STRATEGIC LAND USE MANAGEMENT: ENVIRONMENTAL TRADE-OFFS FOR THE PURPOSE OF ENSURING THE SUSTAINABILITY OF AGRICULTURAL ENTERPRISES

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ABSTRACT

An important condition for the formation of sustainability of agriculture is the ability to achieve environmental trade-offs in the process of land use. The purpose of research is development of methodical approaches to formation of strategy of rational land use by means of improvement of administrative activity at microlevel. Authors have formulated concept of strategy of rational use of land, basic principles, elements and sequence of its construction. The structural mechanism of realization of strategy of maintenance of readiness of the personnel to rational use of land, and also bringing material and technical, financial and land resources in strategic conformity for achievement of ecological compromises in the course of conducting agricultural activity is offered. The authors developed a conceptual model of a strategic map of rational land use on the basis of a balanced system of economic and environmental indicators, and proposed directions for its implementation.

Introduction

The need to form a system of sustainable development in today's reality is an objective necessity and one of the key objectives of agricultural development. The concept of sustainable development was first substantiated in the report of the UN Special Commission

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in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission, 1987). The recommendations and principles outlined in the document were supported by the international community at the UN Conference on Environment and Development in 1992 in Rio de Janeiro (Report of the UN, 1993) and adopted by a number of countries as official state development doctrines, with stabilization of the environmental situation and improvement of the environment identified as its most important tasks.

The Sustainable Development Goals, adopted at the level of the UN, are largely related to agriculture. These are the goals of food security, poverty alleviation, climate risks, halting land degradation and loss of biodiversity (The Sustainable Development Goals Report, 2020). Many of these goals are reflected in the Convention to Combat Desertification (UNCCD, 1994), Paris Agreement on Climate (Paris Agreement, 2015), The European Green Deal (European Commission, 2019), EU Biodiversity Strategy for 2030 (BDS, 2030).

The need for sustainable agricultural development has been confirmed by many scientific studies (Foley et al., 2011; Dessart et al., 2019; Gliessman, 2020; Kuzicheva et al., 2022). Land resources are a key element in shaping the sustainability of socio-economic development (Montanarella & Panagos, 2021), their use must ensure the economic efficiency of production, subject to the preservation of its natural potential (Komov & Sharipov, 2018). Many studies provide evidence that scientific and technological development in conjunction with the built system of biological production contribute to the achievement of certain criteria of rational land use.

The basic principles of sustainable soil management are clearly defined by the Food and Agricultural Organisation (FAO, 2017). The bottom line is to ensure that soil is used in a way that does not compromise either soil function or biodiversity. FAO has made a number of technical recommendations to facilitate the transition to sustainable land use: limiting wind and water erosion, preventing humus loss, maintaining nutrient and acidity balance, preventing soil contamination, compaction, and reducing soil biodiversity (FAO, 2017). Technologies of their implementation are based on a wide use of agrotechnical methods of cultivation of crops, favorable for the ecological state of soils. All of them are sufficiently well developed in the process of numerous scientific studies and have been confirmed in practice (Barreiro-Hurlé et al., 2010; Power, 2010; Orgiazzi et al., 2016; La Canne & Lundgren, 2018; Bengochea et al., 2020). For example, limiting erosion can be achieved through appropriate crop selection, the use of agro-landscapes, and agronomic techniques such as contouring or minimum tillage, mulching, and others. The balance of humus, nutrients and soil acidity can be ensured through a balanced use of organic and mineral fertilizers, mandatory allocation of land for pastures and hayfields, use of crop rotations, use of green and cover crops, etc. The application of minimum tillage and combination of technological operations can help to prevent soil compaction, and the creation of favorable conditions for microflora development (including the plowing of crop residues, limiting the use of chemical plant protection products and a number of others) will have a positive impact on biodiversity.

However, all these developments face problems of implementation, as evidenced by the practical experience of farming. This is evidenced by the ongoing processes of land degradation, i.e. reduction of the ability of soils to perform their functions (FAO, 2022). The main manifestations of degradation are water and wind erosion, loss of organic matter, compaction, desertification, biological degradation, etc. Land degradation leads to a decrease in natural fertility, which limits the growth of gross yields and crop yields and aggravates the problems of food supply of the population. According to the FAO report, one-third of the world's soil resources are degraded due to unsustainable management practices (SWSR, 2015). Over the period of agricultural use, arable land has lost 20% to 60% of its total organic carbon content (IPCC Special Report, 2020).

Land degradation is largely a consequence of appropriate agricultural practices focused on achieving economic results by increasing the intensity of land use (Tilman et al., 2002; Foley et al., 2011). In the process of economic use, land resources are often perceived as a source of economic benefits in the short term, without regard to the need to preserve the natural potential of land in the long term. At the same time, large enterprises and small farmers do not pay enough attention to the environmental issues of agricultural land use. As a result, production technologies are optimized in the direction of weakening the protection of agricultural land from degradation and saving the cost of fertility reproduction (Karamesouti et al., 2015; Zharnikov et al., 2019), which has especially negative consequences against the background of serious climatic changes in recent years (Esfandiari et al., 2020; Dubovitski et al., 2021).

Systemic problems that hinder the formation of sustainability and exist over a long period of time, as well as the complexity of bio-economic processes in the agricultural sector, necessitate the search for effective methods of land use management.

Literature review

Strategic management can be considered as one of the key areas contributing to the formation of land use sustainability. The need to use the techniques of strategic management of economic systems for many researchers is obvious. Thus, A. Chandler in 1962 revealed the importance of business strategy in the formation of the mechanism of management of the organization. He summarized the experience of successful American business corporations and presented strategy as «the process of setting goals, objectives, an action plan, and the allocation of necessary resources» (Chandler, 1962).

In 1965 I. Ansoff formulated his vision of strategy as a set of organizational rules for making decisions within the framework of its activities. He proposed a model of strategic planning as a set of organizational actions and management approaches used to achieve the goals and objectives of the organization. In addition, I. Ansoff identified two groups of factors influencing the formation of strategy (internal and external) and justified that the structure of their interaction depends on the object of management (Ansoff, 1965).

M. Porter analyzed the various management tools used to ensure the operational efficiency of companies, and proved the importance of strategy for sustainability in the long term (Porter, 1996). C. Kaplan and D. Norton substantiated the model of building a strategy based on a systematic approach to the definition of goals and indicators. They determined that the ability to ensure the effectiveness of the company and its long-term sustainability depends on five basic principles of management:

- transfer of the strategy to the operational level;
- creation of strategic compliance of the organization;
- strategy as the daily work of each employee;
- strategy as a continuous process;
- activation of changes as a result of active leadership of top managers (Kaplan & Norton, 2004, p. 19-24).

Strategic management in the agricultural sector of the economy is recognized as a promising tool to ensure economic, environmental and social stability. This has been proven in a number of works in the 1990s, including the works of Pichón (1996), Matson et al. (1997), Reenberg & Paarup-Laursen (1997). Later, this approach was even more widespread in research on improving the use of land resources in order to improve the sustainability of agricultural production and reduce externalities (Peng & Wang, 2002; Koo et al., 2020; Liu et al. 2021; Galleguillos et al., 2021; Siptits et al., 2022).

There is growing interest in eco-economic outcome-oriented agro-ecological strategies. Their advantage is that they promote the use of environmentally neutral farming methods that enable production without harming humans or natural systems. They are based on extensive use of soil-friendly agronomic practices of biological or organic farming (Juerges & Hansjürgens, 2018; Atieno et al., 2020; Walkup et al., 2020), especially in areas where there are serious environmental problems (Fan et al., 2021). Most often in scientific publications, strategic management is considered from the territorial, sectoral and problematic points of view, which is due to the systemic specificity and interrelation and functional combination of agriculture and natural conditions. From the position of the territorial-sectoral approach, strategic management is considered in relation to the sustainable development of territories. Thus, a number of authors, including Brabec & Smith (2002), Peng & Wang (2002), Siptits et al. (2022), Koo et al. (2020) direct their attention to solving regional problems through strategic management of rational land use in certain natural zones.

From the «problem» point of view, one of the most important elements of strategic development of the agrarian sphere is considered the solution of certain (specific and certain) problems in the sphere of land use, affecting the ecological stability. For example, Liu et al. (2021) consider biodiversity conservation strategies, Fan et al., (2021) consider drought mitigation strategies, Ojima et al. (2009) consider integrated carbon management strategies to address global environmental issues.

There is an increase in the amount of available information on strategies focused on a positive environmental result, but they give priority to the presentation of ready-made solutions. Most authors propose ready-made schemes for solving a particular problem, oriented to achieve a certain result for the formation of a sustainable agriculture. They are the main policy tool currently available in many countries and the importance of these studies can hardly be overestimated.

However, achieving agricultural sustainability goals depends heavily on voluntary efforts by farmers to conserve land (Claassen et al., 2013; Reimer, 2015), whether or not it is supported by the state (Espenshade et al., 2022). The decision to adopt new technologies and conservation practices by farmers is their own due to certain objective and subjective factors (Dessart et al., 2019). Moreover, even agricultural enterprises and farms located in the same natural-economic zone may have different soil resources, relief features, soil cover, field configuration, etc.

Therefore, agribusiness must have the tools to independently develop strategies to ensure sustainable land use, solving specific environmental problems within certain landscape conditions and natural areas. Currently, there is no review of this approach in the literature. The purpose of this article was to substantiate methodological approaches to the formation of a strategy of rational land use through the improvement of management activities at the micro level.

Materials and methods

During the preparation of this article, the authors referred to the results of scientific research over the past 25 years in the field of rational land use management and the formation of a sustainable agricultural economy. The authors understand agricultural land use as the process of economic use of land in order to produce agricultural products. In terms of economic use of land, land users are all economic entities that use land as a means of production in agriculture. In this case, rational land use can be defined as the use of land resources that provides economic efficiency under the condition of preservation of soil fertility, prevention of soil degradation and the absence of any environmental externalities.

The authors focus on the management of rational land use through the introduction of environmentally sustainable methods of management. Examples of such sustainable methods are soil-protective agrotechnical measures, crop rotations, use of organic fertilizers and biological techniques of soil fertility reproduction, reduction of pesticide and fungicide use, alternation of vegetation cover type and landscape conservation (FAO, 2017). The main objective of this study is to provide land users with methodological tools for the development and implementation of strategies for sustainable land use in agriculture.

The authors used the principles of strategic mapping by S. Kaplan and D. Norton (Kaplan & Norton, 2004) and methods of solving problems of land management system development by P. Demidov (Demidov et al., 2018) to substantiate the methodology of forming a strategy of rational land use. To describe the strategy the authors used

the system of indicators of economic evaluation of the ecological consequences of land use, justified by them earlier (Dubovitski & Klimentova, 2020). Its essence is reduced to the economic assessment of the physical deterioration of land in the process of agricultural use. In particular, the assessment of the allowed decrease in soil fertility was assessed on the basis of the balance method, which allows to trace the dynamics of the elements of soil fertility and determine the physical deterioration and the necessary costs for its compensation.

Results

The relevance of environmental priorities in the process of land management in agriculture is due, above all, to the need for practical implementation of the concept of sustainable development in the sphere of land use on the basis of land conservation in the long term. From this position, the use of land resources in agriculture should provide the necessary economic results and, at least, the simple reproduction of their natural potential. In other words, agrarian land use should not be accompanied by deterioration of the qualitative condition of lands (decrease in fertility, degradation or pollution of soils). In this case we are talking about the so-called rational use of land. Its components are formed in the process of rational interaction of natural conditions and factors of production and economic order.

In addition, farming systems focused on the implementation of ecological priorities have lower economic efficiency in the short term, although in the long term they can provide greater sustainability of ecological-economic systems. In practice, sustainable land management must strike a compromise between:

- the realization of economic interests and emerging environmental constraints; and

- the pursuit of short-term results and long-term sustainable development goals.

The process of management of land resources directly in farms is a set of actions on formation of the purposes, planning, organization of use and control. The effective combination of all these elements in a single process is possible on the basis of the use of techniques of strategic management.

The main objective of strategic management is to introduce in practice technical solutions that contribute to the implementation of the priorities of rational land use with a set of control actions on the parameters of the internal environment of the enterprise.

Building an effective management system is possible based on the use of behavioral factors (Dessart et al., 2019; Espenshade et al., 2022). The choice by land users of specific economic practices for use in their activities is based on the subjective understanding of owners and farm management of their comparative advantage and the potential benefits they can bring (Prokopy et al. 2019; Ranjan et al. 2019; Thiombiano & Ouoba, 2021).

Our own research confirms this fact and testifies to the importance of subjective factors for improvement of land use. In the process of realization of professional activity on management of an enterprise, decisions for formation of sustainable systems of land use are accepted from a condition of readiness for biologicalization (which is shown as system of professionally important qualities and properties of the person necessary and sufficient for effective professional activity in the field of ecologization of land use). It is about emotional, cognitive, motivational, personal, and organizational readiness (Dubovitski & Klimentova, 2022).

These provisions serve as the basis for the fact that it is the readiness of personnel to make changes to management practices that should become the cornerstone of the improvement of the land use management system. It is the readiness of personnel for environmental protection activities that can ensure the improvement of all internal management processes along the way of forming the sustainability of the agricultural economy. This is the basis for the fact that the training and development of personnel should be the basis for the development of any land use management strategy.

Emotional readiness is characterized by the presence of interest in their professional activity, initiative, responsibility. Its low level may indicate an insufficient interest in introducing new technologies, mastering new ways to perform their professional duties.

Cognitive readiness is formed by the knowledge, skills and abilities necessary to implement the elements of biological land use and soil fertility reproduction in accordance with the principles of sustainable development.

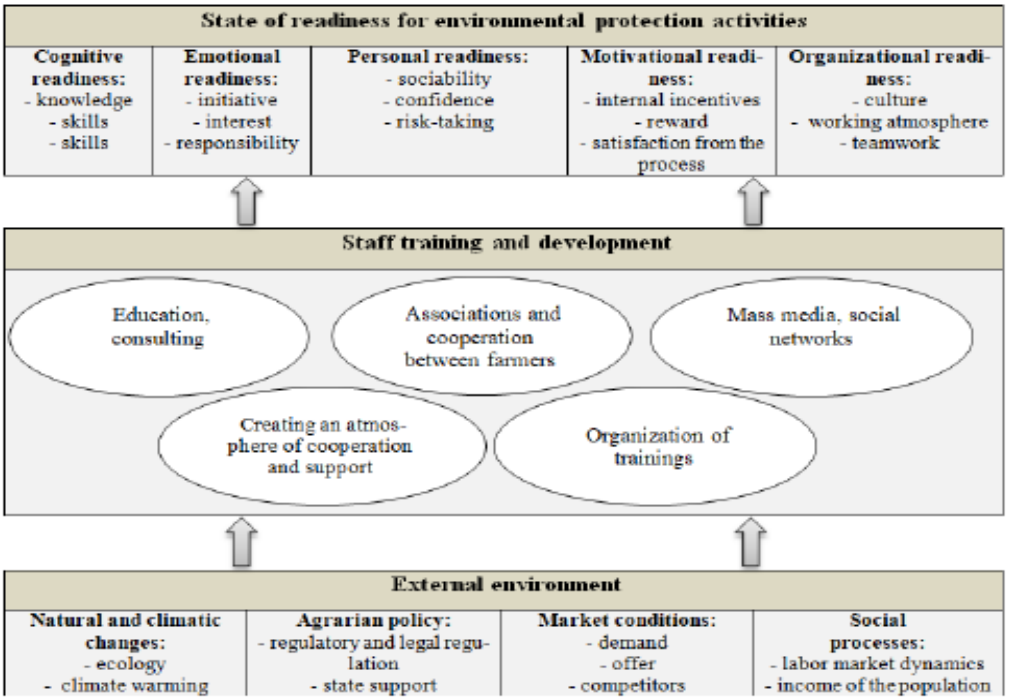
Motivational readiness is determined by the presence of internal incentives to improve the performance of labor activity and getting satisfaction from the process of realization of their own abilities. Its relatively low level may indicate a lack of understanding of the possible positive effects of biologization on the economic results of agricultural production and the ecological state of the land.

Professionally important features of personality (communication skills, organizational skills, self-confidence, a moderate tendency to risk) form the level of personal readiness.

Organizational readiness is determined by the peculiarities of work organization at the enterprise, the created mechanism of technology improvement, corporate culture, etc. Its low level can be associated with dissatisfaction with the conditions created in the organization, lack of opportunities for effective management of biological processes.

Land users can switch to another system of farming, such as conservation, only if they are ready. Therefore, the construction of any strategy must be based on increasing environmental readiness by building a system of training and human capital development (Figure 1).

Figure 1. Formation of the state of readiness of personnel for activities through training and development



Source: compiled by the authors

Emotional and personality readiness are a reflection of the psychological factors underlying human behavior (American Psychological Association, 2018). These elements of readiness are the most difficult in terms of the possibility to correct them. Increasing emotional and personal readiness can be helped by various personal growth trainings, taking various measures to support and assist personnel, as well as organizational efforts to create an atmosphere of cooperation and support in the company.

Influence on the level of cognitive readiness is carried out in the process of training, professional development and professional skill trainings by providing the necessary competencies, skills and abilities to implement the goals of environmental improvement of agro-economy. A great role in the provision of professional competence has a timely receipt of relevant information (Karpunina et al., 2021). This can be facilitated by cooperation and exchange of experience among land users, interaction with scientific organizations, communication through social networks and the media.

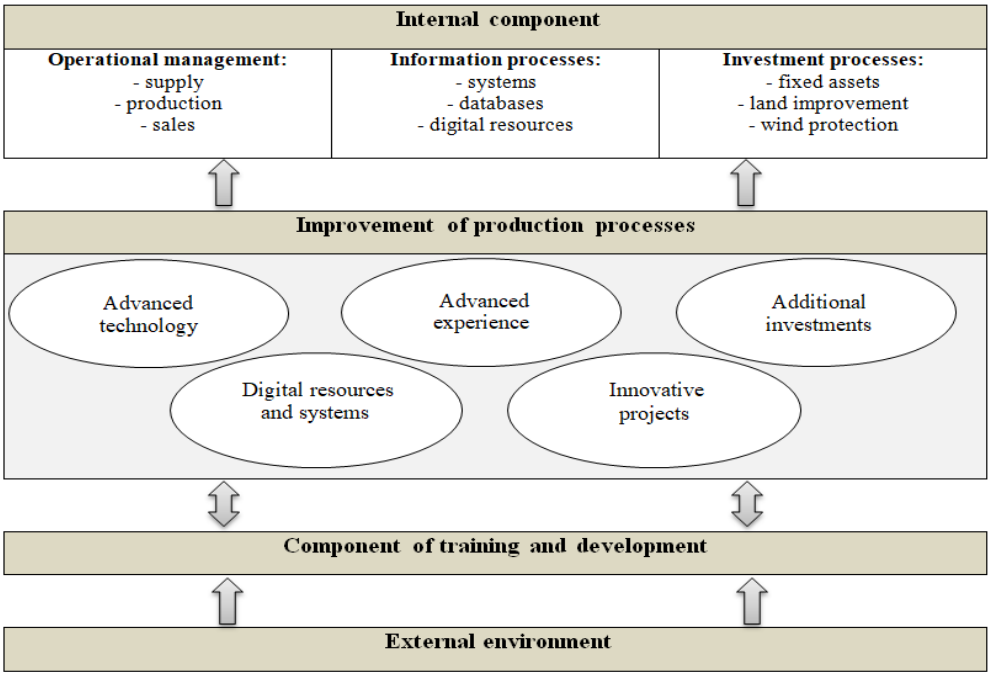
Motivational and organizational readiness is a direct consequence of development of business structures. Their level is determined by the ability to align the system of moral and material remuneration with the results, to provide a working atmosphere in the team, safety (to eliminate the possibility of discrimination on any grounds), to form a corporate culture and technological culture of production.

The optimal state of staff training and readiness, which contributes to the maximum achievement of the goals is expressed in the fact that all employees of the company understand the importance, interest and focus their efforts on the process of continuous improvement of technological processes.

The development of human capital and the formation of readiness does not occur in isolation, but in a certain external environment, which differs even among enterprises located in close proximity to each other. The main factors of the external environment that should be taken into account when planning the activities of agrarian business are natural and climatic conditions, parameters of the agrarian policy conducted by the state, market conditions and social processes in rural areas.

The readiness of the personnel for the activity serves, on the one hand, as a starting point for the development of internal processes of functioning of the enterprise, and on the other hand, in many respects, is subject to the opposite influence. If the staff of the enterprise has a certain degree of readiness for environmental activities (including specific knowledge and skills, motivations) and the farm has organizational conditions for such activities, in this case it is possible to ensure the effective use of productive potential in the achievement of environmental and economic goals. Conversely, the practical implementation of personnel's initiatives to achieve the goals set depends on the financial and economic capabilities of the farm, its provision with necessary equipment, access to promising technologies and resources (Fig. 2).

Figure 2. Formation of the internal component of the functioning of the enterprise



Source: compiled by the authors

The internal component is a set of operational management, information and investment processes. Their improvement allows ensuring the movement on the path of environmental improvement of the agricultural economy. This goal can be achieved by controlling the most important factors of the internal environment. In this case, we are talking about the introduction of advanced technologies (including soil-protective farming techniques), best practices in the organization of land use, development and implementation of various innovative programs in land use (including, increasing the provision of fixed assets of environmental orientation, agroforestry, etc.), improving the information support of business processes.

The first element of internal processes - production management - provides the optimal and comprehensive organization of three main processes: supply, production, sales of products. Strategic management should be aimed at the formation of an optimal supply of resources, introduction of resource-saving production technologies, improvement of labor organization in order to achieve ecological trade-offs. The main task of management is to organize wide use of effective practices and methods of crops cultivation, favorable for ecological state of soils. The first element is organically interconnected with the presence of the second structural element, that is, the information and digital component.

Information and digital processes play an increasing role in the technological transformation of modern land use. Such approaches aim to minimize impacts by maximizing control over processes and the environment (Muller et al., 2017). A promising direction for their practical implementation is precision farming, aimed at providing spatially differentiated and specific type of arable land tillage. The purpose of precision farming is to take into account the differences within the field, its advantage is to treat the soil, apply fertilizers and pesticides in accordance with the needs of plants. Its result is an increase of economic efficiency while reducing the negative impact on the soil (pollution, soil compaction, etc.). An example of technologies used in precision agriculture are drones. They help to monitor hard-to-reach areas of the field, recognize and control weeds, which leads to a reduction in soil compaction, minimizing the use of heavy machinery (Malveaux et al., 2014). This component of land management could get a lot of traction with the focus of agribusiness on increasing sustainability. It needs to be given more attention due to the possible positive effects both economically and ecologically.

The third element is investment processes. Agriculture is often an unattractive sector for investment, which is largely determined by its high dependence on natural and climatic conditions. However, in the context of the ongoing processes of land degradation and the associated aggravation of the problems of food supply to the population (SWSR, 2015; IPCC Special Report, 2020), the importance of investments in agriculture, including the nature conservation orientation, increases significantly. Improving the cultivation of agricultural crops, including through the introduction of agrotechnical techniques favorable for the ecological state of soils, requires additional investment costs for the acquisition of necessary fixed assets, increasing fertility and land reclamation, planting green spaces for wind protection, etc.

The use of specific areas to improve the internal system of functioning in enterprises is individual. Hundreds of processes occur simultaneously in agriculture, affecting the level of performance and parameters of land use. The strategy can be implemented in several directions that are the most important to ensure the rational use of land. For example, one enterprise may increase current expenditures on improvement of production technologies in systems of conservation agriculture or on development of soil-protecting measures and various methods of biologicalization. Another enterprise decides to increase investment in the purchase of modern machinery to increase productivity and reduce pressure on the soil during cultivation, or in the planting of windbreaks. A third enterprise will consider the development of information processes and digital technologies to create conditions for generating positive, economic and ecological effects in production.

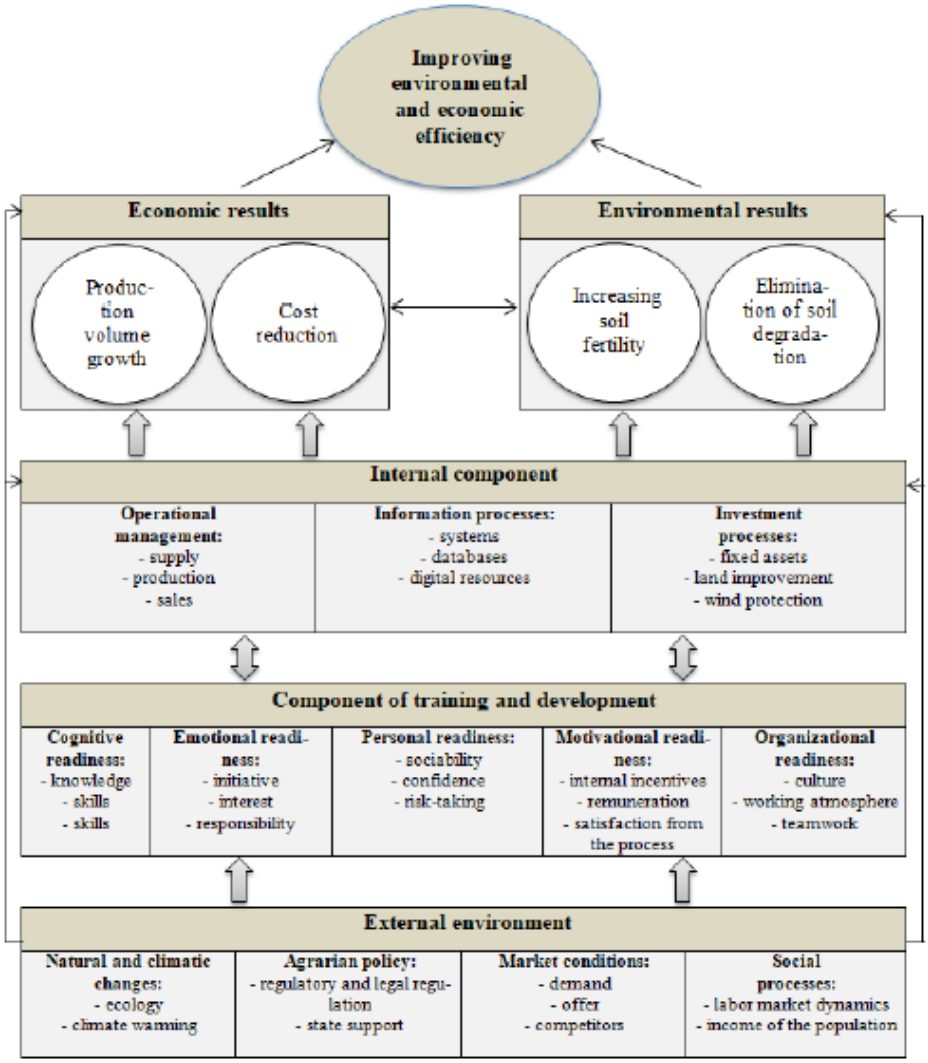
Any component of internal business processes is linked to the target benchmarks and can be decisive in the implementation of the strategy. It is possible to achieve growth in economic performance through the implementation of any of these strategic directions. However, the achievement of sustainability of ecological-economic systems is ensured if a balance is formed between two contradictory tasks - growth of production volumes and care about the qualitative state of land resources. From the point of view of specific land users, restoration of fertility is not a priority task from the position of achieving financial success. The need to ensure profitability makes economic results preferable to environmental ones. The formation of a land-use strategy is inevitably accompanied by such a conflict. The main goal should be to ensure the rational use of land resources as part of the formation of the sustainability of the agricultural economy.

The most important tool for the formulation and implementation of the strategy is a balanced system of indicators (Kaplan & Norton, 2004), which describe it not as a set of independent parameters, but as a balanced set of its individual components, based on causal relationships. In this case, the target indicator of the strategy of rational land use can become the indicator of environmental and economic efficiency. The technique of its calculation provides integration of size of economic efficiency and cost estimation of ecological influence of production on ecological systems, including land resources. For this purpose ecological influence of land use at first is estimated by means of natural indicators on the basis of system of balance constructions by formalization of volumes and structure of streams of movement of elements of soil fertility (Dubovitski & Klimentova, 2020). Then the change of natural indicators in the dynamics (their increase or decrease) can be estimated in monetary terms. In this case we are talking about the monetary evaluation of the obtained ecological effect and ecological damage. Accordingly, the strategy must have both economic and environmental results.

Economic results are expressed by one of two indicators (income growth or cost reduction), they do not contradict each other, but are interrelated. Cost reduction implies the mandatory use of advanced technologies of production with optimal use of inputs in due time and quality of all agricultural practices. This, in turn, provides an increase in crop yields at the optimal level of costs and increased profitability of industries and enterprises as a whole.

The ecological component provides, on the one hand, increase of soil fertility, and, on the other hand, reduction of negative environmental impact (damage). This can be achieved only under condition of maximum level of expenses for prevention of ecological-economic damage, which is determined by timely carrying out of cultural-technical measures (maintenance of bio-logical balance, application of organic and mineral fertilizers in optimal quantity and optimal terms, timely struggle with various kinds of erosion). Consequently, the improvement of soil fertility can be ensured by avoiding or minimizing the negative environmental impact (Fig. 3).

Figure 3. Structural diagram of the strategic map of rational land use



Source: compiled by the authors according to Dubovitski and Klimentova (2021)

The balancing of these conflicting goals is the organizational model of the strategy of rational land use. Working out of strategy of development of any system is a substantiation of its future state with representation of the desired result and definition of the basic steps on its achievement. This allows us to consider the strategy of rational land use as a process of achieving sustainability of agro-farm, which is formed in certain parameters of the external environment and consists of a set of controlling influences on the parameters of the internal environment and the system of human capital development.

The sequence of developing a sustainable land management strategy can be represented by several key steps: 1) study of external environment parameters and forecasting the dynamics of their changes; 2) diagnosis of the state of land resources and identification of economic and environmental problems of their use; 3) justification of the goal and formulation of objectives in terms of time, quality and performance; 4) determination of strategic directions for improving internal environment processes; 5) ensuring strategic alignment of internal environment parameters and human resources; 6) detailed and visual presentation of the strategy in the form of strategic maps.

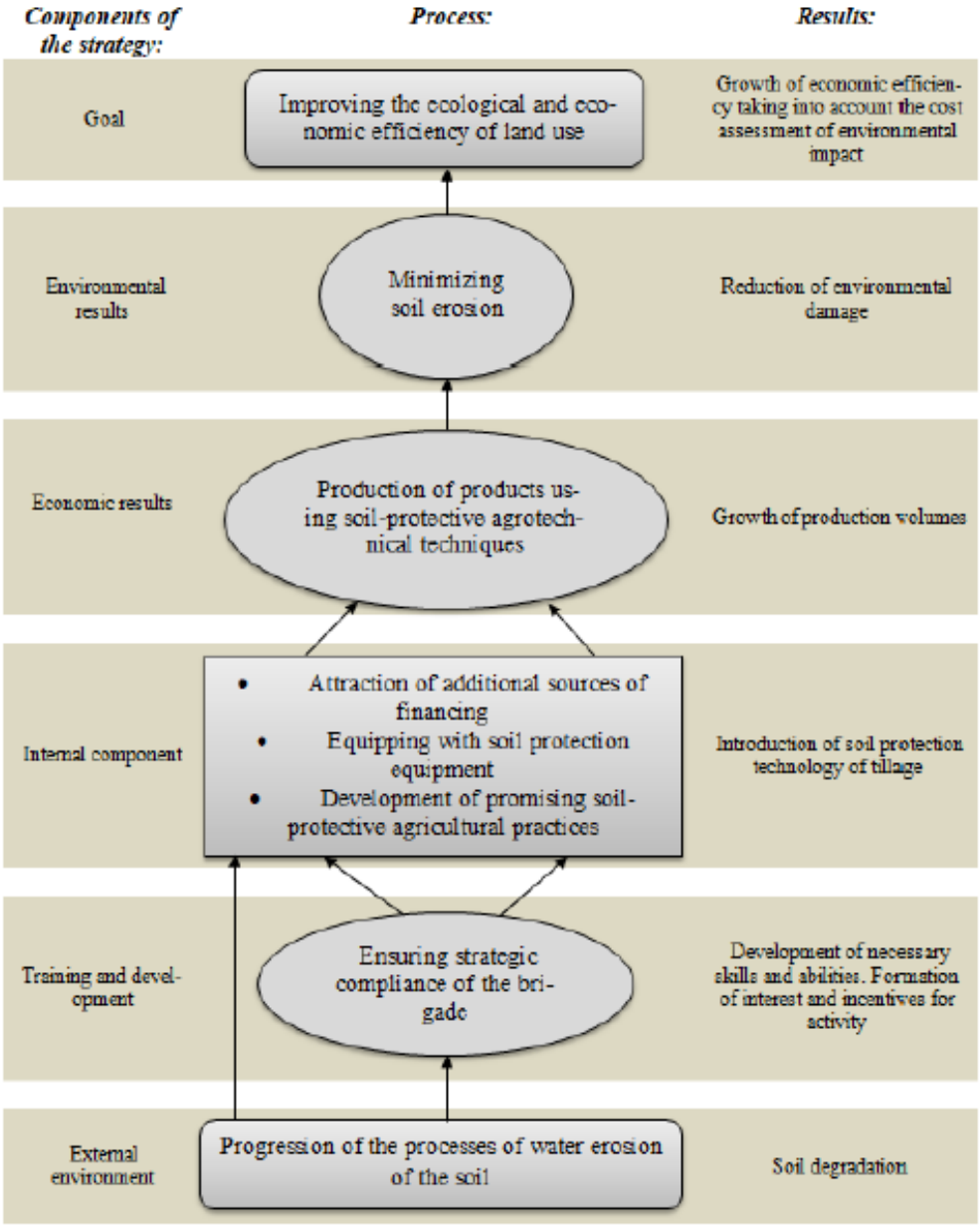
Structural description of goals and mechanism of their achievement in the form of strategic maps is aimed at better understanding of the staff of the whole process of formation of rational land use, optimal distribution of responsibility and increase of possibility to control the implementation of individual stages and the strategy as a whole.

In order to achieve the goals set, it is necessary to implement a set of programs. Each program should be provided with material-technical and labor resources. For example, the task of minimizing water erosion manifested in soil washing out can be achieved through the implementation of a set of agrotechnical measures (Fig. 4).

In this case, the implementation of the strategic direction to combat soil erosion is built as a set of measures for technological improvement of tillage, investments in the purchase of special agricultural equipment, as well as the implementation of staff training. The basis of the strategy is a compromise of economic and environmental components for the sake of agricultural sustainability.

The implementation of the proposed strategy of rational land use is impossible in the absence of at least one of the components. They must be implemented comprehensively, the role of each depends on the actual state of human resources and enterprise as a whole. As of today the ecological constituent is decisive in many problematic territories because it is necessary to restore what has been taken away for so long without compensation for the lost properties of lands. Later it will be possible to return to the parity of economic and ecological components, but we should not forget that agriculture is not the industry which brings income to the state in the first place, but the industry which provides healthy foodstuffs, and the land is the basis of mankind existence.

Figure 4. Strategic direction of combating soil erosion through agrotechnical measures



Source: compiled by the authors

The proposed model for the formation of a rational land use strategy is basic, in each agri-business entity it will be unique with a certain set of strategic directions. For regions with pronounced water erosion, these will be programs to prevent soil flushing, for regions with wind erosion – programs to protect against wind erosion, etc.

In addition, the formation and implementation of the strategy at the enterprise certainly requires maximum detail of the processes of the internal component and the system of training and development of personnel with a description of the desired results. Each of the intermediate results should be reflected by a specific indicator, the achievement of which can be monitored. The strategy should include a list of additional equipment requiring the development of elements of soil protection technologies, personnel training measures necessary for the development of new equipment and promising agricultural practices, as well as a motivation system for maximum interest in the qualitative and responsible implementation of the planned activities.

Discussions

In recent decades, the negative impact of agriculture on land resources has been growing rapidly around the world. This negatively affects the state of soil fertility, soil resistance to degradation in the conditions of ongoing climatic changes. The results of these processes are well known to politicians, the scientific community and specialists. The solution of environmental problems arising in land use is an important factor that should be taken into account when it comes to achieving the sustainability of agricultural farms.

From our point of view, the more active implementation of practices that are favorable for the ecological state of lands is hindered by shortcomings in the management of land resources of farms and enterprises. The use of strategic approaches to land management based on the formation of staff readiness to make changes in management practices has great potential for improving land use. It is the readiness of personnel for environmental protection activities that can ensure the improvement of all internal management processes. Therefore, the training and development of personnel should be the basis for the development of any land use management strategy.

In our article, we did not aim to offer specific land users ready-made solutions for the application of environmental practices of land use, or to calculate their expected economic efficiency. Perhaps this could be the goal of additional research in this direction. New studies conducted taking into account the environmental specifics of specific regions can contribute to the adaptation of the proposed conceptual model of the strategy to environmentally friendly farming methods that are more acceptable to local conditions and are encouraged as a result of various policy measures to support land users.

We offer only a tool using which land users in specific economic conditions would be able to independently formulate goals and ensure their implementation in practice through the improvement of the parameters of the internal environment and personnel development available to them. The achievement of the stated sustainable development goals ultimately depends on the effective activity of each farmer, each agricultural enterprise in this direction. In our opinion, the proposed approach to improving land use management based on ensuring the readiness of personnel for environmental protection

activities can become the element through which it will be possible to significantly advance along the path of increasing the sustainability of agricultural farms.

Conclusions

The implementation of a strategic approach to the management of rational land use should become the basis for solving the problems of ensuring the sustainability of agricultural enterprises. The conceptual model of the strategy developed by us clearly describes the process of ensuring rational land use in agriculture. The proposed strategy is aimed at improving the ecological and economic efficiency of the use of land resources through an optimal combination of economic and environmental components. The main methodological idea of strategy formation is to ensure the readiness of personnel for rational land use and to bring material, technical, financial and land resources into strategic alignment with the goals of achieving environmental compromises in the process of agricultural activity. It describes how the management of internal processes in certain environmental conditions contributes to ensuring the rational use of land resources in agriculture. The correct presentation of the models of functioning of agricultural systems necessitates their presentation in the form of strategic maps that allow for visibility in the decision-making system, focus on the key tasks and resources needed for their implementation. The possibilities of the most effective implementation of the strategy depend on the understanding of its essence by all participants of the ecological and economic system, including individual land users, owners and management of agricultural enterprises. The basis of this understanding is the realization that the environmental and economic components not only do not contradict each other, but are mutually related factors, complementary sides of the same process.

Conflict of interests

The authors declare no conflict of interest.

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