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ECONOMIC ASPECTS OF THE ECOLOGICAL APPROACH TO THE DEVELOPMENT OF AGRICULTURE AT THE PRESENT STAGE

D.K. Suchkov, I.V. Sorgutov,
N.K. Gavrilieva, A.V. Grigoriev

The economic aspects of the development of the agro-industrial complex at the present stage play a significant role in shaping the well-being of any country, since the factor of seasonality and the need to allocate subsidies to support most agricultural enterprises often negatively affect the prospects for the development of the industry in question. At the same time, it should be noted that agro-industrial companies spend significant funds on recultivation and restoration of lands damaged by regular application of chemical fertilizers. Also, various biosystems are being destroyed, without which the implementation of various activities in the agro-industrial complex will be impossible: water resources are being depleted, representatives of fauna are dying, the structure of individual ecological networks is being disrupted. For this reason, the application of an ecological approach in the process of forming an economic strategy for the development of agriculture at the present stage becomes necessary, since if the status quo is maintained, the negative situation in agriculture may worsen in the next few years. For this reason, we consider it necessary to implement the main provisions of the Concept of Sustainable Development in the process of planning and implementing various areas of economic and production activities in the agricultural sector, since relying on the postulates declared by the Concept will expand the horizons of the industry's development, improve the quality and volume of products produced and reduce its negative impact on the environment, thereby preserving the ecological balance in nature.

Keywords: *agro-industrial complex; economic aspects; ecological approach; sustainable development*

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ЭКОНОМИЧЕСКИЕ АСПЕКТЫ ЭКОЛОГИЧЕСКОГО ПОДХОДА К РАЗВИТИЮ АПК НА СОВРЕМЕННОМ ЭТАПЕ

Д.К. Сучков, И.В. Соргутов, Н.К. Гаврильева, А.В. Григорьев

Экономические аспекты развития агропромышленного комплекса на современном этапе играют существенную роль в формировании благосостояния любой страны, поскольку фактор сезонности и необходимость выделения дотаций для поддержания большинства сельскохозяйственных предприятий достаточно часто отрицательно влияют на перспективы развития рассматриваемой отрасли. При этом, нельзя не отметить, что значительные средства агропромышленные компании тратят на рекультивацию и восстановление земель, поврежденных регулярным внесением химических удобрений.

Также разрушению подвергаются различные биосистемы, без которых осуществление различных направлений деятельности в АПК будет невозможным: истощаются водные ресурсы, гибнут представители фауны, нарушается структура отдельных экологических сетей. По этой причине применение экологического подхода в процессе формирования экономической стратегии развития АПК на современном этапе становится необходимым, поскольку при сохранении статуса кво негативная ситуация в сельском хозяйстве может усугубиться уже в ближайшие несколько лет. По этой причине считаем необходимым реализацию основных положений Концепции устойчивого развития в процессе планирования и осуществления различных направлений экономической и производственной деятельности в сельскохозяйственной отрасли, так как опора на декларируемые Концепцией постулаты позволит расширить горизонты развития отрасли, повысить качество и объем производимой продукции и снизит ее негативное влияние на окружающую среду, сохранив, тем самым, экологический баланс в природе.

Ключевые слова: *агропромышленный комплекс; экономические аспекты; экологический подход; устойчивое развитие*

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Introduction

The economic development of any industry makes a significant contribution to the country's GDP. However, quite often an increase in the pace of economic development has a downside, which is expressed in a negative impact on the environment and a violation of the ecological balance [1, p. 90]. One of these areas is agriculture, in the process of implementing the main activities of which there is soil degradation, disruption of ecological chains, reduction of water resources, etc. All this in the future may lead to a decrease in the economic results of agricultural enterprises due to the loss of the potential of the basic resource of the agricultural sector – land.

Agricultural production systems have a profound negative impact on biodiversity due to the transformation and fragmentation of natural habitats associated with the expansion of agriculture, as well as a result of pollution due to the overuse of inputs such as pesticides and fertilizers. This requires a radical transformation of the production process of agricultural enterprises [2, p. 114]. To this end, agricultural specialists need to implement a number of measures in their practice, such as providing feeding areas for wild animals and nesting sites on agricultural land, reducing chemical exposure, preventing water pollution, stimulating biological activity in the soil and strengthening the links between habitats and ecological networks in the landscape. To implement this practice, serious changes are needed in the supply chains of agricultural products, business models and public policy. For this reason, the introduction of the basic postulates of the Concept of Sustainable Development within the framework of greening into the agro-industrial complex system should be designated as an innovative approach.

Materials and methods

In the process of writing the study, both Russian and foreign sources were analyzed in the field of implementing an ecological approach to the organization of economic development of the agricultural sector, including from the perspective of implementing the Concept of Sustainable Development. Analytical and comparative methods were used to systematize and process the collected material.

Results

The loss of biodiversity is one of the biggest environmental problems of the 21st century, and it is happening at an unprecedented pace due to various anthropogenic impacts on the global environment. Understanding the transformations of agricultural systems to increase biodiversity is a problem of society's

transition to solving existing transition models, such as a multi-level perspective or an innovation system perspective. However, there is also reason to assume that the existing transition models will not directly correspond to the transition to sustainable agricultural systems. Most importantly, although the role of ecology is important in agricultural systems, the literature on socio-technical transitions pays little attention to the interaction of agricultural economics with environmental aspects and, consequently, there is no understanding of their consequences for social change.

In various fields of literature, special attention is paid to problems related to the loss of biodiversity (for example, in the field of socio-ecological systems and environmental biology). Based on the analysis of the literature data, two starting points can be identified as characteristics of biodiversity related to the agricultural sector, which are most likely important for our understanding of the transition to sustainability in this sector: first, it is the attachment of agricultural systems to the place, which is a critical issue. since it is in this spatially oriented context that ecological, biophysical and geographical dependencies arise [2, 3, 4].

Secondly, when trying to promote biodiversity in agriculture, certain problems arise due to the fact that nature is a public good. It is expected that these aspects will lead to a different transition dynamic compared to sociotechnical transitions, when attachment to a place and public goods are less important.

The problem of transition to sustainability in the agricultural sector has been reflected in the scientific literature for a number of years, where various authors give an idea of various conditions and processes of change that contribute to the emergence and spread of novelty in sociotechnical systems.

Socio-technical (ST) transitions describe fundamental changes in the way social functions are performed, such as mobility, health care and food supply, socio-technical systems. Socio-technical systems, in fact, have three main dimensions: actors, institutions, technological and material artifacts. The transition requires profound changes in all these parameters of the system [12, p. 761]. A special subset of such transitions are transitions to stability. These are long-term, fundamental and purposeful changes in the agro-industrial complex in order to perform social functions more sustainably [3, p. 132].

Studies of the transition to sustainable development, as a rule, did not take into account the transition processes in the agri-food sectors. However, in the neighboring field of agricultural innovation, scientists have contributed to a better understanding of changes in agricultural sectors. This area has become a systematic approach to the analysis of changes, primarily in the perspective of

the agricultural innovation system (AIS). AIS is defined as a network of organizations, enterprises and individuals focused on the introduction of new products, new processes and new forms of organization into economic use, together with institutions and policies that affect how various agents interact, share, access, exchange and use of knowledge [12, p. 763].

Innovations in the agricultural sector reflect technological, social, organizational, economic and institutional changes. They balance new technical methods with alternative ways of organizing markets, land ownership and distribution of benefits. AIS perspectives are increasingly being linked to transition theories by examining how the functioning of agricultural systems is hindered and how it can be supported. This was done by applying a systematic approach to technological innovations, and more recently also by including literature on innovative ecosystems.

The literature on AIS pays special attention to innovations within the framework of the industrial agriculture paradigm, but does not specifically address environmental elements. Various scientists emphasize the need to go beyond the AIS analysis in order to better understand the problems of sustainability in the agricultural sector [12, p. 764].

Another approach that is increasingly being used to better understand changes in the agricultural sector is the multi-level perspective (MLP). The structure of the MLP was developed in the AIS community to understand the introduction and scaling of technologies, mainly by studying the dynamics of changes in technology-dominated sectors, such as energy and the mobility sector in the Far North. The multilevel perspective describes and conceptualizes general models of changes within the framework of sociotechnical transitions for three analytical levels: niche (micro), mode (meso) and landscape (macro) [11, p. 264].

The transition to more stable sociotechnical systems is difficult to implement when the existing systems are characterized by a high level of institutionalization or isolation. The blocking processes are reflected in the concept of a sociotechnical regime or a "deep structure" that ensures the stability of existing systems. This stability is mainly due to a set of formal and informal rules, such as rules, cognitive structures and general beliefs, as well as established practices that are supported and protected by the active subjects of the agro-industrial complex. The regime may be under pressure from an exogenous socio-technical landscape, which includes slowly changing social values, demographic trends and macroeconomic models.

Important conclusions of research in the energy and mobility sectors are that emerging innovations often cannot compete within the existing sociotechnical

regimes. New technologies often work poorly and are too expensive to compete with fashionable products. Therefore, they must be protected or shielded. Such a protective space is called a “niche”. Typical protective measures to protect niches are subsidies and other public or private measures that support them, such as subsidized demonstration projects or research laboratories. Thanks to protective measures, participants developing innovations gain time to improve innovations in order to compete with existing technologies, services and products at a later stage.

It should be noted that various processes that support the niche and contribute to breakthroughs, such as experimentation, building a network, formulating positive expectations and mobilizing resources are important for improving technological performance and reducing costs.

Niche innovations can either correspond to the current regime selection conditions, in which regime conditions usually remain unchanged, or they can contribute to changes in the current regime environments and thereby influence the environment of their choice, for example, by institutionalizing niche practices for reuse. Various transition paths are conceptualized, in which the transition dynamics is described on the basis of various types of MLP alignment.

Studies of the transition period have shown that new participants often introduce novelty and replace the actors with their radical innovations, choosing the path of technological replacement. However, sometimes the current market players take the initiative either through gradual adjustments or through a more radical replacement of technologies. This is called the mode transformation path.

On the way of regime reconfiguration, cooperation between new participants and existing operators leads to new combinations between innovative and existing technologies. The de-alignment and re-alignment path describe how regimes are destabilized by rapid landscape pressure. As for the current players, the literature on the transition period traditionally focuses on influential and large players, who, for example, can buy smaller companies to control innovation or cause changes in industry trajectories. It can be noted that the study of the typology of transition paths is useful for explaining why the nature of transition dynamics differs between countries or domains.

Various criticisms have been expressed regarding the applicability of the MLP concept for understanding transitions to sustainability in the agricultural sector. Some researchers have come to the conclusion that additional work needs to be done to make the MLP suitable for the purposes of studying the agri-food sector, mainly with regard to the analysis of the dynamics of transition and ways of transition to sustainable development [11, p. 265].

Current critical shortcomings include omission in the analysis of geographical, biophysical and socio-ecological elements, while they play a significant role in the agricultural sector. In addition to scientists studying agricultural systems, other authors studying the possibilities of ST transitions also state that modern sociotechnical concepts of transition do not take into account interaction with environmental aspects and, consequently, do not understand its consequences for the economic development of the agro-industrial complex.

Discussion

In various fields, special attention is paid to problems related to the loss of biodiversity (for example, in the field of socio-ecological systems and environmental biology). From these areas, two key characteristics of agricultural systems can be derived that can improve the understanding of the environmental aspects of the transition of agriculture to sustainability: attachment to the terrain and the nature of biodiversity as a public good.

Agricultural systems are mostly tied to the terrain and are tied to geographical areas. Environmental conditions depend on the location and change geographically. This location-based nature largely determines the type of production system and goods that can be produced, the type of habitat for biodiversity, and the specific environmental problems that can be expected. Thus, the conservation of biodiversity creates certain problems depending on the conditions of the habitat. Moreover, the maintenance of biodiversity also depends on processes and configurations in the wider landscape. For example, landscape-scale management can contribute to the conservation of biodiversity by creating ecological networks and reducing habitat fragmentation. This increases the importance of cooperation between different participants, for example, through inter-economic or intersectoral cooperation.

Sustainability strategies should be adapted to the specific needs of the habitat in the context and history of the agricultural landscape. How actors solve sustainability problems also depends on the context. The stories of subjects embedded in certain places determine to what extent subjects depend on environmental resources for their livelihoods or attach great importance to the sustainability of resources and are motivated to act. Therefore, the conditions associated with sustainable results often depend on territoriality.

The main problem hindering the conservation of agricultural landscapes is that there is often no direct benefit for actors to invest in biodiversity, which underlines the need to support institutions and management, for example, through incentive mechanisms. This problem is based on the nature of nature protection

as a public good. Already in 1968, G. Hardin described the social dilemmas that arise as a result of managing the resources of a common pool [10, p. 85].

In the literature on socio-ecological systems, this is called the "security dilemma", which occurs when the costs of investment are paid individually, and the benefits are distributed among the participants. Moreover, the benefits are often visible in the long term, while investments are required in the short term. This applies to many public goods, such as biodiversity, clean air or other ecosystem services [13, p. 342].

Markets and institutions often do not provide financial incentives to preserve the biodiversity of agricultural landscapes; for example, the conservation of biodiversity is not valued in product prices. Lack of incentives is an important reason for farmers ' decisions not to invest in agrobiodiversity. For example, financial investments are needed to provide natural areas for meadow birds on agricultural land. Moreover, in addition to local benefits, the conservation of biodiversity on agricultural land often brings environmental benefits elsewhere (positive externalities), for which there are also often no incentives provided. This leads to the tendency of individual participants to minimize investments in biodiversity.

A classic example concerns the reluctance of upstream farmers to engage in pro-environmental behavior (for example, regarding the use of pesticides or refraining from deforestation), which will mainly and most immediately benefit their downstream colleagues. There are usually no markets for these external ecosystem services [13, c. 344].

These problems of insufficient investment in biodiversity have led to extensive research in the field of socio-ecological systems and conservation biology on how to overcome these dilemmas, for example, by encouraging collective agreements and developing incentive mechanisms [7, p. 458]. Collective agreements revolve around deciding how different participants collectively manage natural resources sustainably by setting rules and standards. Incentive mechanisms are considered important to encourage actors to invest in biodiversity. Both can be organized at different levels: at the local level, cooperation between farmers can lead to the conclusion of new collective agreements [8, p. 257].

Since decisions are also strongly influenced by the meso-economic environment (for example, markets and national institutions), institutional changes must occur at this level, as well as overcome market and institutional failures. Incentives can be divided into categories such as regulation, planning, and moral persuasion – for example, by preventing specific land management practices through legislation and policies.

Along with these incentives, it is possible to apply various initiatives that will contribute to the implementation of the above-mentioned goals. So, in 2016, in the Netherlands, various participants jointly developed a new business model for a new brand of "environmentally friendly milk" based on a premium to the price of the product, which was as follows: the consumer pays an additional 0.02 euros per package, these funds are directed to the implementation of measures to preserve the population of meadow birds. Due to the received funding, natural areas on agricultural land were expanded, and farmers were able to apply various management methods to preserve agricultural nature, such as the construction of lawns and grass areas for meadow birds and various mowing regimes with less intensity to increase the survival rate of meadow bird chicks [14].

Also, as part of the support of the sustainable development initiative, a new model of land lease was developed for farmers on favorable terms (at a cost of less than half of the current price). It was stipulated that the land would be leased to farmers only if they comply with certain environmental conditions [15].

The assessment of compliance with the above conditions was planned to be carried out taking into account the following criteria and key performance indicators to determine the degree of achievement of the established environmental goals. Key performance indicators (KPIs) were defined as follows:

1) functional agrobiodiversity (for example, fertile soils and the completion of nutrient cycles on farms);

2) variety of landscape (for example, landscape elements such as trees, ditches and hedges);

3) diversity of species (for example, targeted improvement of habitat management of specific species);

4) regional biodiversity (for example, the development of territories between farms and regional management) [16].

Therefore, the implementation of these initiatives and measures can directly have a positive impact on the sustainable development of agriculture and, as a result, increase its economic efficiency.

Conclusion

Since the global loss of biodiversity is one of the most serious environmental problems, a transition from sustainability to nature conservation is urgently needed, which will stop the rapid decline of biodiversity. Transformations are required in the agri-food sector to increase its sustainability in order to increase the economic efficiency of the agro-industrial complex in the future.

The structure of the MLP and its analysis uses a number of tools to explain industry changes and link and understand the dynamics between the conceptual levels of niches and agricultural regimes. It can be argued that the transition to sustainability in the agri-food sector in order to increase biodiversity differs from other transitions to sustainability (for example, the dynamics of socio-technical transition in the mobility and energy sector) due to the central role of ecology. Two key characteristics, namely the dependence of agricultural systems on the terrain and the nature of biodiversity as a public good, have influenced the dynamics of changes in the agricultural sector in different ways.

Because of the attachment to the place, changes depend on the participation of a significant number of agricultural companies that are part of the existing regimes. These subjects of the regime often need support and encouragement to participate in the transition process, as well as to develop an understanding of the need to implement the basic postulates of the Concept of sustainable Development in the economic activities of agricultural enterprises. This applies not only to new methods of farming, but also to the institutional conditions that stimulate these new methods.

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DATA ABOUT THE AUTHORS

Dmitry K. Suchkov

Federal Research Center for Agroecology, Integrated Land Reclamation and Protective Afforestation of the Russian Academy of Sciences
97, Universitetskiy prosp., Volgograd, 400062, Russian Federation
suchkov1992@yandex.ru

Ilya V. Sorgutov

Perm State Agro-Technological University named after Academician D.N. Pryanishnikov
23, Petropavlovskaya Str., 23, Perm, Perm Territory, 614990, Russian Federation
Sorgutov_iliya@mail.ru

Nadezhda K. Gavrilieva
Arctic State Agrotechnological University
Sergelyakhskoe highway, 3 km, building 2, Republic of Sakha (Yakutia), Yakutsk, 677000, Russian Federation

Alexander V. Grigoriev
Moscow Aviation Institute (National Research University)
4, Volokolamsk highway, Moscow, 125993, Russian Federation

ДАННЫЕ ОБ АВТОРАХ

Сучков Дмитрий Константинович
Федеральный научный центр агроэкологии, комплексных мелиораций и защитного лесоразведения Российской академии наук
пр. Университетский, 97, г. Волгоград, 400062, Российская Федерация
suchkov1992@yandex.ru

Соргутов Илья Валерьевич
ФГБОУ ВО Пермский ГАТУ
ул. Петропавловская, 23, г. Пермь, 614990, Российская Федерация
Sorgutov_iliya@mail.ru

Гаврильева Надежда Константиновна
Арктический государственный агротехнологический университет
шоссе Сергеляхское, 3 км., 3, г. Якутск, Республика Саха (Якутия), 677007, Российская Федерация

Григорьев Александр Владимирович
Московский авиационный институт
Волоколамское шоссе, 4, г. Москва, 125993, Российская Федерация

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