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Economic Administration of Agricultural Sector Development in the Concept of "Natural Capital"

Administração econômica do desenvolvimento do setor agrícola no conceito de "Capital Natural"

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Resumo

A investigação centra-se na formação do conceito de "capital natural" e no seu potencial para o desenvolvimento económico do setor agrícola. O estudo visa fundamentar as bases teóricas e metodológicas e identificar os fatores organizacionais e económicos para a sua implementação. O "capital natural" é tratado como uma categoria económica que engloba o potencial dos recursos, das plantas e dos animais utilizados na produção. As áreas-chave incluem a sua formação, conservação e ambientalização e ecologização dos setores da economia agrária. Os componentes institucionais e as prioridades ambientais na produção agrícola são enfatizados. O estudo propõe estratégias de desenvolvimento verde e princípios de economia verde, destacando a necessidade de avanços tecnológicos, do uso eficiente de recursos e da gestão integrada. Pesquisas futuras devem se concentrar na avaliação quantitativa, na relação custo-benefício e na utilização sustentável do capital natural na agricultura.

Palavras-chave: desenvolvimento econômico, setor agrícola, capital natural, ambientalização, economia verde

Abstract

The research focuses on the formation of the concept of "natural capital" and its potential in the economic development of the agricultural sector. The study aims to substantiate theoretical and methodological foundations and identify organizational and economic factors for its implementation. "Natural capital" is treated as an economic category encompassing resource potential, plant, and animal components used in production. Key areas include its formation, conservation, and the environmentalization and greening of the agrarian economy. Institutional components, environmental priorities, and the integration of digital administration tools for monitoring, managing, and optimizing natural resource use in agricultural production are emphasized. The study proposes green development strategies and green economy principles, highlighting the need for technological advancement, efficient resource use, and integrated management. Future research should focus on quantitative assessment, cost-efficiency, and sustainable utilization of natural capital in agriculture.

Keywords: *economic development, agricultural sector, natural capital, environmentalization, green economy, digital administration tools*

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Introduction

Agricultural production processes are closely linked to the use of natural resources, which requires a comprehensive consideration of environmental and economic interconnections and interdependencies. Nowadays, not only the composition of natural resources involved in economic activity, but also the total volume of industrial and other wastes discharged into the environment is expanding. This situation requires the development of an appropriate concept of development to implement the mechanism for an effective policy on the conservation of the environment, while increasing the efficiency of economic activity; the search for new organizational, managerial and technological factors; the scientific justification for the rational use of existing biological potential for the development of individual industries and the economy as a whole. The concept of "natural capital" in which natural capital is embodied in the form of resource potential, plant and animal components of the natural environment used as means of production, is of great importance for the current stage of development of the ecological and economic system. The concept of "natural capital" is at the stage of formation; it requires the study of the conceptual apparatus, the definition of patterns and areas of implementation.

Literature Review

Analysis of recent research and publications. Scientific developments on the theoretical, methodological and practical foundations of green development and economic growth, on production systems, on the natural environment, and on organization of processes of formation of natural capital have been developed among national and foreign scientists (Burkynskyi & Goryachuk, 2013; Valyukh et al., 2018; Goychuk, 2002; Goryachuk, 2012; Daly, 2002; Costanza, 2000; Paskhaver et al., 2009; Petty et al., 2001; Solow, 1974; Stepanenko & Omelchenko, 2018; Bilokinna & Furman, 2018; Holland, 1996; Shlapak, 2017).

Classical approaches traditionally treated natural resources as isolated and static production factors, primarily land, water, and raw materials, whose economic role was reduced to the quantitative availability of inputs for agricultural or industrial use (Petty et al., 2001; Solow, 1974; Goychuk, 2002). In contrast, the modern paradigm of "natural capital" emphasizes the systemic, regenerative, and multifunctional character of ecosystems, which simultaneously generate material flows (resources) and immaterial flows (ecosystem services) (Costanza, 2000; Daly, 2002; Paskhaver et al., 2009). While the resource-based view operates within the framework of scarcity and extraction, the capital-based interpretation incorporates the dynamic value of biodiversity, resilience, and the capacity for self-renewal (Valyukh et al., 2018; Stepanenko & Omelchenko, 2018; Bilokinna & Furman, 2018). Therefore, the category of "natural capital" extends beyond the notion of "resources," integrating ecological sustainability and intergenerational equity into the logic of economic development (Holland, 1996).

The purpose of the study is to substantiate the theoretical and methodological foundations and organizational and economic factors of the agricultural sector development in the concept of "natural capital". The objectives of the study include: disclosing the basic principles of the concept of "natural capital" and the possibilities

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of its implementation in the economic development of the agricultural sector; substantiating areas of the of formation and preservation of natural capital; considering agricultural production processes depending on the components of the environment and making proposals for environmentally friendly development and the implementation of the postulates of "green economy" in the concept of "natural capital" for the agricultural sector of economy.

Materials and Methods

The methodological basis of the study is represented by a systematic approach to the study of the basic principles of economic development of the agricultural sector as well as by scientific works of domestic and foreign scientists. In order to achieve the goals of the study we used: the abstract method, the monographic method, the methods of synthesis, induction, deduction, comparison and logical generalization.

Results and Discussion

The agricultural sector of Ukraine, the basic component of which is agriculture, forms the food and, within certain limits, economic, environmental and energy security, ensures the development of technologically related sectors of the national economy and creates socio-economic conditions for rural development (Cabinet of Ministers of Ukraine, 2015).

In the context of global globalization, a dynamic agricultural sector, which is capable of ensuring sustainable growth of agricultural production, food and economic security of the state and the improvement of the standard of living of the population, has a significant impact on the development of the national economy. However, today, as a result of global food and financial crises in the world as a whole and in Ukraine in particular, the problem of agricultural production has become aggravated; its solution requires improving agrarian relations, enhancing the efficiency of agricultural production and the modernization of state agricultural policy, ensuring favorable conditions for efficient use of the scientific-technical potential of the agrarian sphere of the national economy. Under condition of developing effective levers to minimize the negative impact of the crisis on it, reducing the dependence on imports of goods, stabilizing financial and credit policies (in this case, any country with effective management of the economy can count on the increasing of the share of profits from participation in the system of international division of labor), the available natural resource and labor potential of Ukraine make it possible to create efficient, competitive, world-class agriculture.

Capital is the material basis of any form of social activity, including agrarian production and organization of business, services, banking and finance. Capital is broadly understood to mean the totality of physical, human, social, natural and financial capital and intangible assets that are attracted or can potentially be attracted to meeting a person's needs or to the production process to create value. This vision is due to the following reasons. With the transition of developed countries to the post-industrial stage, physical capital has lost its decisive role; human capital and intangible assets have shifted to the forefront, paving the way for innovative development and the construction of a knowledge economy. Social capital is becoming increasingly

important as a tool for consolidating the efforts of society and a catalyst for improving the use of other forms of capital. The issue of optimal balance between the real and virtual economies and, accordingly, the financial and other types of capital needs to be addressed. The growth of the world economy, the scarcity of a number of natural resources (primarily energy), their irrational use, and the aggravation of environmental pollution have all put the preservation of human civilization in a position of direct dependence on the rational use of natural capital (Goryachuk, 2012).

The interpretation of "natural capital" that includes to its composition genetic information, biodiversity, ecosystem functions, the ability of waste to be assimilated was first proposed by A. Holland (Holland, 1996). The recognition of objectified forms of this type of capital as a resource reveals the institutional state of natural capital. In a formalized form, these are property rights, certificates, environmental licenses. Practice proves that the institution of private property enables not only to preserve natural capital so that it can be used by future generations in a state not worse than the present one, but also to accumulate it.

From the point of view of ecological economy, natural capital and capital created by man are mostly complementary and only partially replace each other, that is, each of the components must be kept constant, because the productivity of one of them depends on the availability and efficiency of the other one.

The opinion of Solow R. on the need to change the current vision of the ecosystem and to consider it not as a set of passive natural resources but as a producer of ecosystem services is reasonable (Solow, 1974)

Based on the concept of "natural resources", we propose to consider natural capital as (Burkynskyi & Goryachuk, 2013):

1) the part of natural resources that is owned by economic units of the country and used for the purpose of added value creation. This definition corresponds to the classic definition of capital as value-generating value;

2) a concept identical to that of "natural resources". In this case, natural capital consists of the "active" part of natural resources that ensures added value creation and the "passive" part that can potentially be used for these purposes.

Natural capital is formed by stocks consisting of life-sustaining systems, biodiversity, renewable and non-renewable resources used by man or of interest to him. Natural capital is seen as an asset in an economy with the potential to increase the productivity and the well-being of people. For example, the value of a natural resource as an economic asset depends on the amount of income or well-being it can bring. The productivity of anthropogenic capital is increasingly limited by the reduction of the size of natural capital.

Based on the functional definition of capital as "a fund that produces the flow of useful goods and services" natural capital is a fund that produces the flow of natural resources. In addition to useful commodities – natural resources – natural capital provides people with many services that support people's economic activities, such as

waste absorption, soil formation and natural fertility maintenance, biodiversity and genetic bank of plants and animals, recreational services and more.

In the traditional agrarian economic science, the analogue of natural capital is represented by such a factor of production as "land", which is understood as a natural component of the economy strictly limited by the size of economic supply. Proponents of the concept of natural capital (including representatives of the "green economy") consider the term "natural capital" to be more accurate because, for example, the quality of land can be improved or deteriorated, like the quality of artificial (human-made) capital. Thus, natural income provided by natural capital consists of natural resources and natural services. Moreover, production capital and natural capital are seen as supplements, not substitutes. The neoclassical model assumes that natural capital and human-created capital are interchangeable and that investment creates an equivalent value of artificial capital (Petty et al., 2001).

The concept of "natural capital" is a fairly new economic category, especially when it comes to assessing this phenomenon, which is due to existing approaches to the assessment of natural capital.

The decrease of the value of natural capital and the corresponding flow of natural goods and services are affected by ecosystem degradation. Compensation for these losses reduces well-being, living standards, increases economically unjustified costs of industrial goods and engineering services (Costanza, 2000).

Experience of engaging in modern agriculture convincingly proves the need for conducting radical measures to preserve the existing natural potential, recreate resources and environmentalize production and economic activity (Pogrishchuk & Pogrishchuk, 2011: 8-9).

The environmentalization of production involves the use of factors of nature protection, restoration, protective, agro-zoo-technical and forest melioration nature that contribute to the ecological balance of the environment and to the preservation of the health of the population; they are implemented at two levels: the state one and the business one.

The environmentalization of production in the agricultural sector implies continuous improvement of natural conditions for its development, transition to adaptive systems of agriculture, placement of industries and crops in the natural conditions that are most favorable to them, wide introduction of biotechnology, development of breeding work, conducting and wide distribution of crops that are new, high-yielding and resistant to adverse weather conditions, crop diseases and pests, improvement of breeding work, raising of high-yielding breeds and classes of animals (Goychuk, 2002).

The concept of the formation of natural capital is based on the dependence of production processes on the components of the natural environment in which it exists and a part of which it is. Therefore, one can recognized as axioms of modernity the fact that it is impossible to infinitely expand the sphere of influence in a limited space as well as the fact that it is impossible to demand that ever-increasing needs are met with limited resources.

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Society more and more focuses on the threats constituted by the build-up of unfavorable trends in the dynamics of indicators of the state of the social and natural resource components of social development. This encourages to boost scientific development and managerial decision-making to ensure environmentally balanced and socially oriented economic growth (Paskhaver et al., 2009). Today, the quality of the latter, which is characterized by the achievement of certain social and environmental standards, is of paramount importance. In turn, the necessary level of quality growth is ensured by optimizing the internal proportions of the development of economic systems, their structural balance.

The current excess of the aggregate anthropogenic load creates an unfavorable agro-ecological situation, which is exacerbated by insufficiently rapid rates of the natural processes of self-purification and self-healing, and thus the environmental sustainability of the environment is disturbed. The issue of compliance with environmental safety is now one of the most urgent in the implementation of economic processes and requires the development of appropriate mechanisms for ensuring it (Melnyk & Pogrishchuk, 2014). Today, humanity has not yet formulated perfect mechanisms for solving environmental problems. The efforts of scientists and researchers are focused on the development and implementation of new technologies, the search for funds for financing environmental protection measures, the development of national and regional programs of rational natural resource use.

There is a physical exchange between the entire ecosystem and the economic subsystem in the form of a flow from sources of input low-entropy energy in the form of resources to dumps of output high-entropy energy in the form of waste. The amount of a substance in raw material is equal to the amount of the substance in the waste and in the manufactured products, which, after all, will also become waste, but raw materials and waste are qualitatively different.

Researchers from the Organization for Economic Co-operation and Development have concluded that there is no negative impact of more stringent environmental regulation measures on economic growth (Shlapak, 2017).

In market relations, the volume of production is determined by the balance of supply and demand. The manufacturer will increase production volumes until the specific benefits of an additional unit of production exceed the unit costs. The main objective of governmental policy in terms of green economy is to ensure such a development of the economy whereby benefits exceed losses and an equitable distribution of goods and efficient use of resources are present. In the end, it will stop the increase of the physical volumes of natural resources being used.

We are accustomed to assessing an economy according to the GDP, but this indicator reflects the development of economic activity rather than changes in the well-being of people. In fact, it is the sum of not only the benefits of an economy but also of its losses. Economists are accustomed to taking into account the depreciation of fixed assets (machinery, equipment, buildings, etc.), but have forgotten to take into account the depletion of natural resources. If neoclassical economists focus on value added, for environmental economists it is also important to what this added value is added. In the democratic world, the level of public policy cannot be higher than the average level of

its understanding on the part of the population, so the dissemination of knowledge is no less important than the growth of welfare (Shlapak, 2017).

From the point of view of "green economy" natural capital and human-made one are mostly complementary and only partially replace each other. There is a physical exchange between the entire ecosystem and the economic subsystem in the form of a flow from sources of input resources to the accumulation of production waste.

Since, as the economy grows, the size of the ecosystem remains constant, over time, the scale of the economy relative to the ecosystem that contains it will inevitably increase.

If we consider the economic subsystem as infinite relative to the whole system, then the scale loses its relevance, because it can be neglected. Let us note that the optimal placement of resource flow of a certain scale within the economy is a micro-economic problem that is solved by the market. The optimal, environmentally sustainable scale of the whole economy relative to the ecosystem is the task of modern socio-economic development of not only the agricultural sector, but of the entire national economic complex.

The new eco-modernization paradigm is significantly different from the one that dominates society today. If the existing paradigm is based on the anthropocentric theory, according to which man is the center of the universe, and nature is the object of use and property of people, then the basis of the new paradigm is ecocentrism, which, unlike anthropocentrism, is based on the idea of the objective existence of a single system in which all living organisms of the planet, including humans, resources, economy, technology and culture, are part of nature (Stepanenko & Omelchenko, 2018).

Anthropocentric optimum implies an expansion of the scale, that is, economic growth to the point where the marginal benefit to humans from the additional physical capital created by them is just equal to the marginal consumption of natural capital sacrificed to that growth. All non-intelligent biological species and their habitats are judged solely from a practical point of view, according to their abilities to meet human needs, and their self-worth is equal to zero.

Biocentric optimum is achieved when biological species and their habitats are preserved to a greater extent than it is necessary in terms of avoiding ecological catastrophe or ecosystem decline and for reasons of their practical usefulness. In doing so, it is recognized that other species are intrinsically valuable, regardless of their practical utility to humans. Thus, the biocentric optimum scale of the niche occupied by humanity will be smaller than the anthropocentric optimum.

The meaning and interconnection of the fundamental principles of an ecological economy are consistent with the slogan: "The standard economy of growth ignores the finitude of the world, entropy and ecological interconnection, because the concept of resource flow is absent in its pre-analytical vision, represented by the isolated cycle of exchange value". The economy of agro-industrial production does not function according to the laws of an abstract system, and, as an artificially created system that strives for maximum entropy, it is not fully self-regulating, even in the

conditions of competition, since the demand for foodstuffs is not elastic, and one for the means of production is reduced due to lack of funds in commodity producers.

In the agricultural sector, economic activity has an inseparable link with the environment; in this case, the latter, especially in terms of the use of natural resources, is significantly affected by the activities of agricultural enterprises; such influence is not always positive, since the activities of agricultural producers are closely associated with the use of chemical fertilizers and protective equipment, the use of which has adverse effects on flora and fauna, and leads to soil depletion.

Such a negative trend has been observed in agriculture for a long time, since the intensification of agricultural production has often been based on: irrational use of non-renewable natural resources, excessive scale of the amelioration, growing large-scale use of nature antagonist agrochemical means for protecting plants from diseases and pests, irrational system of animal husbandry organization. Such a "rational" strategy of agriculture should be characterized as chemical-technogenic, environmentally unfriendly and destructive activity. Due to a significant decrease in production volumes, the eco-destabilizing impact of agricultural activity on the environment has declined, albeit at an inadequate pace.

Therefore, if radical measures to preserve the environment are not taken today, further development of agricultural production on the basis of environmentally unfriendly, resource-, natural- and energy-intensive technologies can have catastrophic consequences and cause environmental degradation on a global scale.

These environmentally destructive factors include (Daly, 2002):

- the ecologically unacceptable ratio in the structure of the land fund;

- the process of reducing production productivity, the degradation of the natural environment and the reduction of its reproductive and assimilation potentials in general that threaten the conservation and enrichment of agro-landscape complexes;

- irrational structure of crops and their ecological imbalance, over-saturation of crop rotations with intertilled crops, especially soybeans, sunflowers and rapeseed;

- acceleration of erosion processes on the reclaimed lands;

- outdated forms of plowing and imperfect methods of cultivation of land, uneconomical agricultural machinery, heavy agricultural means, physically and morally outdated technologies and systems of organization of animal husbandry.

In general, such methods of agricultural production should be called organizationally and technologically backward and ones that actively contribute to the aggravation of the ecological situation and to the decline of all branches of the national economic complex.

The integration of digital administration tools allows for continuous monitoring of natural capital stocks and flows. Remote sensing, GIS mapping, and IoT-based soil and water sensors enable real-time assessment of resource availability, ecosystem health, and land use efficiency, thereby supporting proactive decision-making in agricultural management (Valyukh et al., 2018; Goryachuk, 2012). In turn,

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digital dashboards and data analytics platforms help assess production efficiency in relation to environmental impacts. By comparing inputs, yields, and ecosystem service outcomes, managers can prioritize investment areas, implement targeted interventions, and optimize the balance between economic performance and environmental sustainability.

In the development of the concept of "natural capital", a special place is taken by the component of "green economy" which is defined as a new global area of development. Greening an economy is seen as a way of promoting economic progress in ensuring environmental sustainability, where the economy is a dependent component of the natural environment.

"Green economy" is a driving force for sustainable development, and Ukraine's future depends on its ability to modernize the economy, to improve the competitiveness of the economic sectors, to use natural resources more efficiently and to halt / slow down the environmental degradation (Bilokinna & Furman, 2018).

"Green bioeconomy" as a source of raw materials for bioproducts is a key sector in the development of bioeconomy. And it is it that concentrates the main problems of bioeconomy that hinder its dynamic development. In the decades when new riches have been created using the model of the "brown" economy, society has not solved such problems as social marginalization and resource depletion, and humanity has not yet reached its stated goals of development. Sustainable development remains the most important long-term goal, but its achievement requires changes in the direction of biologizing the economy.

In order to move to "green" economy, conditions that contribute to this must be created. These include: the development of a regulatory framework, public policy instruments concerning subsidies and incentives in environmental management, the development of nature protection infrastructure, the expansion of international cooperation, increased stock movement and "green" investment.

The current conditions contribute to maintaining the "brown" economy, which, among other things, is largely dependent on the use of natural resources and energy. Conversely, conditions conducive to the transition to a "green" economy can prepare the ground for successful public and private investment in "greening" the world's economies.

At the national level, examples of such conditions include: adjusting fiscal policy, reforming and reducing subsidies for enterprises whose activities are harmful for the environment; the use of new market instruments: attracting public investment in key "green sectors"; the transition to "green" public procurement; improving environmental rules and regulations as well as ensuring that they are implemented at the state level. There are also opportunities at the international level to improve market infrastructure, foreign trade flows and financial aid ones as well as the development of international cooperation (United Nations Environment Programme, 2011).

Particularly relevant is the issue of the production of environmentally friendly agricultural products due to the existence of the problem of radioactive contamination of agricultural land and ensuring production on it. Currently, only 10% of agricultural

land in its overall structure is characterized by a satisfactory reclamation and ecological status and is safe for growing in the agricultural sector of eco-products and raw materials, out of which it is then possible to produce baby food products. The results of the land and agrarian reforms carried out in Ukraine can hardly be called positive, since such changes did not ensure the safe, ecological and rational use of natural resources; first of all, it concerns the fertile Ukrainian black earth – the most valuable and unique national wealth.

Improving the environmental status of the agricultural sector of the economy is possible through its further development on the basis of an innovative model; due to the implementation of an agro-environmental strategy, the introduction of an improved economic mechanism of nature management, etc. The system of methods of stimulating ecological use, rational reproduction and, first of all, protection of natural resources should become the basis of such activity in the future, instead of the existing mechanism of purely paid nature use by the subjects of the national economic complex.

Under such conditions, organic farming, which involves the abandonment of herbicides and mineral fertilizers, becomes popular. However, the main problems of its development are weak state support, lack of biological plant protection means, imperfect legislation on product certification and standardization (Nadvinichny, 2018).

Currently used environmental and economic instruments - payments for the use of natural resources, fees for environmental pollution, penalties for violation of environmental legislation – are mainly command-administrative, compulsory and aim to limit the environmental activities of economic entities. Therefore, they do not significantly affect the behavior of polluter enterprises which practically do not compensate for the damage caused to natural resources and the environment.

In view of this, levers that encourage environment users and polluters to take effective preventative action should be broader used. These include: environmental subsidies, advance compensation systems, various types of tax benefits and preferential loans, etc. The reorientation of the economic mechanism to preventive levers rather than overcoming the consequences of eco-destructive action should become the priority area for improving the mechanism of ensuring environmental security and innovative development.

Green development should also be promoted by the implementation of the identified priorities for agriculture, namely:

- subsidies should be widely used to support environmentally friendly farming practices;

- a tax on the use of chemical fertilizers, especially pesticides, by industries and farms should be introduced.

It is worth noting the unique characteristics of the biosphere that is capable of self-renewal and self-reproduction and even, in some cases, of neutralizing the harmful effects of humans, which should be fully supported through creating favorable conditions for the implementation of such natural functions.

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We believe that, for the economic development of the agricultural sector, the priority vector is a modern innovation policy, which should be based on a steady increase in the efficiency of using the achievements of scientific and technological progress. Such a process should be systematic, clear, scientifically sound and balanced, that which can help solve the problem of formation and conservation of "natural capital" in the process of carrying out agricultural production in all entities in the agricultural sector. On the basis of the above, we will determine the main factors that will stimulate such activities in the agricultural sector:

- economic and political stability;

- perfect legal framework governing the relations of participants in the production process;

- availability of one's own financial, logistical and technical resources and possibility of attracting external investments;

- high professional level of personnel and ability to carry out retraining and advanced training in accordance with modern requirements;

- availability of a modern information system that can ensure the collection, storage and provision of useful information on the availability of scientific developments and innovative projects;

- a perfect system of measures that minimize technology and innovation risks;

- motivation of goods producers to introduce environmental innovations.

Specifically, the utilization of digital administration tools offers the potential for more precise management of natural capital. Agricultural enterprises can track resource consumption, evaluate the effectiveness of eco-friendly practices, monitor the environmental impact of production processes, and optimize land use by implementing data-driven decision-making platforms. Consequently, digital tools facilitate the transfer of scientific knowledge to practical applications, thereby improving the sector′s economic and ecological efficiency.

An important area of the conservation of natural capital is Ukraine′s international cooperation in this field with the governments of other countries of the world, which is multifaceted. There are a number of environmental organizations operating internationally, the main ones being the Global Environment Facility (futher – GEF), the European Environment Agency, the NATO, the IAEA, the IUCN, Green Pease, UNESCO and many others. However, it is worth noting that financial assistance for financing and implementing natural capital conservation measures, given the catastrophic decline of species, environmental degradation, and climate instability, is generally insufficient.

Currently, due to lack of human and technical resources, the cooperation with the European Environment Agency as one of the major donors of financing measures for the conservation of natural capital is not fully ensured. Therefore, the issue of training specialists and personnel who could, in accordance with the European requirements, work in this area, remains pressing. Funding for environmental projects,

that is, granting grants internationally, is handled by the Global Environment Facility, which has allocated more than $20 million for natural capital conservation activities during 2008-2017 and remains one of the leading donors in financing natural capital conservation activities internationally (Valyukh et al., 2018).

We believe that at the level of individual entities, the mechanism for efficient use of natural resources in the agricultural sector should include:

- taking into account the cost indicators of the use of natural resources in determining the economic performance of agricultural producers;

- the effectiveness of the mechanism of liability for causing damage to the environment and the development of a system of compensation for damages in case of non-compliance with environmental requirements.

In order to prevent environmental degradation owing to conducting any activity, including agro-industrial one, it is important to carry out environmental expert examination and economic and environmental assessment of all economic projects, technological solutions, farming systems, etc. as well as environmental audit. Ensuring the environmental sustainability of agro-industrial production should become an area of special state support, as is the case in developed countries. For this purpose, it is necessary to develop and implement targeted environmental programs for agriculture, which would provide educational, technical and financial support for strategic areas in the field of safe functioning of the ecosystem. The following areas are:

- promoting the active use of biologically safe methods of using natural resources;

- introduction of an environmentally friendly approach to the protection of vulnerable areas; watersheds; agricultural land;

- application of environmentally friendly technologies, types of machinery and systems of livestock management;

- expanding scientific research on environmental aspects of agriculture and developing more sophisticated systems of agricultural and food production, including ones of environmentally friendly food, as well as enhancing the training of agricultural specialists in the field of agriculture, etc.

In modern conditions, it is impossible to develop the agrarian sphere without the use of scientific achievements, so the main priority should be to develop it on an innovative basis. In particular, state agrarian policy should be prudent and based on the improvement of the legislative framework in the field of environmental management on an innovative basis, on granting targeted state support to enterprises carrying out their own resource-saving innovative developments, on the development of information space in the field of innovation dissemination. This can be done only under condition of constant cooperation of state authorities, public organizations, research institutions and agricultural enterprises themselves. It is worth noting that digital administration tools and platforms also facilitate coordination between public authorities, research institutions, and agricultural enterprises. By centralizing information on regulations, subsidies, and environmental compliance, these tools increase transparency, reduce

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administrative delays, and strengthen the implementation of policies aimed at conserving natural capital.

Summarizing the presented positions, it is possible to distinguish three conceptual models of natural capital use in the agricultural sector. The first, the extractive-utilitarian model, is based on maximizing short-term outputs through intensive resource exploitation, often ignoring environmental constraints. The second, the compensatory-technological model, assumes that negative environmental effects can be offset through technological innovation and partial restoration. The third, the sustainability-oriented model, regards natural capital as a self-reproducing system whose preservation is a precondition for long-term productivity. In our view, the Ukrainian agricultural sector is at a transitional stage, combining compensatory-technological elements (such as biotechnology and breeding innovations) with an increasing orientation toward sustainability. However, the imbalance between these models indicates the need for institutional reforms and targeted incentives to accelerate the systemic shift toward the sustainability-oriented paradigm.

Conclusions

The study substantiates that natural capital consists of the "active" part of natural resources that is used to create value and the "passive" part that can potentially be used for these purposes. Taking into account the basic principles of forming the concept of "natural capital", the main principle of development of agro-industrial production should be the greening of all its components with a focus on the implementation of scientific and technological progress. To this end, it is necessary to develop a system of ideas and notions that defines goals of the development and areas of the greening of production, its focus on the use of modern developments, the improvement of relations between subjects and objects in the process of commodity exchange, the relationship between all elements of the target system and also the nature of the relationships between individual subsystems within it.

It is determined that in the development of the concept of "natural capital", a special place is taken by the component of "green economy", which is defined as a new global area of development. Greening the economy is seen as a way of promoting economic progress in ensuring environmental sustainability, where the economy is a dependent component of the natural environment.

The contemporary agrarian industry is characterized by technical and technological backwardness, low level of implementation of environmental stabilization measures as well as insufficient level of financial support, which impedes the process of implementation of environmental stabilization measures at agricultural enterprises. Insufficient financing of environmental measures leads to inadequate control of state bodies over compliance with the environmental legislation, and therefore the financing system requires improvement and search for sources of investment support. One way out of this situation is to stimulate business entities to introduce innovative technologies in the field of environmental safety and sustainable use of the environment.

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Areas to address these issues are possible in the direction of developing a national program of environmental management and improving the financing of environmental projects. In particular, solutions need to be given to the issues of the reproduction of land and water resources, the reduction of air pollution, the search for an optimal model of the correlation between effective functioning of the economic and environmental systems.

The prospects for further research center around the development of clear quantitative estimates of the cost, price and effectiveness of natural capital utilization in the agricultural sector of the economy. In particular, they involve the development of quantitative tools to measure the efficiency of natural capital use in agriculture. Promising methodological approaches include (1) cost-benefit and material flow analysis, which allows for a quantitative assessment of the balance between resource extraction and waste assimilation in agricultural production systems; (2) cost-benefit analysis and economic efficiency analysis adapted to consider the external effects of ecosystems; and (3) spatial econometric models that allow for the assessment of regional differentiation in the use of natural capital. The application of these methods will provide a descriptive and evidence-based assessment of the effectiveness of agricultural sector development within the framework of the 'natural capital' concept.

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