Environmental aspects of the development of large agricultural integrated formations

Sh M Gazetdinov[1*], *A M* Abdulkhakov[1], *M Kh* Gazetdinov[1], and *O S* Semicheva[1]

[1]Kazan State Agrarian University, 65, Karl Marx street, Kazan, 420015, Russia

Abstract. The article examines the environmental aspects that arise in the process of concentration and specialization of agricultural production in a particular rural area. Thus, as scientific and technological progress develops, the problem of carbon dioxide concentration in the atmosphere increases. The share of CO_2 emissions in the production of agricultural products is high, including in the conditions of the creation of large integrated agricultural formations. Thus, from a cowshed for 200 heads with an average weight of 500 kg, productivity of 30 kg, the daily CO_2 emission is 1,445 kg. Accordingly, with an average livestock of 5,000 heads in megafarms, this indicator in a particular facility is about 40 tons per day. There are also problems with the protection and improvement of reservoirs and the formation of a "carbon footprint" in the environment. It is proposed to implement a unified integrated approach to solving this problem and its mutual alignment with other sections of the plan when developing a comprehensive development plan for integrated agricultural formations in terms of environmental protection; to ensure the unity and consistency of sanitary and health indicators with socio-economic indicators of rural areas; to carry out all environmental calculations based on current standards; to cover a set of quantitative and qualitative indicators characterizing the level, condition and development of individual industries, socio-economic parameters and the environment of a particular rural area.

1 Introduction

Modern agrarian integrated formations represent a complex of processing and technologically related agricultural industries with servicing and auxiliary enterprises, unified transport and the sphere of product sales.

The formation of such integrated enterprises, as a rule, depends on local natural, labor and material resources, while the products produced are processed in their own or nearby food or light industry enterprises. Their creation, on the one hand, is due to the specifics of agricultural raw materials: low transportability, volume and limited shelf life. On the other hand, it is important that a significant share of the added value is formed at the stage of processing of agricultural products.

* Corresponding author: gazetdinov.shamil@yandex.ru

The presence of technological links between agricultural and processing industries is the basis for the creation of various agro-integrated formations at the initial stage, and the deepening and expansion of economic ties in the future leads to the organization of geographically integrated agricultural production formations [1]. This is facilitated by the processes of specialization, concentration and intensification of production, as well as its cooperation and systemic development, which are crucial in the context of scientific and technological progress. In order to ensure the country's food security and involve labor reserves in production, it is necessary to locate enterprises processing agricultural raw materials, taking into account the principles of logistics [2-3]. In the future, all this will strengthen the development of rural areas and the solution of socio-economic problems of the rural population, which in turn will allow faster transfer of the main branches of agriculture to digital methods of production organization. The use of digital technologies and robotics reduces labor and production costs, promotes the expansion of the product range, and the use of industrial waste.

The creation of processing enterprises in rural areas helps to use labor resources more efficiently, and over time, on this basis, to overcome differences in labor and socio-economic conditions of workers in rural areas and cities. Also, the functioning of processing plants as part of integrated formations ensures timely primary processing of raw materials, reduces product losses, and leads to a sharp reduction in transportation and overhead costs.

The purpose of the study is to substantiate the optimal combination of sectoral and territorial management principles with the processes of nature protection and environmental management.

The scientific novelty consists in developing the principles of integrated planning for the development of large integrated formations in terms of environmental protection, taking into account the concept of development of specific rural areas.

2 Materials and methods

Studies of the practical experience of integrated formations of the Republic of Tatarstan indicate that specialization and concentration of production and effective management of the flow of goods and materials allowed to gain profit, increase labor productivity [4]. At the same time, there is a close relationship between economic indicators and investment processes. Thus, the agroholding Krasny Vostok Agro invested 14 billion in the development of dairy cattle breeding. At the expense of these funds, 13 megafarms were built and put into operation, which ensured an increase in the number of cattle from 16,200 heads to 65,000, i.e. an average of 5,000 heads in each farm [5]. It should be noted that dairy farming is a significant source of carbon dioxide, which affects the formation of a "carbon footprint" in the environment.

The results of research by Russian scientists show that the emission of carbon dioxide from a cowshed depends on the productivity and weight of animals. Thus, from a cowshed for 200 heads with an average weight of 500 kg, the daily emission of carbon dioxide is: with a daily milk yield of 20 kg – 1277 kg, 25 kg – 1354 kg and 30 kg – 1445 kg [6]. Accordingly, with an average livestock of 5,000 heads in megafarms, this indicator in a particular facility is about 40 tons per day.

At the same time, non-compliance with zootechnical requirements for the content of carbon dioxide in livestock premises negatively affects the productivity of livestock, and can also cause chronic poisoning and reduced resistance to diseases [7-8]. At the same time, it is well known that in one warm sunny day, 1 hectare of forest releases 180-200 kg of oxygen and absorbs 220-280 kg of carbon dioxide. If we take into account the carbon dioxide released by forage harvesting and maintenance equipment for these farms, it is not

difficult to calculate what measures need to be taken to protect the environment in a particular rural area. It is often overlooked that manure storage facilities on farms periodically overflow with their contents and organic matter enters reservoirs through rains.

Foreign researchers claim that the problem of carbon dioxide concentration in the atmosphere increases with the development of scientific and technological progress [9]. The share of CO2 emissions in the production of agricultural products is high, including in the conditions of the creation of large integrated agricultural formations.

3 Results and Discussion

The strengthening of not only technological, but also organizational ties between agricultural formations and other entities operating in rural areas depends on the development of scientific and technological progress. As a manifestation of this process, we can consider such ongoing activities within a specific rural area:

- Establishment of direct links between integrated agricultural formations and small and medium-sized businesses.
- Participation of integrated agrarian formations in solving socio-economic problems of municipalities, etc.

The process of formation and development of integrated agricultural formations is accompanied by an acceleration of the intensification of agricultural production, an increase in the need for skilled labor, an expansion of the technical capabilities of complex processing of agricultural raw materials, etc.

Increasing the efficiency of the development and placement of production processes largely depends on the structure of the integrated formation, that is, on how well individual industries and productions are combined in it, which, in turn, is determined by the nature of agricultural raw materials, the possibility of its processing and the economic feasibility of organizing this process [10].

One of the fundamental problems that arise when creating integrated agricultural formations is environmental protection, which has a number of aspects: scientific and technical, socio-economic, sanitary and hygienic, biological, etc.

There is a problem of optimal combination of sectoral and territorial management principles with the processes of nature protection and environmental management. The negative side of the sectoral principles is the fragmentation of participation in the management of many agricultural enterprises. It reduces responsibility for the state of the natural environment to some extent. The negative aspect of the territorial principle is manifested in the lack of material resources, incentives and necessary rights. Leaving the advantage to the territorial principle of management in the field of nature protection, it is necessary not to oppose both principles, but to combine them wisely.

Livestock industries are one of the main sources of greenhouse gases in rural areas. Research by domestic scientists has shown that greenhouse gas emissions in the country due to internal fermentation amount to about 50 million tons annually, and the manure collection and storage system adds another 15 million tons [11].

An analysis of the agricultural process in the Republic of Tatarstan, animal husbandry in particular, and an increase in its concentration shows that in 2022, the number of cattle in farms of all categories was 75.3% by 2001 (Figure 1).

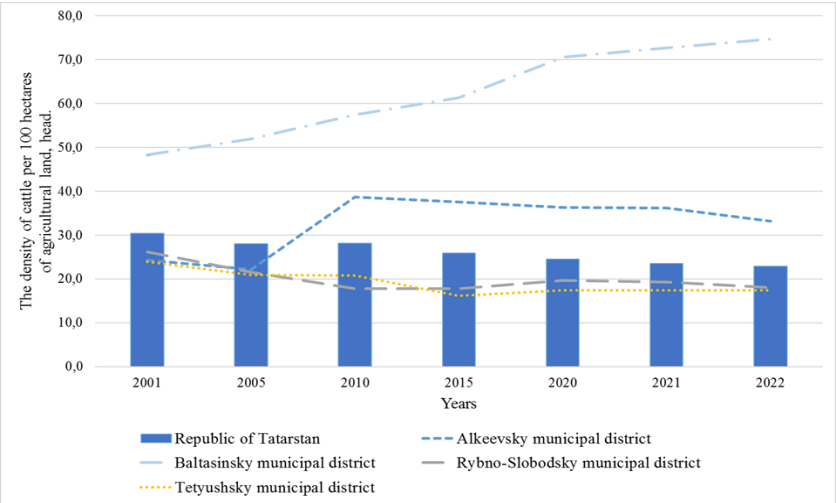

Fig. 1. Dynamics of the density of cattle per 100 hectares of agricultural land in the Republic of Tatarstan for 2001-2022.

At the same time, the trend of livestock reduction is not observed in all municipal districts. Thus, in the Baltasinsky municipal district, the number of cattle increased by 21260 heads or by 54.3% during the study period. Thus, the density of cattle per 100 hectares of agricultural land increased to 74.66 heads, which is 3.3 times higher than the national average.

In addition to large agricultural formations in the Baltasinsky municipal district, there are more than 20 medium-sized and small agricultural enterprises, 39 construction organizations and more than 200 small businesses in other areas. All of them make a negative contribution to the ecology of the rural area. At the same time, the area covered by forest vegetation is 11.6 thousand hectares, only 10.6% of the territory. It is obvious that the needs of the district in increasing environmental resources should be met by financial sources, including large agricultural formations, and this, accordingly, should be reflected in comprehensive plans for their development.

As a result, the concentration of livestock production in certain rural areas leads to the accumulation of possible pollutants. All this should be reflected in the organizational and economic aspects of the development of a specific rural area within the framework of a natural economic zone.

When analyzing the shortcomings and omissions in the development of long-term development plans for integrated agricultural formations, the following should also be borne in mind: carbon dioxide emissions into the atmosphere, wastewater discharged into a reservoir, are obstacles to the development of entrepreneurship, both directly agricultural production and other fields of activity in rural areas. Projects and calculations of the economic efficiency of development, in particular processing enterprises, do not always provide for investment costs for sanitary and health measures to protect the environment.

The development of large integrated agricultural formations shows that the phased reconstruction of existing facilities or the construction of new ones, causing a gradual increase in production capacity, as a rule, leads to a gradual deterioration in the sanitary condition of a particular rural area. Since such changes are difficult to take into account in economic projects, the solution of problems associated with them is postponed indefinitely.

Moreover, the development plan for integrated agricultural formations is not linked to the concept of development of a specific rural area. There is a narrowly sectoral approach of specialists to solving the issues of development of the planning object, while not taking

into account the interests of local villagers, the concept of development of specific rural areas, for example, the organization of landscaping and the cost of landscaping, the cost of growing and caring for plantings, etc. At the same time, the economics of landscaping should provide not only the lowest costs for new livestock facilities and processing products, but also the lowest operating costs in the future.

Another problem related to the concentration of production is the protection and improvement of reservoirs. The effectiveness of wastewater treatment from megafarms and fields where various chemical elements are used is largely determined by the amount of funding and allocated material resources. With a low level of concentration of production and small agricultural enterprises, there was a uniform dispersion of production facilities, while the creation of integrated large agricultural formations is accompanied by an increase in concentration and specialization of production. Accordingly, when creating large production sites, it is necessary to allocate finances for the construction of wastewater treatment plants. The most radical and effective solution to this problem should be the complete cessation of wastewater discharge into reservoirs. This can be achieved by replacing existing technological processes with new ones that completely disconnect the sewerage system of integrated formations from the reservoir.

There are problems with the ecology of the air environment. Here it is necessary to study and evaluate:

- Individual livestock megafarms as sources of atmospheric pollution and the sanitary state of the air environment as a whole.
- Hygienic and economic efficiency of the implemented health measures.
- The scope and sequence of planned technological, sanitary and planned measures to preserve the environment.

It is necessary to find out the prospects for increasing the capacity of processing enterprises and livestock farms and to obtain calculated data on the expected environmental pollution with an increase in production capacity.

The task of nature and environmental protection is not only to identify environmental pollution, but also to actively prevent the accumulation of possible pollutants. All this should be reflected in the long-term development plans. The severity of the problem is caused by the contradiction between the continuously increasing volume of agricultural production and the slow introduction of new progressive forms of production organization, in particular, sanitary and health measures. The pace of concentration and intensification of agricultural production in integrated formations is ahead of the development and implementation of effective wastewater treatment plants, as well as methods of processing by-products, while existing wastewater treatment plants, as a rule, operate inefficiently.

4 Conclusions

Thus, in the long term, when creating integrated agricultural formations, it is necessary to develop in detail the issues of organizing cooperation with small and medium-sized businesses in a specific rural area on water intake, recycled water supply and wastewater treatment, based on district planning schemes that have sufficient information on water supply, sanitation and wastewater treatment. In general, a comprehensive plan for the development of integrated agricultural formations in terms of environmental protection should meet the following requirements:

- A unified integrated approach to the development of this problem and its mutual alignment with other sections of the plan.
- Unity and consistency of sanitary and health indicators with socio-economic indicators of rural areas.
- Carrying out all environmental calculations based on current regulations.

- To cover a set of quantitative and qualitative indicators characterizing the level, condition and development of individual industries, socio-economic parameters and the environment of a particular rural area.

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