

Geo-management in organic agriculture

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3. METHODOLOGY AND SYNERGY OF ORGANIC PRODUCTION

3.1. Methodology, mechanisms and tools for substantiation of socio-ecological and economic benefits from the implementation of organic production

Successful and stable development of society is impossible without the proper use of natural resources in the process of social production to meet the material, spiritual and health needs of people. Ukraine is developing in the direction of European integration, which requires the provision of appropriate standard of living, including food safety and nature conservation, policy and legislation improvement, the formation of proper social and managerial institutions and economic development on the basis of international cooperation. The basic guidelines for the development of the world community are sustainable development due to the implementation of sustainable nature management into practice. European Spatial Development Perspective Towards Balanced and Sustainable Development of the Territory of the European Union (ESDP, Potsdam, 1999; Principles of Sustainable Spatial Development, Hanover, 2000) states that its implementation can contribute to the protection, effective management and development of landscapes. This requires close interaction at international and interregional levels between programs concerning natural environment (NE) protection, development of culture, agriculture, social and economic policies. The exchange of experience and cooperation in conducting research in specific local and regional conditions on the improvement of landscape development should be strengthened. This requires the reorientation of the economy from classical principles into EU (96/61/EEC; IPPC Directive) principles of ecological and economic (integrated) system management with the obligatory consideration of the environmental component when using natural resources and the desire to harmonize the economic benefits with minimizing negative impact on NE and human health [1]. However, as shown by the analysis of international institutions supporting the

implementation of these goals, achieving this coordination of social, economic and environmental interests is rather difficult as a result of a number of contradictions in axiological, social, political, legal, economic and other senses [2-4].

In the program of National Academy of Agrarian Sciences of Ukraine (NAAS), the priority tasks for 2016-2020 are sustainable nature management in the agricultural sphere, as well as scientific and methodological support of the organic production development in Ukraine. It is important for increasing the ecological safety of agrarian production. Currently, most studies of anthropogenic changes in landscape ecosystems are devoted to certain structural and functional components, and not to the entire ecosystem, which makes it impossible to assess the fullness of the negative effects. Still, this problem has not been sufficiently studied at the synecological level: distribution of the consequences human activity's negative influence on the structural components of the ecosystem, taking into account its type, characteristics and ecological background [2, 5]. It does not allow effectively regulating anthropogenic impact on natural objects, which are industry resources, as well as on NE, to establish interagency cooperation on the methodological basis of sustainable development. Therefore, it is relevant to define and substantiate effective measures for harmonizing classical principles of agriculture with principles of sustainable nature management, norms of ecological and economic management, including organic production of food and livestock feeds, the formation of environmentally sustainable territories taking into account regional peculiarities of existing social, economic and environmental risks / threats, challenges of the present and changes in the demands of society.

Organic agriculture is an important component of the harmonization between two institutions of Ukraine – the agrarian sector of the economy and the Ministry of Ecology And Natural Resources Of Ukraine, which have different and usually contradictory goals (respectively, economic and environmental). And within the framework of the Ministry of Ecology And Natural Resources, the same contradictory motivation and activity strategies

are observed between two sub-institutes of environmental policy – between the environmental safety which well-developed and supported by management (in anthropocentric society oriented towards the humans) and the protection of the NE (biocentric approach). Organic production should contribute to a certain harmonization of people’s interests with activities to preserve biota of natural ecosystems, as well as the economic interests of various adjacent industries among themselves and with the institutions of ecological safety and the protection of nature.

The state and prospects of the agrarian sector development are an integral part of the activity of this ecological-economic system as a sub-system of two interconnected national systems – «economy / nature management» and «protection of NE».

Methodological bases of the complex approach to land use problems and environmental protection at the regional level, elements of the transition to sustainable development of regions, as well as methodology algorithm of ecological and economic assessment of the agricultural activity’s impact on the state of resources in agrosphere to a certain extent have already been developed within the framework of constructive and socio-economic geography, agroecology and other areas of scientific knowledge [6]. However, the main obstacle to implementing the principles of organic production in agriculture is the lack of completed programs and scientific and methodological recommendations at the national, regional and local levels that would ensure the harmonization of economic, social and environmental interests and cooperation with adjacent natural resources and environmental protection institutions.

Prerequisites for organic agriculture. The sustainable nature management plays a leading role in maintaining the constancy of total natural capital as the basic criterion for sustainable development, as well as ensuring the vital needs of mankind. Soil is a non-renewable spatial resource, and its fertility provides the population of any area with food. At the same time, it is the non-adherence to the scientifically grounded norms in agriculture (excessive intensification of production, focusing only on market demand and economic benefits, the use of pesticides and GMOs,

degradation of soils, their pollution, etc.) was almost the most significant factor of the negative impact on the natural environment, deterioration of the adjacent natural ecosystems conditions, the quality of human life, the threat to the safety of its existence [7-14]. In these conditions, the risks of contamination in food chains, the decline in the quality of agricultural production have increased significantly. Therefore, during the last 30 years, the increase of safety and quality of food has become especially relevant. These indicators are currently one of the main factors of internal and external competitiveness of agricultural production, its compliance with international principles of sustainable development. Eco friendly products, first of all, are necessary for children's, medical and preventive nutrition. Therefore, an increasing share of society, especially in developed countries, is converting into consumption of only these products, the logo of which rapidly conquers the information space. According to the International Federation of Organic Agriculture Movements (IFOAM), in the global food market, the segment of organic production grows on 20-25% each year, forecasting that in 2020 it can reach \$200-250 billion, although the cost of organic products on 20-30% higher compared to traditional and intensive agronomic products [15].

Consequently, due to the growing demand for organic production in the world and internal markets, there is a need for the development of efficient technologies for the cultivation of organic crops.

The essence of organic production, potential environmental, social and economic risks / threats, the potential to overcome or minimize them. By IFOAM «Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved». [15].

In Ukraine organic production is regulated by the law: The Law of Ukraine «On the Production and Circulation of Organic Agricultural Products and Raw Materials» No. 425-VII dated

September 3, 2013 (this Law is valid in Ukraine until August 2, 2019); The Law of Ukraine «On general principles and standards of organic production, circulation and labelling the organic product» No. 2496-VIII dated July 10, 2018; the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Detailed Rules for the Production of Organic Products (Raw Materials) of Plant Origin» No. 587 dated August 31, 2016; the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Detailed Rules for the Production of Organic Products (Raw Materials) of Animal Origin» No. 241 dated March 30, 2016; the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Detailed Rules for the Production of Organic Products (Raw Materials) of Beekeeping» No. 208 dated March 23, 2016; the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Detailed Rules for the Production of Organic Marine Algae» No. 980 dated September 30, 2015; the Decree of the Cabinet of Ministers of Ukraine «On approval of the Concept of the State target program of development of the agricultural sector for the period 2020» No. 1437-p dated December 30, 2015, etc. Ukraine also uses the EU legislation: Regulations 834/2007, 889/2008 and others.

The motivation, potential and prospects for the organic production development in the world and in Ukraine is that organic agriculture provides a harmonious social, economic and environmental effect: the use of natural mechanisms of soil formation and fertility, the ecologically coherent use of land resources, their preservation from depression, enhancement the quality of food, the creation of additional jobs in the countryside, etc. [16-19]. Organic production uses materials and technologies that improve the ecological balance in agrarian and adjacent ecosystems and promote the creation of a favorable interaction between them, the formation of sustainable agro-landscapes, and in general – of the agro-landscape sphere [3, 12, 13, 14, 20-26]. Due to better use of natural mechanisms of soil formation, refusing from pesticides, lower using of fuel, expensive fertilizers, optimization of plant protection systems and agrotechnical methods, organic production ensures reproduction of soil fertility and stable development of cultural agrocenoses [16, 27-29]. That is, it allows

one to achieve simultaneously greater economic, social and environmental effects, which is one of the basic goals of sustainable nature management [2, 4, 6, 13, 18, 20, 30-32].

The concept of organic agricultural production is based on three principal building blocks. The social block is driven by the rapid increase in consumers' demands for food quality, especially for children, medical and preventive food in the conditions of everyday pollution; ecological consciousness of society; improving the well-being of the rural population by diversifying this activity; increase of employment level and creation of proper conditions for developing rural regions. The ecological block consists in activating natural mechanisms and increasing the soil fertility; more effective use of agro-climatic potential of certain territories (ecotope); biological methods of plants and animals protection from harmful organisms – pests (insects, diseases and competitors of plants – weeds); the desire to preserve biodiversity of the ecosystem, which increases their ability to self-regulation, self-improvement and self-development; protection of agro ecosystems and NE. The economic block focuses on the potential capacity of developing effective and sustainable ecological and economic technologies of organic production and the forecast of increasing market demand for organic products, increasing its competitiveness in conditions of improving people's living standards and their purchasing capability. When refusing to use pesticides in the system of plant protection, the exclusion of chemical fertilizers, GMOs and preservatives, it is possible to significantly reduce the expenditure of production resources, production costs and at the same time to reduce the negative impact on agroecosystems, NE, and promote their conservation. This coordination of economic and environmental components of technology meets the principles of the social request for environmental safety and environmental nature management; it prompts consumers to the willingness to pay a higher price for organic products gained with the harmonized adherence to the norms of human safety and conservation standards [3, 13, 18, 21, 30-32].

Thus, organic farming is an environmentally-friendly, multifunctional and integrated model of organic production that is

based on a parity and sustainable compliance with environmental, economic and social interests and requirements and provides a dynamic balance of the structural components of the agro-sphere, its sustainable development (Fig. 1). The importance of organic production for sustainable development is also considered by other researchers [4, 13, 21, 31-39].

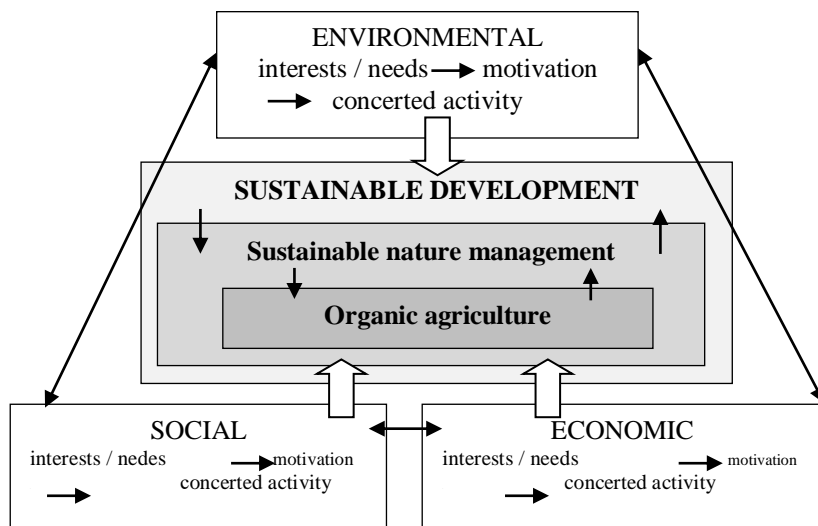


Fig. 3.1. Organic agriculture as an important component of sustainable nature management and sustainable development of the agrosphere

Organic agriculture harmoniously ensures an increase in the efficiency of the agrarian sector of the economy, raising the level and life quality of people by preserving the development and maintenance of the state and ecological role of agro-ecosystems and NE. These principles of organic agriculture require the appropriate restructuring of technological cycles of agricultural products, system of agro-technical measures and the replacement of intensive management by integrated. For organic farming, there are three groups of potential risks (environmental, social and economic threats, Fig. 2) [40, 41]. Economic risks / threats are an integral consequence of social and environmental factors [19, 42].

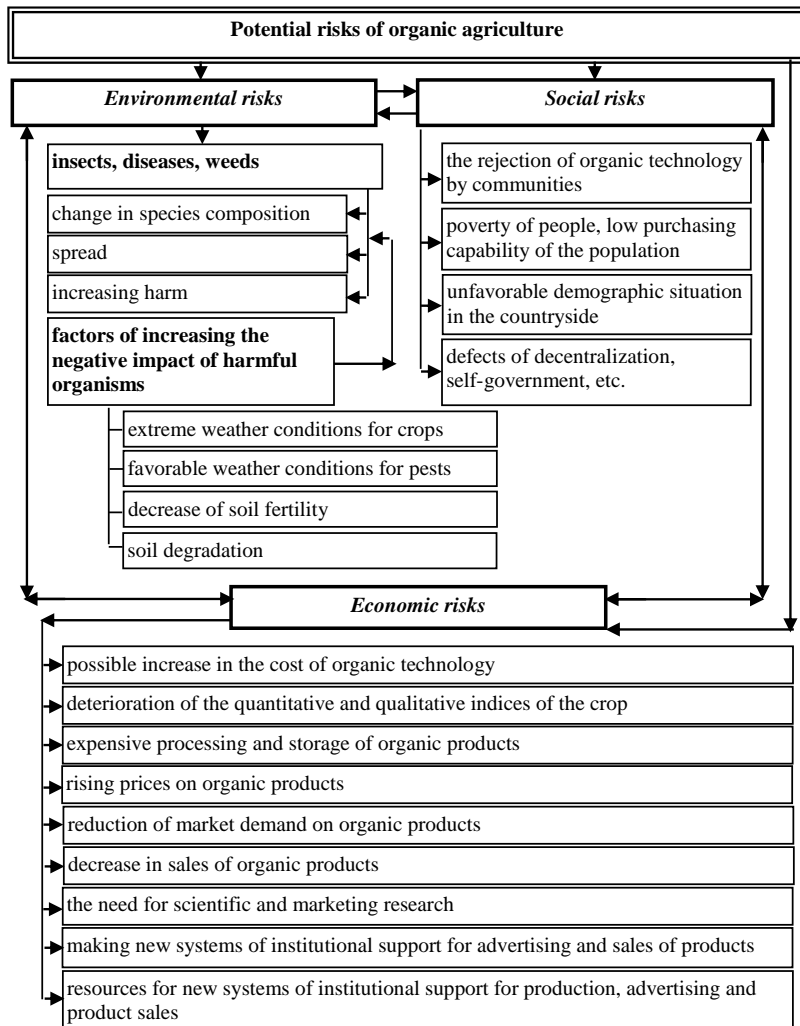


Fig. 3.2. Factors of environmental, social and economic risks of organic agriculture and their interdependence [social and economic risks – taking into account 18, 19, 36, 42-45]

An analysis of the available practices in Ukraine shows that there is a scientific and methodological potential and practical

experience in overcoming or minimizing the mentioned risks [9, 10, 13, 17, 18, 24, 25, 30, 36, 37, 42, 44, 46-48].

Currently, there are selection and genetic methods for increasing the competitiveness of varieties and hybrids of agricultural crops relative to weeds, biological resistance to phytophages, pathogens and adverse abiotic factors [12, 49]. There are known principles for replacing plant protection chemical methods on biological, using special agrotechnological measures (crop rotation, fertilizer system, sowing date, cultivating soil and agrocenoses, mechanical care, selection of stable varieties and hybrids) [50, 51]. It is likely that the biological and economic efficiency of these measures can be greatly improved with systemically agreed time and space of application, taking into account the effects of summation and synergy [52].

An important and complex issue of organic production is the supplying agricultural crops with sufficient quantities of nutrients without the use of synthetic mineral fertilizers. Renewable resources, siderates, by-products of plant growing, organic fertilizers, etc. can play a leading role in this [53]. Siderates, cover crops, as well as bacterial preparations and growth stimulators are used to suppress and displace weeds, pests and pathogens. To do this, adjustments must be made in the management of soil fertility, taking into account their biological activity, the degree of the soil biota pool's transformation / depression, the unbalance of nutrients, the natural conditions and the intended use [54]. Equally important is the search of new biological preparations with fungicidal and insecticidal properties, the combination of their use for pre-sowing seed treatment and croptreatment during vegetation.

So far, the potential of optimizing the biological nutrition of crops, achieving the proper balance of NPK, other nutrients in the soil, and the content of microelements has not been fully exploited [55]. Such coordinated use of these environmental techniques with promising biological and agrochemical means can not only reduce the cost of production and obtain quality organic food and eco-friendly feed for livestock with a rich variety of valuable herbs, it will also contribute to the reproduction of soil fertility.

Consequently, the development of organic agricultural production is now one of the most promising agrarian sectors in the world. The switchover agriculture to the principles of organic production in many developed countries already has the appropriate regulatory framework, proper resource and institutional support. Therefore, Ukraine should use existing experience on the basis of international cooperation.

Status, problems and perspectives of Ukraine regarding the development of organic agriculture. Ukraine has good natural conditions for organic production – a favourable climate and fertile lands, which have created a high agroecological potential and provide high yields of agricultural crops. The society already has a widespread motivation to switch to organic food and demand for it [17, 18, 30, 44, 56].

According to the most methodological principles, the concept of organic agricultural production corresponds to the current legislative framework of Ukraine. Nowadays agrarian policy in Ukraine is aimed at ensuring food security of the country, creating favourable conditions for the development of competitive agricultural production, and transferring it to market principles. As stated by the Strategy for the agrarian sector of the economy for the period up to 2020, food security is given a leading place among the priority activities. It is based on promoting the development of organic agriculture as a solving a number of environmental problems, creating additional capital, increasing the investment attractiveness of the state and its competitiveness in the foreign market. Environmentally safe areas that can be used for organic production have already been allocated on agricultural lands. However, to ensure the successful development of organic agriculture, a systematic approach to inter-industries cooperation is required on an agreed methodological basis.

Our country takes an active part in the EU programs to implement the principles of sustainable development, its spatial, landscape-ecological, environmental strategies, ecological and economic management in the agrarian sector, including organic production. However, agricultural production in the prevailing territory of Ukraine is still carried out on a classic basis of

traditional and intensive production using a plant protection system, which contains pesticides, synthetic mineral fertilizers, which is contrary to the requirements of organic farming. Abandoned premises of fertilizers and pesticides storage in former collective farms increase potential environmental hazards for humans and NE.

It should be emphasized that environmental land use is one of the prerequisites for sustainable development of the agrosphere and society. Unfortunately, nowadays in Ukraine, as in most countries of the world, the ascendancy of material values (in comparison with environmental and spiritual) makes economic priorities dominated other motivations that destroy the foundations of nature and human's life. In societies of a market economy, they are the determining benchmark for choosing the priorities of the certain industries development, targeting consumers' demand. Compared to demand for food, demand for environmental functions of natural objects, including land (which the world community has already recognized as a commodity), as well as other non-raw values of natural resources, is scanty or absent at all. This is based on the lack of proper methods for assessing non-raw materials, including ecological resources due to the complexity of this work, insufficient public demand and weak motivation of the governing bodies. This is a negative background for the formation and development of organic agricultural production.

To reduce the intensity of land degradation and other related disadvantages, the implementation of the sustainable land use principles, NAAS of Ukraine identified the priority tasks of agrarian science for 2016-2020. Among them are sustainable nature management in agro-sphere, the formation of sustainable agro-landscapes and scientific and methodological support for the organic production development. Selection of special raw-material zones in the land fund, territories suitable for organic production, improvement of the regulatory and legislation, the institutional support system, and the growth of proper motivation of the management subjects should facilitate the acceleration of the organic agriculture distribution.

According to statistics [57], Ukraine has significant potential of organic agricultural production, as well as growth of its

consumption in the internal market and exports. This is evidenced by the 24th place that Ukraine has among the world's organic leaders by the volume of certified agricultural lands (289 thousand hectares). The share of these areas (in 2017) is 0.67% of the total agricultural lands in the country.

According to the Ministry of Agrarian Policy and Food of Ukraine, this branch will become one of the priorities mentioned in the Strategy for agriculture and rural development 2015–2020. Ukrainian organic products, in particular, cereals, juices, syrups, jam, honey, meat and dairy products are already actively filling the internal market and beginning to win European markets. Organic Federation of Ukraine states that Ukraine produces more than 400 organic products, 90% of which are exported to 40 countries, mainly to the Netherlands, Germany and the United Kingdom. These are cereals – corn, wheat, barley; oil – sunflower; as well as beans, wild berries, mushrooms, nuts and herbs. According to FiBL and IFOAM [57, 58], in 2017 organic exports from Ukraine reached 264 thousand tons for \$ 90 million. In 2018, 300 tons of organic honey and more than 400 tons of frozen raspberries were exported; export of organic sunflower oil was increased. Deddens Agro Ltd is already dominated the Ukrainian market producing organic sugar (more than 800 tons).

Until February 2019, for the certification organic products from Ukraine, 18 international bodies have been accredited (EU Regulation 1235/2008). Most organic operators in Ukraine are certified according to EU Regulations 834/2007 and 889/2008, which are used both for export and for the internal market [58].

Methodological (scientific and methodical) principles and problems of organic production. Nowadays world agrarian production is based on the concepts of innovative, competitive organic agricultural products, adaptive agriculture and sustainable spatial development that require transparency, responsibility and co-ordinated cooperation. Organic farming to some extent meets these requirements, because it is oriented on harmonious observance of the principles for preserving the people's health, environmental management, equity of interests (distribution of benefits) and the principle of care. This dynamic system of

interdependent components of management and control is the ethical basis of activity. Therefore, foundations of sustainable development should be the methodological basis for the implementation of organic production (see Fig. 3.1).

On the basis of cooperation between FIBL, Institute of Agroecology and Environmental Management of NAAS (Skvyra research station for organic production) and Bila Tserkva National Agrarian University in the framework of fundamental research 03.03.00.05F (SR No. 0111U003790) during 2016-2020 we develop scientific and methodological approach for the formation of sustainable organic agro-ecosystems. The research is made on the main groups of agricultural crops in the conditions of the Right Bank Forest-Steppe. From 2013 Skvyra research station for organic production is the only one in Ukraine certified testing ground among the institutions of NAAS for demonstration organic production technologies and educational process.

Organic agriculture has ecological properties as it should be based on the principles of natural ecosystems, their productivity and sustainability, and the cycles of their development, ensuring coexistence with them and supporting them by environmental production and anthropogenic load within the limits of norms (nature resource potential and the limits of environmental sustainability of a certain ecosystem, landscape or territory). That is, production should be based on the ecological processes of certain types of ecosystems (agroecosystems, hydroecosystems, ecosystems of farms, etc.) and processing should be as close to nature as possible.

To ensure the harmonization of the economy and environmental requirements, organic agriculture management must be adapted to the ecological conditions of territories (taxa of territorial and administrative division, local landscapes, agroecosystems, and artificial production premises). The problem of harmonizing social, economic and environmental requirements is that the taxonomy of the administrative division of territories (including the territory of certain enterprises) does not coincide with the territories of certain landscapes, catchment areas or ecosystems, but they are only their share. This greatly complicates

ecosystem management and minimization of negative impact on the natural environment [2, 6].

State should also focus on the social aspects of changing agricultural technology and its environment, since local communities, especially rural and village, are currently at the initial stage of self-identification, formation and development program's activities in a context of decentralization, negative effects of changing land ownership patterns (shortcomings of land reform, land market, etc.), lack of qualified specialists and high-quality management.

The current unfavourable demographic situation in the countryside (unstable political situation, loss of motivation for development at the place of residence, departure of young people, reduction of senior citizens, etc.) led to a sharp decrease in labour resources in rural areas, which complicates the development of communities and the introduction of new ideas including the implementation of organic food production. Therefore, it is to be expected that the indicated changes in the norms of agricultural technologies can be perceived ambiguously – as a consequence of modern processes of demographic, socio-economic and ethno-social nature, especially in depressed regions (for example, Polissya, Carpathians). It would be desirable to expect that the implementation of organic land management will contribute to the solution of these problems in the countryside, but executive authorities and non-governmental organizations that are involved in this activity should take an active part in its implementation.

To create favourable conditions for biological, organic and other environment oriented agricultural methods aimed at efficient and sustainable use of land resources, their protection, preservation and reproduction of land fertility, it is necessary to put into practice the landscape and environmental principles of nature management, to ensure that the owners respect the classical principles of agriculture (contour, adaptive-landscape), stable functioning of agro-ecosystems and agro-landscapes. In Ukraine, there is already groundwork for strategic directions and mechanisms for implementation principles of sustainable nature management, integrated solution of food safety problems by means of

conservation of land resources, increase of soil fertility, optimization of agricultural technologies, formation of environment stable agro-landscapes, landscape-ecological optimization of protective forest plantations, harmonization of environment-users and environment-guards interests in catchment areas and transition of agriculture to sustainable development as a mechanism of system implementation these standards into practice and cooperation on these issues.

However, under the anthropocentric paradigm of rational nature management, conflicts of social, economic and especially environmental values, relevant motives of activity, regulatory and legal bases and action of social activity at different hierarchical levels of management and cooperation are still occurring. They are particularly exacerbated in competitive market conditions under the economic interests' globalization on the background of degradation values of the society development, in the transition period of state formation, imbalance of legislation branches, ignoring subjects of legislative requirements regarding the activity, ineffective use of existing regulatory mechanisms of governance, etc. [2, 6]. So far, some issues are still without due regard: problems about increasing the number and intensification of environmental, economic and social risks in organic agriculture; the dynamics of these threats in space (from agrarian lands to agrosphere) and time; identification and evaluation the effects of their overlay (summation, synergy) and their environmental, economic and social consequences; characteristics of potential changes in agroecosystems at different levels of their organization in farms, agrolandscapes, ecotones between them and ecosystems; biodiversity conservation, etc. [42].

The refusal from an important component (the classical system of plant protection) in organic farming results in at least five risk groups: harmful insects' activation, crop diseases, weeds, change in the quantity and quality of yield, production efficiency [40]. These problems will be manifested differently, depending on the weather conditions, the type of crops and their cultivation technologies. To solve them requires research on the basis of sustainable development (system harmonization of social, economic and environmental imperatives/interests/principles), systemology

(interdisciplinary approach and analysis). In order to align various interests, integrated management is needed: inter-industrial and inter-sectoral cooperation, economic and natural resource management on ecosystem basis.

At present, the theoretical and practical problems of successful implementation of organic production are actively being studied by scientific and expert groups of Ukraine. There is criticism about the lack of scientific substantiation of organic farming, the total prohibition of almost all synthetic fertilizers and pesticides [59]. There are still debates regarding the full value of yield in organic production, the protection of agricultural crops from insects, diseases and weeds, the selection of resistant varieties and hybrids to changed environmental conditions, etc. Lack of knowledge on these issues significantly inhibits the spread of organic movement in Ukraine, implementation of organic agricultural production for food and feed for livestock.

Implementation principles of organic production into practice should be carried out when developing regional (at the district level) and local programs of socio-economic development, following the «Concept of Sustainable Development of Agro-Ecosystems in Ukraine for the period until 2025». Social, economic and environmental interests need to be harmonized on the basis of system analysis of the situation on specific territories, the conditions of the activities of certain enterprises, the principles of mutually beneficial and transparent cooperation, environmental and economic management of natural resources and the associated social, economic and environmental threats.

Thus, organic production of food and feed for livestock is a strategically important direction for Ukraine, which it implements in the context of European integration and harmonization of social and economic standards. Therefore, organic agriculture should be considered not only as a new direction of activity of the agrarian sector, but also on the methodological basis of sustainable development and sustainable nature management, defined by international documents ratified by Ukraine and corresponding commitments. From this perspective, organic agricultural production is an important component of the harmonization of the

agrarian sector of the economy and the Ministry of Ecology And Natural Resources Of Ukraine, as well as the human security and the protection of NE. The motivation, goals, programs and methods of these institutions are significantly different and often contradictory. Therefore, under the prevailing anthropocentric paradigm in Ukraine, implementation of the sustainable nature management principles and greening the economy are inhibited, which hinders the implementation and programs of organic production.

Ukraine is currently in the first stage of the formation proper legislation, institutional and resource support for the implementation organic farming standards into practice. There is a hope that it will promote a certain harmonization of the man's interests and the economic interests of various adjacent to organic farming sectors among themselves, as well as with human security and environmental institutions. To achieve this goal, it is necessary to reorient the model of the agrarian sector of Ukraine from the economic bases to the environmental-economic, wider implementation of the integrated management principles in agriculture. Effective development of the agrarian industrial complex in this direction is still hampered by the lack of favourable motivational atmosphere in the relations between consumers of organic agricultural products and land use subjects, between organic enterprises and environmental institutions, between the central and local executive authorities, and between adjacent farms. The basic obstacle to establishing an agreed co-operation between these subjects is a deep conflict of social, economic and environmental interests that manifests itself in all sectors and levels of governance in the «society-nature» relationship for a number of reasons: the consequences of a system crisis in the transition period of state creation; negative consequences of land reform; deterioration of the social structure of the rural population; disadvantages of the agricultural product market; the contradiction between the impoverishment of the population and the increase in the cost of the subsistence minimum, including prices for organic products; current unfavourable social-political processes, etc.

In order to achieve proper and qualitative implementation of organic agricultural production into practice, there is a need in harmonization of normative documents, norms and rules with international standards, veterinary and sanitary requirements, which determine or extend the requirements for organic products and raw materials, as well as instructions and recommendations for food products and conformity assessment procedures. It is worthwhile to start with the creation of an optimal structural-functional organization and spatial-temporal structure of agro-landscapes – to optimize the ratio of land plots which have special purpose use (arable land, natural fodder, wetlands and protective forest plantations), as well as to adhere already tested positive practices of adaptive-landscape, landscape-ecological nature management on ecosystem-based inter-industry cooperation with parity agreement of social, economic and environmental interests.

In general, to create favourable conditions in Ukraine for transition of agrarian sector to the organic production framework, it is necessary first to create the proper regulatory, managerial and legislative basis for the transfer to sustainable development of the agrosphere, which would increase the motivation for the expansion and development of such activities and increase the flow of necessary innovations and resources. The following tasks must be solved: adoption of the Concept and Strategy of Sustainable Development of the State and the branches of the economy (taking into account organic production), as well as creation of a coherent system of legislation in this area; reduction of poverty, outflow of youth from village to city and abroad, minimization of other processes concerning to society development degradation; decentralization and promotion of the civil society formation; partnership between the branches of power at the local, regional and state levels; implementation of an effective economic mechanism for systematic harmonization of nature, land use and environmental management; improvement of procedures for access to information on state and dynamics of NE and people's health; ensuring cross-sectoral and interagency harmonization of actions taking into account interests of all social groups on the basis of partnership between the authorities, citizens and public associations, and the private sector.

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3.2. Rent approach to ecological and economic assessment of the value of organic land

The socio-ecological and economic development, in particular, the agricultural sector, depends on the process of building land relations, which is one of the decisive factors in land transformation and land system.

The new land use model needs to take into account the integral potential of the territory, conservation, rational use and reproduction of all resources in the corresponding area. Land use should be considered in accordance with the considerations of A.M. Tretiak, which invests in the concept of «land» the whole ecological system in which the land is located, namely the complex of factors of the environment, natural conditions of production, which determine the growth and development of plants, the conditions of agricultural land use [1, p. 94].

The main objective of the current stage of land reform is to strengthen the stimulating and regulatory function of the economic mechanism of agrarian land use, the main components of which are rental relations, economic evaluation of land, land payment,

increase its efficiency and transition to an ecologically oriented model of land use.

Environmental resources need to be used most rationally and profitable, while preserving them for the future. This use should be based on the understanding of both natural conditions and types of land use. Achieving such an understanding and comparing the most promising types of land use is a function of land valuation.

Land quality evaluation is the basis of economic and cadastral evaluation. Land evaluation - definition of land productivity for its use for these purposes. It implies the implementation and interpretation of fundamental research on climate, soils, vegetation, pollution and other aspects of land in terms of requirements of alternative forms of land use, as well as the obtaining of a comprehensive land characteristics according to their level of fertility and production efficiency based on standard land characteristics.

The basis for valuation the quality of land is the information on natural land characteristics (natural vegetation, soil, climatic, relief properties, etc.) contained in soil, geobotanical and other materials of surveys and surveys, as well as in other sources.

Land valuation goals. The valuation of the land may be due to the current productivity of the land. However, this often entails changes and their consequences: in the use of land, and in some cases in the land itself.

The valuation takes into account the type of management of the enterprises concerned, the social consequences for the population of the region and country, the favorable or unfavorable state of the environment. Thus, the valuation of the land should include the following issues:

- the current state of the land plot;
- types of land use that are physically possible, economically and socially meaningful;
- adverse physical, economic and social consequences associated with the use of land;
- possible and necessary changes in the state of land;
- necessary measures to achieve the desired production and minimize the negative consequences;
- the benefits of each form of ownership for land use.

- costs for implementing changes.

The economic valuation of land masses on the basis of the account of the qualitative state of soil, its functions serves as a basis for assessing a more realistic price for soils, which due to the inefficient use of these natural resources is significantly lost.

A valuation of the ecological state of the land should include the study of all options for reducing the level of soil productivity and accordingly, based on the processed data, influence the value of the monetary valuation of land use.

The evaluation process provides information on which decisions can be made. The environmental and economic valuation should include the calculation of potential costs that may include:

- the cost of lost products as a result of pollution, depletion and use of natural resources, as well as the costs of disinfection and control of pollution;
- additional expenses, which are caused not by the complex use of raw materials, insurance and health care.

The cultivation of organic products is carried out on agricultural lands, which implies that the analysis of the cost of lease/purchase and sale of land under this type of alternative farming takes place on the basis of the calculation of land rent. Land rent is an expression the a certain amount of money, which the landowner annually saves from the proceeds from the lease of land [2, p.172-173].

Land rent of organic land and lands transformed into organic includes the calculation of income based on the taking into account:

a) Absolute Rents – a form of land rent, which is must payed to the owner for any plot of land, regardless of its fertility and location. In absolute rent, the landlord receives income as a result of the permission to capitalize on the land plot, regardless of the soil fertility;

6) Differential rent I introduced by K. Marx, which determines the production of the product by the investor on more productive lands (organic land, by its characteristics, is already more productive than the usual land plot) and the receipt of additional profits or leases on this land. This rent, of course, varies depending on the general supply and demand for agricultural crops and the ruling market price of the products. As for land plots that are only planning to be transformed into the organic category, the differential rent and type should be

clearly used in calculating their value, due to the emergence of different levels of suitability of land for transformation. And of course, better quality land, less contaminated, will require less costs to bring them to a natural state;

b) the actual amount of additional costs invested in improving the quality of the land parcel and called the Differential rent II, which determines the increase in production, avoiding changes in the size of land plots. Thus, the process of improving the qualitative components of the soil cover on the land mass, resulting in the average costs of production in such areas are reduced and creates a profit;

r) Ecological rent, which significantly affects the quality and safety of products and, accordingly, depends on the ecological cleanliness of the land mass, in particular the environmental quality of the indicators determined by the agrochemical passport. However, all indicators can not be taken into account, as a result of which it is necessary to determine a typical list of pollutants, which will allow the assessment of eligible land to be converted into organic.

An analysis of the rent formation mechanism after the calculation of the land plots comparison of different quality was presented in the monograph by L. Ye. Kupinets [3, p. 352], proceeding from the demand for organic products and insignificantly undoing the production costs of low quality land and organic land. The rent of the latter far exceeds the rent of other types of plots. Similar indicators testify to the need to introduce environmental rent as such.

The methodological approach, taking into account the quality of land, which provides an valuation of the soil-climatic conditions, can also be seen in the researches by Sharyi G.I. [4, p. 93]. This methodical approach adequately carries out a classification division between lands and their quality. The underlying factors in the assessment are soil factors that affect fertility. Otherwise, the formation of land rent occurs in relation to the cost of production and transport, as a result of the existence of restrictions that lead to the emergence of marginal costs. It is determined that to use the appropriate approach it is necessary to have a factor (criterion) in order to characterize the mechanism of cost formation.

The elaboration of criteria for calculating environmental rent may include both the data of agrochemical passports and indicators

of environmental risks, degree of pollution, which can also bring significant changes in the future use of the land, the yield fluctuations and, accordingly, the income from the resulting products [5, p. 481, 6, p. 46].

The degree of contamination of the territory included in the ecological component of the rent can be estimated separately for each of the pollutants by the following indicators: the concentration factor or the MPC, with the fact that the concentration coefficient K_c , according to experts [7, p. 110], it is possible to calculate relative to the natural regional-background content of a certain chemical element in the corresponding component – soils, waters, etc.

In calculating the rent of land masses, which are only subject to conversion to organic, the necessary condition is the inclusion of the cost of measures of transitional period of creation from the ordinary land to the organic. These include: surveying, pre-planting soil preparation, removal of contaminated substances with the help of innovative technologies, consolidation of homogeneous quality characteristics of land masses, reducing the risks on the land mass, waiting for a three-year transition period of the «rest» of the land, planting of crops, caring for crops, plant protection, other work and costs.

The best option for the assessment of organic land is the methodological approach, which is based on the capitalization of rental income and the most effective use, that is, physically possible and economically expedient use of land and/or land improvements in accordance with the law [8, p. 11].

The rent generated by the use of land of better quality and location will be the difference between the expected income from production, production costs and the profit of the producer and will be the source of the land tax.

Land price is a capitalized land rent, which is characterized by the ratio of the value of land rent and the loan interest rate. The ecological rent is identified as part of the land rent as part of the additional income received by the land user from the ecologically safe land [9, p. 352-360]. It follows that the growth of land rent, including ecological, will lead to the equality of other conditions to increase the effective indicator, that is, the price of land. Calculation of land rent of

organic land (LR_{ol}) and land subject to transformation into organic (LR_{tol}) can be represented as follows:

$$LR_{ol} = \Delta P_{(I+II)}, \quad (3.1)$$

$$LR_{tol} = AR + DR_{(I)} + DR_{(II)}, \quad (3.2)$$

where DR – differential rent; AR – absolute rents.

The valuation requires comparing the benefits and resources needed for different types of land. Land itself requires the production potential, and conservation of nature requires the adoption of measures to protect it. Suitability for separate use of land use is valued by comparing the benefits: environmental, land use, land costs, environmental costs, reimbursements, fines, costs for social improvement, reimbursement, treatment, labor, fertilizers and road construction and requires the use of a land improvement factor ($K_{\text{improvement of land}} = K_{\text{environmental improvement}} \cdot K_{\text{economic improvement}} \cdot K_{\text{social improvement}}$ (table 3.1):

$$K_{\text{improvement of land}} = K_{\text{environmental improvement}} \cdot K_{\text{economic improvement}} \cdot K_{\text{social improvement}} \quad (3.3)$$

$$K_{\text{economic improvement}} = S_{\text{benefits from land use}} / S_{\text{costs of land maintenance}} \quad (3.4)$$

$$K_{\text{environmental improvement}} = S_{\text{monetary assessments of environmental benefits}} / S_{\text{monetary assessments of environmental costs, reimbursement, fines}} \quad (3.5)$$

$$K_{\text{social improvement}} = S_{\text{monetary assessments of the improvement of the habitat}} / S_{\text{monetary cost estimates for basic costs}} \quad (3.6)$$

Based on this, the environmental rent can be calculated according to the formula:

$$ER_{ol} = (DR_{(I+II)}) \cdot K_{\text{improvement of land}} \quad (3.7)$$

$$ER_{tol} = (AR + DR_{(I+II)}) \cdot K_{\text{improvement of land}}, \quad (3.8)$$

Since it is a question of organic land massifs or of land that is subject to transformation into organic, it will not interfere in the evaluation, to distribute land by classes of purity on the basis of a ballpoint valuation of the ecological purity of the site (P_{ec}) [10], which includes levels of contamination by radionuclides, pesticides and other organic substances, heavy metals and other harmful substances with respect to

Table 3.1

Example of calculation of land improvement coefficients

| Formulas for calculating the coefficients of improvement of land | S _{benefits from land use, UAH.} | S _{cost of land maintenance, UAH} | Coefficient |
|---|---|--|-------------|
| $K_{\text{economic improvement}} = S_{\text{benefits from land use}} / S_{\text{costs of land maintenance}}$ (The effect of improving product quality) | 122400,00 | 27592,00 | 4,44 |
| $K_{\text{environmental improvement}} = S_{\text{monetary assessments of environmental benefits}} / S_{\text{monetary assessments of environmental costs, reimbursement, fines}}$ (The effect of increasing the profitability of production) | S _{monetary assessments of environmental benefit, UAH.} | S _{monetary assessments of environmental costs, reimbursement, fines, UAH.} | Coefficient |
| | 246500,80 | 717392,00 | 0,34 |
| $K_{\text{social improvement}} = S_{\text{monetary assessments of the improvement of the habitat}} / S_{\text{monetary cost estimates for basic costs}}$ (The effect of increasing employment, which is reflected in the cost of jobs) | S _{monetary assessments of the improvement of the habitat, UAH.} | S _{monetary cost estimates for basic costs, UAH.} | Coefficient |
| | 1865,00 | 2115,00 | 1,13 |
| $K_{\text{improvement of land}} = K_{\text{environmental improvement}} \cdot K_{\text{economic improvement}} \cdot K_{\text{social improvement}}$ | 1,73 | | |

Notes: S_{benefits from land use} – expected income from products UAH/ha; S_{costs of land maintenance} – production costs, UAH/ha; S_{monetary assessments of environmental benefits} – the profit of the producer from the receipt of products from the organic site; S_{monetary assessments of environmental costs, reimbursements, fines} – producer costs, calculated on the total area of the plot; S_{monetary assessments of the improvement of the habitat} – the cost of creating additional jobs; S_{monetary cost estimates for basic costs} – basic costs for existing jobs.

their maximum Permissible values. Point of environmental cleanliness of the site (*Pec*) can be calculated (table 3.2) by the formula:

$$P_{ec} = K_1 \cdot K_2 \cdot \dots \cdot K_i, \quad (3.9)$$

where K_i – the coefficient shows the ratio of the reference value to the actual value of the pollution indicator.

Different types of land use have different requirements. For example, alluvial floodplains can be well suited for rice cultivation, but not for other crops. The notion of land suitability makes sense only

from the point of view of specific types of land use with its requirements, for example, soil moisture, depth of the root system, etc. Properties of each type of land, such as the presence of moisture or the possibility of flood, are compared with the requirements and use as organic and suitable for such. Thus, the necessary condition for land valuation is the introduction of a point of

Table 3.2

Example of calculation the point of environmental cleanliness of the site

| | Pollutants | The content of pollutants | MPC | MPC/content on site |
|----------|-------------------|---------------------------|------|---------------------|
| K_1 | Cd | 0,33 | 2 | 0,17 |
| K_2 | Pb | 11,65 | 60 | 0,19 |
| K_3 | ^{137}Cs | 0,072 | 0,15 | 0,48 |
| K_4 | ^{90}Sr | 0,007 | 1 | 0,01 |
| K_5 | ДДТ | 0,001 | 0,1 | 0,01 |
| K_6 | 2,4 D-amine salt | 0,002 | 0,25 | 0,01 |
| P_{ec} | 1,00 | | | |

Source: calculated using [11].

eligibility of a land plot for use as an organic (P_e). Point of eligibility the land plot for its use as organic consists the product of the coefficients of the degree of loss of humus and nutrients, recoil, swelling and peeling, water erosion, acidification, waterlogging, wind erosion, salinity, degradation, salinization, silting, reduction of surface, deformation of the earth's surface by wind, irrigation soils and etc. (table 3.3).

$$P_e = K_1 \cdot K_2 \cdot \dots \cdot K_i, \quad (3.10)$$

where K_i – the coefficient shows the ratio of the reference value to the actual value of the indicator of the optimal qualitative state (ground quality, climatic conditions, relief conditions, etc.).

The size of the price of land closely depends on the level of capitalization established in the economy, as a discount rate, bank interest on a long-term loan (for today 17 %) [12, p. 93].

Then the normative price of the land plot, which is suitable for transfer to organic forms (table 3.4):

$$PL_{tol} = LR \cdot T = [(AR + DR) + (ER \cdot P_e \cdot P_{ec})] \cdot \frac{1}{r}, \quad (3.11)$$

where T – term of capitalization; r – the rate of capitalization of net income.

Table 3.3

Example of calculation the point of eligibility of the land for use as an organic

| No. | Definition of the coefficient | Current values | Standard values | The ratio of the reference and the current value |
|-------|--|----------------|-----------------|--|
| K_1 | ground quality, points of bonitet (p) | 46 | 55 | 0,84 |
| K_2 | climatic conditions, minimum temperatures of ecotope (°C) | 20,0 | 17,5 | 0,88 |
| K_3 | relief conditions, distribution of solar heat on the exposure slopes (%) | 75 | 100 | 0,75 |
| P_e | 0,55 | | | |

Source: calculated using cartographic materials

The result of such a calculation may be the formation of differentiated scales and rates of valuations of the existing classification of land, land tax rates and rent taking into account the environmental component, which are formed on the basis of land rent.

Table 3.4

Example of calculation of normative monetary valuation of a land plot subject to transformation into organic, UAH

| | |
|--|-----------|
| LR | 26720,00 |
| AR | 640,00 |
| $DR_{(I)}$ | 10240,00 |
| $DR_{(II)}$ | 15840,00 |
| $ER_{tol} = (AR + DR_{(I+II)}) \cdot K_{improvement\ of\ land}$ | 46187,88 |
| r | 0,17 |
| $ER \cdot P_e \cdot P_{ec}$ | 25350,85 |
| $PL_{tol} = LR \cdot T = [(AR + DR) + (ER \cdot P_e \cdot P_{ec})] \cdot 1/r,$ | 213122,63 |

Ecologically oriented reformation of land relations to the development of various forms of property, in particular lease relations, must have an appropriate economic and environmental justification. The regulation of lease relations is based on the rental theory of evaluation, which should take into account both the quality and location of the sites, and the costs and results of their use. In order to justify rent, as well as land tax rates, it is necessary to conduct qualitative ecological zoning of territories in accordance with the certification of organic lands, as the basis of accounting and auditing of agricultural enterprises.

The analysis of land characteristics, lowering the qualitative background, which leads to lower yields and increases in costs, allows us to determine the economic value of land as a natural resource and a monetary valuation of organic land plots. It is logical to assess the market value of agricultural land, taking into account the environmental (ecological) rent, as part of the additional income received by the land user in the environmentally sound land. The accounting of the ecological component in the value of land will depend on the class of purity and suitability of natural conditions for a particular type of agricultural crop.

Consideration of the ecological component in the assessment of land will provide an important practical result – to formulate zonal recommendations for economic entities, respectively, their main specialization and serve as a basis for establishing rental rates for land plots.

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3.3. Analysis on the system of certification and marking for organic commodities

At present, commodities with low quality is growing on the consumer market. Worse quality of raw materials, low technical, technological and sanitary levels of production, the weakening of commodities quality control, inadequate certification and standardization contribute to this issue [1].

That is the reason why the last ten years are characterized by increasing the consumption and, accordingly, production of environmentally friendly foodstuffs, by which we mean products grown on a safe area without the use of pesticides, various fertilizers, etc.; or it is a commodities obtained from natural raw materials under new, more modern technologies that ensure minimum other substances in the product.

Organic farming is one of the most modern trends that is gaining momentum all over the world. In the past 16 years, its areas have increased by 4 times; over 2 million organic producers have been certified, more than three quarters of which are located in developing countries. Nowadays, about 1% of the world's agricultural land is involved in organic production.

Trends in organic production are relevant in more than 170 countries in the world, and this figure is increasing annually due to the fact that organic commodities are becoming popular among many social groups for various objective reasons. The development of organic production in Ukraine is at the active formative stage. According to Organic Federation of Ukraine, since 2002 (when the organic direction began to develop in the country), the number of certified farms has increased by more than 100 times, and the total area of certified lands has tripled. It gives the experts a reason to assert that organic agricultural production has become one of the most promising direction in agrarian business.

According to the International Federation of Organic Agriculture Movements (IFOAM), the area of domestic certified organic farmlands in 2016 accounted for only 0.9% of the total area of agricultural land. In general, there were 294 organic farms in Ukraine.