Ukraine in 2021**

Source: compiled by the author according to reference data [1; 15; 22]

However, the budgetary investment costs for the reproduction of resource opportunities of the natural capital of the hunting industry of Ukraine are in-creasing every year. On the average for 2014-2021 they increased by 49% and amounted to 11.83 million EUR. A significant part of it (4.71 million EUR) is spent on protective and environmental measures, implementation of biotechnical measures, registration of wild animals, expenses on organization of hunting grounds for growing of medicinal herbs, gathering of mushrooms, wild fruits and berries (fig. 5). Other expenses make up the majority (7.11 million EUR). These include payment of salaries, purchase of equipment, spare parts, etc.

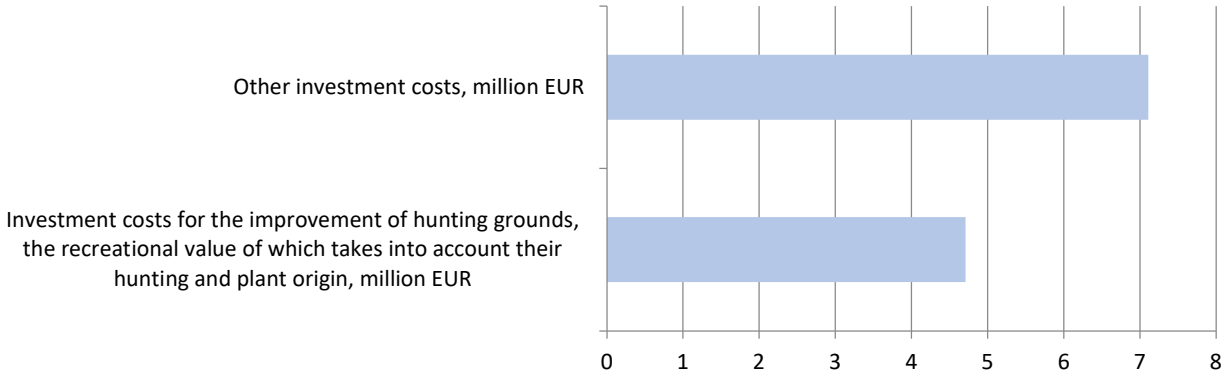

Figure 5 – **The volume of budgetary investment costs for the reproduction**

Source: compiled by the author according to reference data [1; 15; 22]

Conclusions. Hunting industry of Ukraine has all necessary conditions of geographical, climatic, regulatory and economic development for successful and effective reproduction of natural capital. At the same time, the functioning of hunting enterprises is affected by many negative factors, including: instability of the economic environment, a high level of poaching, imperfect state management mechanisms, and an insufficient number of specialists. A negative feature of the provision of environmental policy at the state level is its lack of coordination with economic incentives for the use of hunting grounds and the efficient and ra-tional use of natural resources. As a result, the main economic indicators of this industry are characterized by a low number of hunting species and, consequently, high indicators of unprofitability. The investment costs in hunting farms exceed the income more than twice. This is the main reason for the deterioration of this industry. On the positive side, the area of hunting grounds is decreasing, while the number of hunting farms is increasing.

Such a system should consist of interconnected and interdependent natural components (geomasses) in space and time, which have different degrees of eco-nomic transformation and negative impact, forming a qualitatively new geosys-temic integrity. The natural components of the geosystem should include certain types of geomasses: lithomasses (rocks), pedomasses (soils), aeromasses (air), hydromasses (soil, surface and atmospheric waters), biomasses (biota). It is ex-pedient to assess the impact of ecological risks of man-made pollution on the sus-tainability of natural capital of hunting farms on the basis of the transition from quantitative changes in the content of man-made substances in geomasses to qualitative changes in geosystems and potential functions of their use.

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