Environmental Problems of AIC

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Abstract. Agriculture and related industries have traditionally been of great importance in the national economy of the Russian Federation. Socio-economic prerequisites for the development of the agro-industrial complex are determined by the scale and general development of the territory, its population, labor resources, as well as regional differences in the economic situation: rising prices, investments, proximity to markets for products. At the same time, the functioning of the agro-industrial complex is a source of various problems for the environment and requires the adoption of effective measures to restore the ecological balance.

1 Introduction

The agro-industrial complex (AIC) is the largest intersectoral complex that combines several sectors of the economy, including agriculture, food industry, agricultural engineering, feed production, as well as the functioning of specialized infrastructure.

In the 20th century, the large-scale industrialization of the Russian state ousted the agricultural sector from the priority areas of the country's development, and today it accounts for only 4% of the total GDP. At the same time, in the context of the activation of fundamentally new sanctions and epidemiological threats, the strengthening of agriculture directly meets the tasks of ensuring the national security of the country.

In 2020, by Decree of the President of the Russian Federation dated January 21, 2020 No. 20, a new Doctrine of Food Security of the Russian Federation was approved, which is a strategic planning document reflecting official views on the goals, objectives and main directions of state policy in the field of providing the population with domestic agricultural products and other food. The implementation of the provisions of this doctrine can be achieved through comprehensive support and innovative reform of the country's agro-industrial complex. Currently, agriculture is the only Russian industry that demonstrates sustainable development even in a crisis situation in the economy.

2 Materials and Methods

The agro-industrial complex is the sphere of social production most closely associated with the use of natural resources. The development of technologies used in agriculture and,

in general, in the agro-industrial complex, makes the problem of environmental protection more and more urgent. Pollution of natural resources as a result of the activities of industrial enterprises and enterprises that are part of the agro-industrial complex leads to a decrease in soil fertility, a decrease in the efficiency of crop and livestock production, and a deterioration in the state of water reserves.

With the modern approach to agriculture, its impact on nature in many cases becomes more negative in comparison with other areas of social production. If until the 60s of the 20th century, industry and transport posed the greatest danger to the environment, then later the agro-industrial complex took the first place in terms of pollution. The reason was a number of factors related to the development of agriculture and animal husbandry.

The development of agriculture caused the following negative consequences:

- replacement of large natural areas with sown fields in which only a few plant species are cultivated;
- destruction of territories that were the natural habitat of animals;
- soil pollution with mineral fertilizers and various chemicals that enter water basins with groundwater and rainwater and damage vegetation and fish stocks;
- changes in the hydrological state as a result of groundwater depletion and the accumulation of organic and mineral sediments in water basins;
- air pollution when aviation is used to apply fertilizers containing nitrogen to the fields.
- formation of wastelands and waste lands.

The development of animal husbandry caused the following negative consequences:

- the appearance of wastelands as a result of pasture overload;
- destruction of natural vegetation on pastures;
- pollution of reservoirs located near animal camps and processing plants.

The functioning of the modern agro-industrial complex is associated with the allocation of the most valuable lands for agricultural land, which, after degradation, are replaced by lands with low potential. This leads to significant economic losses, while it is very difficult to assess the real damage due to the lack of information about the decline in land productivity and the state of restored lands. However, statistics show a steady decline in agricultural land per capita. The problem of land use is intensifying due to the development of transport systems and the use of land for the construction of industrial enterprises and other facilities.

The most dangerous consequences for land are waterlogging, degradation of the fertile layer, salinization, pollution, wind and water erosion. These changes can lead to the impossibility of further use of land, as well as cause the death of wild animals, desertification and depletion of forests, and on a global scale - to a change in climatic conditions in certain regions.

One of the urgent problems is the development of animal husbandry, which requires the expansion of pastures at the expense of useful land and increased use of water. It is known that for the production of one kilogram of meat, it is necessary to use from 4 to 15 thousand liters of water, and for the production of 200 ml of milk, about 200 liters of water are required. At the same time, the production processes used in animal husbandry negatively affect the quality of water in nearby rivers and lakes, and also worsen the state of the environment in general.

Also, significant volumes of water are used on livestock farms for disinfection, washing animals, and equipment maintenance. The total amount of wastewater in the livestock sector can reach 1 million tons per year, and with the further development of this sector, wastewater discharge will increase. At the same time, untreated, manure-containing wastewater, when released into water bodies, negatively affects the ecosystem and causes economic damage. Thus, the impact of agriculture on the environment is expressed both in the increasing

consumption of natural resources and in the emission of waste produced by livestock farms, poultry farms and other objects related to the agro-industrial complex.

The volume of waste in the activities of livestock complexes and poultry farms remains one of the main factors of environmental pollution. It is known that 10,000 animals on cattle feed farms produce up to 200 tons of manure in one day. A large livestock complex generates pollution comparable to the pollution created by a large industrial center with a population of about 500,000 people.

3 Results

Changes in the forms of management in the agro-industrial complex and the introduction of modern technologies in most cases are not accompanied by the deployment of environmental measures and the installation of equipment to limit harmful emissions. Most livestock complexes and poultry farms discharge wastewater without treatment. Only 20% of the existing wastewater treatment plants meet the standards and ensure the environmental friendliness of production processes. The main reason for this situation is the use of outdated treatment facilities and applied technologies, as well as the critical wear of equipment.

No less acute is the problem of atmospheric pollution by substances formed in the course of the activities of agricultural enterprises. Sources of chemical and biological air pollution are manure storages, cattle feedlots, sewage, irrigation and filtration fields. Livestock complexes emit ammonia and other particles into the atmosphere, which can spread within a radius of 10 km.

To date, about 116 million hectares have been allocated for agricultural land in Russia, of which more than 53 million hectares are located in areas prone to water and wind erosion of the earth. In connection with the crisis in agriculture in recent years, the area of land has decreased, which has led to the emergence of abandoned lands. First of all, this process is observed in the regions of the Non-Black Earth Region. The reduction in agricultural land has both positive and negative consequences. The former include the restoration of the fertile layer of degraded lands, the latter include the formation of wastelands, the spread of weeds, and an increase in the load on used land.

The presence of a large amount of fallow lands became one of the main causes of locust outbreaks in the Volga region and other regions in the second half of the 90s. Large areas of former sowing fields, where mechanical tillage is not carried out, become a favorable breeding ground for locusts. At the same time, in the steppe regions, during the recovery period, a layer of turf appears, which prevents the laying of locust eggs. Thus, in the steppe lands, the fallow period is one of the important stages in the restoration of the steppe ecosystem.

In Russia, the main environmental problems in the field of agriculture are related to the state of cultivated land, surface and groundwater. The degradation of agricultural resources observed in recent decades is explained both by the lack of restorative measures and by the changed type of activity of the rural population. First of all, we are talking about mass deforestation in those areas where agricultural work has practically ceased. Deforestation, accompanied by insufficient reforestation, leads to soil erosion and a drop in groundwater levels.

The crisis phenomena that accompany the Russian economy have not drastically affected the environmental situation in the field of agriculture and, in general, in the agro-industrial complex. It should be recognized as erroneous the opinion about reducing the burden on the natural environment as a result of a reduction in the use of fertile lands and a reduction in the production of certain types of products, since during crises there is a decrease in land use culture, a change in management principles and non-compliance with established

environmental measures. All these factors cause excessive anthropogenic pressure and lead to massive degradation of agricultural land.

Researchers name among the main causes of anthropogenic degradation such factors as the destruction of the soil structure, wind and water erosion, dehumification, technogenic pollution of land, desertification, salinization, and soil flooding [1]. Among the reasons causing these phenomena are insufficient soil moisture, excessively high soil plowing, insufficient care for pastures and hayfields, and a low level of culture in managing agricultural processes.

According to modern data in Russia, 2/3 of agricultural land has a potential danger of soil erosion, and about 20% of the land has already been eroded [2]. Also, about 2/3 of forage lands are exposed to the danger of wind and water erosion. In general, by now we can talk not only about the non-renewable loss of land resources, but also about the impact of soil erosion processes on the surrounding landscape.

Soil degradation is associated not only with erosion processes, but also with the problem of insufficient use of fertilizers. The balance of humus in the arable layer on most lands is negative. The minimum level of humus in the soil is considered to be 1.5%, but according to experts, this figure has decreased over the past decades to 5% in the Central Chernozem zone and to 1.3% in the Non-chernozem zone. When the humus value is less than the threshold value, the role of mineral fertilizers is minimized, since they are not retained in the arable soil layer.

Agriculture also shows a number of problems left over from the Soviet era. The most acute of them are associated with environmental disasters that have led to irreversible changes in the landscape. So, during the accident at the Chernobyl nuclear power plant, sown fields in 14 Russian regions were exposed to radioactive contamination, ten years after the accident, 3,500 hectares of cultivated fields were contaminated with cesium-137.

4 Discussion

Currently, the very nature of environmental pollution has changed. Compared to the 1980s, the application of chemicals and mineral fertilizers to the soil has decreased by more than 5 times. Due to the increased cost of manure, its accumulation stopped, which led to flushing into water bodies. Manure is currently fully used in household plots or is sold to summer residents. As a result of a sharp decrease in the use of fertilizers, the accumulation of chemicals in the fields and adjacent forests has stopped, which has caused an increase in the number of bird species such as mallard, black grouse, cracked teal, gray partridge and many others.

But if earlier mineral fertilizers and pesticides were the main tool for increasing productivity, today these substances are actively used in anti-erosion treatments of agricultural land. Also, chemical compounds and drugs are widely used to control pests and weeds. Chemical fertilizers pollute the environment and enter food through the soil, posing a threat to human health. In addition to the direct negative impact on the soil, water bodies, plants and the atmosphere, chemical fertilizers are dangerous if the rules for their manufacture, transportation and storage are violated. Chemical warehouses are often dilapidated and fail to meet toxic storage standards, and many companies violate transportation regulations by not properly treating cars,

Another problem is the widespread violations observed when organic and mineral fertilizers are combined, which leads to their going beyond the root layer of the soil and getting into surface and ground waters. This problem is most relevant for the Non-Chernozem region, where low-humus soils and soils with a low absorption capacity predominate.

Speaking about landscape change, first of all, it is necessary to mention the processes of desertification, flooding and salinization of soils, which pose a serious threat to the ecological

situation in the region. On the territory of the Russian Federation, more than 500 thousand hectares of agricultural land are flooded by reservoirs, and the process of land desertification is observed in 17 Russian regions. About 50% of the territories are subject to desertification in Kalmykia, Rostov, Astrakhan and Rostov regions.

In Kalmykia, as a result of agricultural work on sandy lands and uncontrolled grazing, the only anthropogenic desert in Europe was formed, the area of \u200b\u200bwhich is currently 600 thousand hectares. For thirty years, this territory has remained a zone of ecological disaster, during which time 25 settlements ceased to exist due to the onset of the desert. Due to the increase in livestock, prolonged droughts and insufficient restoration work, experts predict a new wave of desertification in Kalmykia and the northern regions of Dagestan.

Soil salinization affects about 9% of agricultural land in the Russian Federation, mainly saline land is located in the Volga region, the North Caucasus, Eastern Siberia and the Far East. Excessive salinity leads to the formation of sulfites, carbonates, chlorides and other substances in the soil that have a toxic effect on various plant species [3]. Also, the salt concentration causes an effect in which the roots of plants lose their ability to absorb water, which leads to the loss of the photosynthesis process and can be detrimental to many species.

In most cases, the processes of desertification, salinization and flooding of the soil are caused by hydrotechnical and reclamation works that were carried out back in the secular era with insufficient attention to assessing the consequences of tillage in risky farming areas. Unfortunately, over the past thirty years, it has not been possible to establish land reclamation systems, many of which were privatized during the perestroika period and in many cases were repurposed or destroyed.

5 Conclusion

The solution of environmental problems in the field of agro-industrial complex is possible by revising the very concept of the development of the agricultural sector, which must necessarily include environmental measures carried out in accordance with the natural characteristics of land resources. The active development of the agricultural sector is possible with an environmentally friendly approach to land reclamation, mechanization and other processes in agriculture and the introduction of modern technological methods in the functioning of the entire agro-industrial complex.

The solution of environmental problems is inextricably linked with the main task of land use - ensuring the restoration of the natural fertility of agricultural land. The solution to this problem involves such measures as preventing wind and water erosion of soils, protecting the topsoil from salinization, competent application of organic fertilizers, melioration, limiting the technogenic load on the soil, applying biological methods of plant protection, and many others.

An important task for the development of the agro-industrial complex, taking into account modern environmental requirements, is the modernization of the production and marketing sector. This is primarily the development of infrastructure, which includes supply routes, logistics, modern storage facilities, and specialized transport. We are also talking about improvements in the processing industries and the introduction of environmentally friendly technologies in livestock complexes and poultry farms.

Experts note that due to the obsolescence of equipment and storage facilities in the agricultural sector, losses reach 20-30%. The conservation of resources requires the accelerated development of the processing industry and infrastructure, the withdrawal of degrading land from land use and the implementation of global restoration measures that can ensure a stable growth in agricultural performance.

An urgent task to improve the environmental situation in the agro-industrial complex is the organization of effective disposal of organic waste. Waste accumulated near livestock

and poultry enterprises can be processed using biological methods, which will allow not only to switch to waste-free production, but also to receive additional profit. Such methods are being developed, among other things, by Russian scientists: on the basis of the All-Russian Research Institute for the Use of Reclaimed Lands (Tver), a technology for processing by biological fermentation has been created, and VNIVI (Kazan) produces a UV-1 preparation that accelerates the fermentation process [3].

In modern conditions, the agricultural sector is faced with the task of resource conservation, based on achieving high results with reduced use of land. Soil degradation, industrial development, urbanization lead to the destruction of lands and their replacement with less fertile lands. The way out of this situation can be a move away from the extensive nature of land use and the transition to an efficient use of resources based on a targeted approach and reducing losses through the modernization of basic processes.

The efficiency of agricultural production and the rate of its growth are directly related to the rational use of land resources. For the stable production of agricultural products, it is necessary to provide protective measures to reduce the anthropogenic impact on the soil cover and reduce the level of environmental pollution.

References

1. I. S. Azarova, Influence of agriculture on ecology, In the book: Gorinsky Readings. Innovative solutions for the agro-industrial complex, 163-164 (2022).
2. Kh. A. Fashiev, Competitiveness of the organization: assessment and management: monograph, 271 (2019).
3. Yu. N. Klyushnikova, World economy and national economies, Beneficiary, 94, 16-22 (2021).
4. B. G. Litvak, Strategic management: textbook, 507 (2022).
5. Ya. E. Lvovich, Problems of ecology in agriculture, In the collection: Design and construction, 227-230 (2020).
6. M. Porter, Competitive strategy. Methods of analysis of industries and competitors, 845 (2020).
7. A. A. Thompson, A. J. Strickland, Strategic management: Concepts and situations for analysis, 928 (2021).
8. A. V. Yashkin, S. V. Balandina, Directions of harmonious development of agriculture and agrarian territories, Management accounting, **1-3**, 367-372 (2022).