

Theoretical and Practical Aspects of
the Introduction of
the Low-Carbon Land Use

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The theoretical principles of introduction of low carbon land use are analyzed, which is the continuation of implementation of the strategy of low carbon economic development, as a key component of sustainable development. The systematization of factors of carbon stock changes in is carried out which is the basis an attempt of the ranking of the indicated land use principles. It is substantiated that in this way an integral balance of carbon in the mineral soils pool on agricultural lands is ensured as a condition for the restoration and preservation of agrarian resources. Also it is a way of activating the economic development of the state through the development of related industries of the economy (agro-chemistry, agro machinery-building and others).

Key Words: carbon stock change; land use; agroecological safety; land-saving measurements; agricultural land; pool of mineral soil

Introduction. The extensive way of the society economic development that is based on the raw material orientation of the production component, including the increase in agricultural production profits due to the depletion of agro-resource potential, is recognized in the world as unpromising and economically unprofitable.

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The international community is trying to adjust these processes by means of agreements and joint commitments to reduce the total level of anthropogenic pressure on the environment. One of the example is the United Nations Framework Convention on Climate Change and a number of subsequent documents. The transformation of the ideas of Rio 1992 is gaining new shape in the form of the concept of low carbon development (LCD). In the context of the UNFCCC, the LCD is usually expressed through the notion of “Low-Emission Development Strategies” (LEDS) - the LCD strategy, which in turn focuses on national long-term low carbon development strategies, and after all GHGs, and takes into account Indicators of economic development plans that include measures to mitigate climate change. The introduction of LEDs involves technological modernization of not only the production-economic complex as a separate component of the economic system, but provides for a higher level upgrade - for all components of the production stages and consumption. Ukraine has also joined these processes and is making efforts to fulfill obligations under international agreements. For example, in the key of developing a national system for greenhouse gas (GHG) inventories, the Concept for the implementation of state policy on climate change for the period up to 2030 [1] was adopted and the Strategy for Low Carbon Development of Ukraine until 2050 [2] was proposed. In this document the particular attention was paid to the need for intensification of absorption processes in the land use sector. Therefore, the introduction of a scientifically grounded of low-carbon system of measures for agricultural land using is an important issue not only from the ecological and economic point of view, which is confirmed by the dynamics of land degradation, but also from the standpoint of fulfillment of international obligations by Ukraine. The measures of low-carbon development of land using ensures an integral balance of carbon in a mineral soils pool, which opens up the potential possibility of financial and economic revenues from additional sources

to the agricultural sector through the sale of carbon absorption units. This is possible as the result of the restoration and preservation of agricultural resource potential of agricultural land.

Literature Review. The constant attention has been paid at the development of the theoretical basis for the organization process of the land use. The emphasis on theoretical substantiation has been developed in parallel with socioeconomic inquiries, which can be followed in the works of J. Feigin, K. Hoffman, V. Tregobchuk, A. Tretyak, M. Andriyshin, M. Mitsai, V. Gorchuk, O. Semikin, O. Lebedenko and others. The ways of the theoretical and methodological foundation of organization and applied aspects of ensuring the effectiveness of land use were studied by D. Babmidra, I. Bystryakov, P. Sabluk, O. Furdichko, George Boody, Vondracek Bruce, Scherr, S. J., S. Shames and R. Friedman and others. Aspects of the agricultural land market introduction were studied in the works of M. Bohyra, A. Martin, A. Ya. Sokhlich, M. Fedorov, Yong Jiang and others. Solving the problems of the LCD implementation and highlighting of the state role for GHG emissions regulating is shown in the studies M. Bereznitska, I. Gaidutckiy, N. Karaeva, A. Kitura and in others.

Aims. The aims of the publication were to substantiate the theoretical bases for the introduction of the measures of low-carbon development of land using, to establish its advantages and importance for the reproduction and preservation of agro-resource potential of the regions.

Results. The destructive effects of excessive exploitation of the natural environment have led to changes in the philosophy of the development of the system “society - the environment”, which opened the way to the formation of a new paradigm adopted in Rio 1992 [3]. This event called for the agenda and outlined the avant-garde positions of the separated direction of research that is aimed at finding theoretical of methodological substantiation and economic and applied solution of

Theoretical and Practical Aspects of the Introduction of the Low-Carbon Land Use problems of restoration and preservation of the environment and an acceptable level of environmental safety of life. The indicated ways of the transformational processes of the philosophy of the development of society contributed to the stage of a higher level of awareness of the responsibility of society before the coming generations. This entails increasing of the all-inclusiveness of the natural resources using with the requirement of simultaneous increase in the level of their savings. The search for ways to solve a given range of problems under an updated angle forces the issue of increasing producer economic responsibility. That is, shifting the emphasis of priority in the direction of maintaining an acceptable level of environmental safety in front of economic benefits, and the volume of profits from management acquire the status of equivalent importance along with the preservation of the environment. Under this condition, the indicators of profitability of agroproductions become dependent on the extent of changes in the components of the landscape under anthropogenic pressure, which creates conditions for increasing the level of capitalization of natural resources, contributes to the integrated consideration of their value in the final output of production and stimulates the involvement of economic levers to solve environmental problems, ensuring acceptable the level of agroecology and food security.

The transformation of the ideas of Rio 1992 is now gaining ground in the form of the concept of low carbon development (LCD), under which at the level of individual countries, developing and implementing national long-term strategies for the development of low carbon emissions and all GHGs. Also the indicators from economic development plans are taking into account that contain measures to mitigate climate change. The positions of developing countries and those whose economies are in a state of deep crisis with a production complex in a state of degradation are automatically increasing in this aspect (Ukraine belongs to the latter group). The advantage lies in the fact that for this group of countries the path

to modernization is shorter and cheaper, because in many cases the question is not so much modernization as creation. A balanced combination of socio-economic goals to improve the quality of life and socio-environmental demands of society give the advantages of the LEADS strategy to address these problems. A key factor of ensuring the preservation of environmental parameters, and above all the climate system, is the economic basis.

The implementation of the low carbon development strategy involves technological modernization not only of the production-economic complex as a separate component of the economic system, but also of all components of both production and consumption. The advanced technologies of a higher level open the way to the release of dependence on fossil fuels and energy resources, and in general, reduce the level of resource intensiveness of life. The reducing of the carbon fuels consumption also reduces resource dependence in other sectors of production, which makes it possible to reduce costs (in the extractive industry, which automatically entails a number of technological chains: transportation, processing, storage), and ultimately reduce the cost of final products. This approach contributes to increasing competitiveness by reducing the cost of the final product by economic parameters. This results in a synergistic effect of the implementation of the low carbon strategy: the achievement of an acceptable level of environmental safety is the result of ensuring the positive results of economic development. So, the frame of the economic profitability dependence of production on the state of the environment are outlined. Thus, the main idea of the strategy of low carbon development is balanced development of the economic complex and the country as a whole, while reducing the volumes of GHG emissions and increasing the volumes of their absorption. It is in this guiding principle that European countries form a standard of living for their citizens. After all, the economic development of the state, which is supported by the preservation of the environment, allows you to live not only

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An aspect of carbon stock changes for anthropogenic and natural ecosystems, including a mineral soils pool of agricultural lands, is a separate place in the system of low-carbon development strategy. Since carbon is a component of humus, the physical effects of carbon emissions will have similar effects that lead to humus losses that can be grouped by of mechanical, chemical, agronomic, structural and landscape features:

- mechanical - due to the cultivation of soil cover on agricultural lands with the purpose of obtaining of the commodity output of crop production;
- chemical - through the processes of erosion, the introduction of fertilizer materials, meliorants and agrochemicals;
- agronomic - due to the impact of various species and varieties of crops;
- structural-landscape - when changing the ratio of land areas.

The category of mechanical factors includes not only the processes of plowing the soil, under the influence of which violates its established balance in the state of natural ecosystems. It also matters the mechanical impact of agricultural machinery on the surface, that is, under the weight of machines, there is a consolidation of the soil environment, which leads to the destruction of humus and activates the processes of carbon release and its inflow into the air environment. It is possible to slow down these processes by minimizing the volume of plowing, and the mass of agricultural machines, as well as the use of machinery with a wide area of contact of the wheelbase with the surface of the earth.

The influence way of the chemical factors group is manifested, above all, through erosive processes, which lead to loss of humus, and, consequently, to carbon emissions. On the other hand, due to the reactions of the soil environment, the chemical factors can contribute to increasing of the carbon stock change in the mineral soil pool on agricultural lands. The prevention of the carbon stock is possible by the

introduction of an anti-erosion measures system that is aimed at intensifying absorption processes by its.

The impact of agronomic factors can be explained by the different level of anthropogenic loading on the soil environment, which is created by different types and varieties of agricultural crops, which vary with intensity of carbon stock changes. It is possible to regulate these processes by the application of scientifically based agrotechnologies of cultivation and should be noted big important in this context the crop rotation implementation.

Structural and landscape factors are identified as a separate group which have a more indirect impact. The ratio of the land areas of the territory determines the special shape of the water-climatic regime, from which depends on the qualitative characteristics of the soil cover, and above all - the stocks of humus, and, consequently, the volumes of emissions and carbon sequestration.

Due to the physical and chemical properties of the main component, humus, which is a basic component of land resources for the purpose of agricultural production, is able to change the volumes of carbon stocks. The physical and chemical processes under the anthropogenic load from human activities, have both of results a carbon emissions or their absorption. The purpose of low carbon development of agricultural land use is to ensure an integral balance of carbon in the cultivation of crops. That is, to provide such a way of production that would minimize the negative impact of these factors and direct their action to the preservation and increase of carbon stocks in mineral soils pool. It is worth noting that the division of factors into groups has a sufficient degree of conventionality in view of the synergistic effect of their interaction. The category of synergy of anthropogenic influences is closely linked to the notion of differentiation of ecological and agroecological safety of regions, when the sublimated result of the influences of all groups is not identical to the simple sum of each separately taken from them. The synergistic effect is due

Theoretical and Practical Aspects of the Introduction of the Low-Carbon Land Use to the change in the intensity of the effects of various aspects of each group of factors as a result of their complex interaction (Fig. 1).

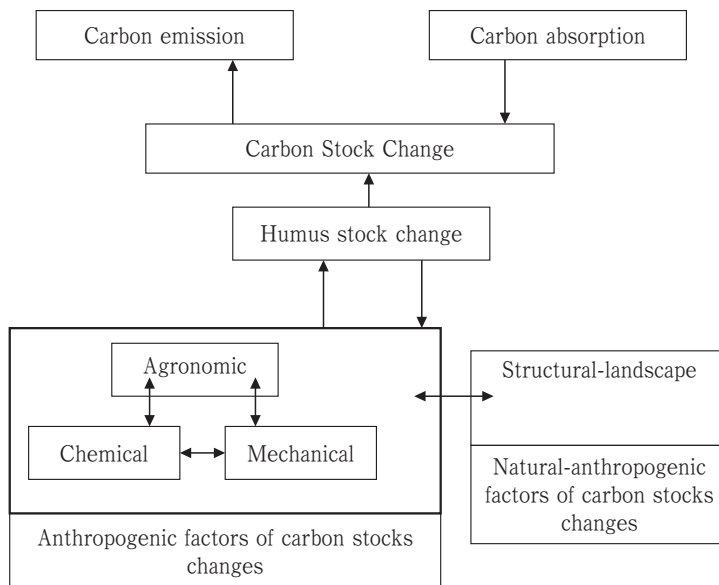


Fig. 1. Interaction of factors of carbon stocks changes in a mineral soils pool under anthropogenic influence

A clear understanding of the anthropogenic impact types on the soil cover of agricultural land, their nature and the system of interactions between the factors make it possible to manage of the carbon stock changing in mineral soils pool through the introduction of preservation measures of soil fertility in the agricultural production process. Hence it is logical that the introduction of low-carbon land use can not only ensure the restoration, conservation and increase of humus stock in the soil cover of agricultural land, but will contribute to the restoration and conservation of agro-resource potential.

The resources of the land are exhaustive both in spatial and in terms of the

constraints of all its other potentials - reserves of fossil fuels, possibilities of location of objects of social production activity. Also and in the broader sense - natural and climatic resources, in particular and the fertility of the land can be exhaustive resource too. This attribute is related to their ability to vary in time, which depends on the intensity of anthropogenic load. Preferably, such changes are destructive, up to the level of loss of land. The reason of these or because of reduction of areas as a result of flooding, or through the intensification of desertification processes, both as a result of climatic changes, and the intensification of destruction of natural landscapes due to excessive levels of anthropogenic depletion. An important feature of natural resources is their indispensability in the most cases. Therefore, in order to preserve the spatial and resource base, the organization of the life processes should be based on well-balanced approaches with the hierarchy of principles, the introduction of which will allow use these resources in the future.

The attempts to systematize of approaches to the scientific and theoretical basis are increased with the deteriorate state of agro-resource potential. On this basis, an important step are the views of O.V. Lebedenko (2010) [5, p. 13], which proposed a classification of principles for the rational use of land resources by groups:

- of an organizational nature, covering: the targeted use of land resources; priority of agricultural land use; account of zonal differences; the planning using of the land resources;
- of an economic nature: equality of all forms of ownership and management on the ground; payment of land use; the improving of the economic incentives;
- of an social nature: legality; regulatory support; responsibility for violation of the land legislation; state regulation;
- of an ecological nature: regulation of anthropogenic loading on the land; differentiated use of land; increase of soil fertility and productivity of land; land

Theoretical and Practical Aspects of the Introduction of the Low-Carbon Land Use protection.

The use of foreign experience in the organization of agricultural production and the related nature of the use and preservation of agro-resource potential is important for solving agro-ecological problems. It is significant experience of the European Union, where a Common Agricultural Policy, which is an integrated production management sector silskohospodarskoho financial and economic levers, implemented through price protection of domestic production of marketable agricultural products and direct subsidies to agricultural producers [6, p. 128] and is based on the principles of: a) granting preferences to EU agricultural producers; b) unity of the internal market and c) financial reciprocal proceeds [7]. The formation of the organizational and economic environment for the agricultural sector in the EU has a rather long history since the Treaty of Rome in 1956, which, in view of the priorities of social development in the middle of the last century, was chosen as the objectives of the Common Agricultural Policy [7], which can be considered. as the principles of organization of agricultural production:

- increase productivity of the agrarian sector through the promotion of technical progress;
- ensuring rational development of agricultural production and optimal use of factors of production;
- providing an acceptable standard of living for citizens employed in agriculture, in particular by increasing their income;
- the stabilization of agricultural markets, the protection of producers and consumers from external factors;
- guaranteeing the population of EU member states quality food at the expense of own production of agricultural products at affordable prices.

This creates the protection of the domestic market against imported products, protection against fluctuations in the international market, which guarantees the

protection of producers from bankruptcy - in case of falling international prices by more than 10%, products are guaranteed to be bought back from the producers at minimum prices of the EU. Legally secured safeguards for such protection, financial and economic protection and subsidy support are preservation of an acceptable level of fertility of agricultural lands, support of the ecological balance of regions and the general requirement of “environmental protection” implemented through the system of environmental standards for agricultural producers [8]:

- reducing the use of agricultural products, including mineral fertilizers;
 - financial and economic, organizational and administrative and regulatory and legislative support for the development of rural areas;
 - the transition to extensive methods of production in crop and livestock production;
 - provision of land for social access and rest;
 - not to cultivate land for a long time due to environmental reasons.

recognized the mitigation of the effects of agricultural production on the processes of climate change and adaptation to their consequences as a separate task for the period until 2020 until the implementation of the Common Agricultural Policy of the EU. There is a shift in emphasis in the implementation of policy on production priorities in relation to the restoration and preservation of natural resource potential of the territories of countries. Actuality is not only the problem of protection of agricultural lands, which are in use by individual producers, but also intensifies the landscape approach, which increases the importance of preserving the milestones of the components of the environment. The mechanism to support this approach is simplified and more targeted compensation, which is a mandatory basic level of environmental requirements and commitments to be followed in order to obtain full financing from the sources of the Common Agricultural Policy, which is why the combined effect of various tools is expected to be ensured. In particular,

Theoretical and Practical Aspects of the Introduction of the Low-Carbon Land Use as stated in [7, p. 6], there is a change in the principles of subsidization from estimates of agricultural production volumes to the principle of volume of land in the use of an individual producer and the system of mechanisms is involved:

- regulatory and regulatory - provides through a system of legally established requirements for achieving an acceptable level of consistency both in the production of agricultural products and human-induced environmental impacts in the process of agricultural production;
- financial support - provided by “greening” of agricultural production that is bound to comply with the financial support provided through a distributed approach “green” benefits per unit area, which is in the use of agricultural producers;
- voluntary participation with compensation for incurred losses and lost profits.

The implementation of new tools and levers of the Common Agricultural Policy in the end provides integrated environmental benefits provided that local requirements are met by individual land users and agricultural producers, due to the development of a regulatory and legislative field with a priority for the restoration and preservation of an acceptable state of the environment and the use of scientific and technical developments in the agricultural and ecological direction. Thus, a balanced agricultural development approach is being implemented in the EU countries with a focus on priorities:

- preservation of the natural environment that is close to the original state of the landscape;
- provision of an acceptable level of vital activity of the population and development of rural territories;
- preserving profitability and competitiveness of agricultural producers - residents of the EU countries in ensuring the development of education and research and innovation activities.

In our opinion, the state of the agro-resource potential of Ukraine determines the necessity to preserve the identity of the principle of the principles of restoration and preservation of soil fertility on agricultural lands, while ensuring acceptable indicators of the profitability of agribusiness activity of agricultural enterprises, which requires studying and taking into account the experience gained in agricultural production of other countries. Moreover, this does not mean the secondary role of other principles. Harmonization of the diverse interests of production and the ecological and economic demands of society necessitate not only the introduction of low carbon agricultural land use, but also preservation of agro-resource potential of the region, which should be based on the whole complex of principles of organization of land use. This has been reflected at the legislative level, in particular in the Land Code of Ukraine, Article 5 [9], which lists the basic principles of land legislation:

- combination of features of the use of land as a territorial basis, natural resource and the main means of production;
- ensuring equal rights of land ownership to citizens, legal entities, territorial communities and the state;
- State interference with the exercise of citizens, legal persons and territorial communities of their rights of possession, use and disposal of land, except in cases provided by law;
- ensuring rational use and protection of land;
- guaranteeing land rights;
- the priority of environmental safety requirements.

Thus, ensuring the preservation of the agro-resource potential of the regions, provided that an acceptable level of profitability indicators is maintained, is possible under the financial and economic responsibility of the land user / landowner for the state of qualitative characteristics of land resources that arise as a result of their

Theoretical and Practical Aspects of the Introduction of the Low-Carbon Land Use use, which contributes to raising their level of capitalization. Until recently, the cost of agro-resource potential is not fully taken into account in the process of production of commodity crop production, which makes it possible to increase profits due to the depletion of soil fertility.

Conclusions. Complex use of the approach to introducing low-carbon land use on a systematic basis provides an opportunity to determine the directions of further development of the agricultural sector with priority in the field of land management, which opens the opportunity to intensify the functions of absorption of greenhouse gases. This ensures the preservation of humus stocks, which means restoration and preservation of agro-resource potential, and conditions for implementation of programs of balanced development of the sector are created.

The formation of updated organizational and economic conditions of management based on low carbon land use enhances the financial and economic responsibility of landowners and land users for the qualitative characteristics of the soil cover of agro-oils that appear after their economic use. In addition, it contributes to the facilitation and optimization of the process of making managerial decisions in the formation of state and regional programs for the industrial development of crop production and the use and protection of agricultural land. The introduction of financial and economic levers of such a kind contributes not only to the implementation of environmental tasks, but also to stimulate the socio-economic development of the regions and contributes to overcoming the ecological and economic crisis.

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