

# The Role and Impact of Economic Processes on the Environmental Management of the Agro-Industrial Complex

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**Abstract.** The economic situation in the agro-industrial complex is heterogeneous. One of the fastest growing industries is the food industry. This industry is characterized by a stable financial position, it is being actively modernized. The production of chemical fertilizers, after a sharp drop in domestic demand for them in the 90s, was reoriented mainly to external demand. The state of this industry is currently influenced mainly by the conjuncture of the world market. Low domestic demand and competition from imports of used machinery have a negative impact on the development of agricultural engineering. Low capacity utilization and unsatisfactory financial position do not allow industry enterprises to concentrate financial resources for large-scale modernization of the industry. In agriculture, the situation is also not homogeneous.

## 1 Introduction

The spheres that enter the first sphere of the agro-industrial complex are designed to provide resources for the creation process, form the basis for the industrialization of the agricultural economy and promote the standard functioning of absolutely all parts of the complex. Rhythm, flow and the multiplicity of production of agricultural products and the final product as a whole largely depend on their work. The share of the first sphere of the agro-industrial complex requires almost 15% of the total volume of manufactured products, 13% of production assets and 22% of the number of workers [1;2]. The main component of the second sphere of the agro-industrial complex is directly agricultural production, in which two key sectors are distinguished - crop production and animal husbandry. Within the branches of crop and livestock production there are also branch divisions. In crop production, there are: vegetable growing, horticulture, grain production, cotton growing, flax growing. In the composition of animal husbandry, branches are distinguished according to the types of animals: cattle breeding, pig breeding, sheep breeding, and poultry farming. Along with this, livestock industries are distinguished by the nature of their products: dairy cattle breeding, meat and wool sheep breeding [3].

The agro-industrial complex (AIC) is the largest intersectoral complex that unites several sectors of the economy and is aimed at the production of agricultural products and

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the processing of agricultural raw materials [4]. The main sectors of the agro-industrial complex:

- production of agricultural products;
- agricultural engineering;
- production of mineral fertilizers;
- branches of processing, storage, transportation and sale of agricultural products;
- food industry;
- research organizations.

However, in general, the industry is characterized by low prices for agricultural products sold and intense competition from imports. At the same time, the relatively slow development of agriculture is due to a number of the following reasons. First, there are low rates of structural and technological modernization of the industry. In terms of the renewal of fixed production assets and the reproduction of the natural and ecological potential, the agro-industrial complex, and above all agriculture, lags far behind other industries. In particular, in agriculture, the coefficient of renewal of fixed assets is at one of the lowest levels, while the retirement rate of fixed assets is characterized by the highest value when compared with other sectors of the economy (see figure below) [7]. The industry is dominated by an extensive farming model. The technological backwardness of the Russian agro-industrial complex ultimately leads to low productivity compared to the world and insufficient dissemination of resource-saving technologies. Secondly, the financial instability of the industry remains.

On the one hand, this is due to the traditional for this industry factor of instability in the markets of agricultural products, raw materials and food. In Russian conditions, the situation is deteriorating due to the insufficient inflow of private investment for the development of the industry. On the other hand, the lack of available funds does not allow most enterprises to carry out a full-fledged technical and technological modernization of fixed assets. Enterprises' own funds continue to be the main source of financing. There is still a shortage of long-term resources for capital investment. Thirdly, agriculture is facing unfavorable general operating conditions.

## **2 Research Methodology**

Standardization and the creation of a data network facilitate two-way information exchange and promote the effect of interaction between representatives of the same and different levels of production, market participants (including consumers) and government agencies. As a result of the growing global pressure of competition, the question of which of the stakeholders will be best able to develop and use the potentials of digitalization is becoming increasingly important. According to experts, in Russia in 2020-2021, the ultimate sustainability of food security has been achieved [8]. In value terms, the export of agricultural products last year reached the level of imports. Such basic foodstuffs as grains and oilseeds, vegetable and animal oils and fats, as well as sugar and meat of various types began to be exported. Thus, the Russian Federation, in our opinion, using all the opportunities and resources available to it, can be considered completely self-sufficient in terms of food supply [9]. At the same time, in the production of such types of agricultural products as beef, milk and dairy products, vegetables, import substitution is possible. It should be noted that the above-mentioned depreciation of the ruble against the dollar and the euro caused an increase in the investment attractiveness of agriculture, making imported food products less attractive and affordable for consumers. Taking into account the new realities, investors in the agrarian industry, of course, had to adjust their plans, abandoning some projects, or shifting their implementation dates to a later time. A number of agricultural producers are faced with the forced need to change the range of products and

channels for its sale. Appropriate adjustments were promptly made to the business plans of investment projects. In some cases, investors have had to put up with additional investment while reducing investment performance. They had to adapt to new realities, relying, of course, on state support.

### **3 Results and Discussions**

An analysis of the global trend in the development of MES for various purposes shows that automated electric drives are intensively used in them (on asynchronous, synchronous and valve-induction motors, DC motors). Today, this direction is characterized by the use of tens of millions of electric machines. The intellectualization of mobile means of the agro-industrial complex requires their further development, including the use of automated energy-efficient electric drives across the entire spectrum of the system of machines and technologies [10]. Large-scale intellectualization and robotization of mobile energy and transport-technological means of the agro-industrial complex will allow for the next 5-10 years to significantly increase productivity, labor productivity and environmental safety, as well as reduce crop losses and energy and material consumption by 2.5-3 times. Undoubtedly, the use of modern automated power drives on mobile and stationary agricultural equipment provides significant economic benefits compared to existing traditional hydraulic, pneumatic, mechanical ones. For example, the use of automated electric drives on the technological units of the Torum combine (manufactured by Rostselmash), according to experts, will give an economic effect of about 400-450 thousand rubles per harvesting season.

In the current period, unmanned tractors are being introduced into agriculture in developed countries. So the companies Case IH, CNH Industrial have developed an unmanned tractor capable of performing the whole range of basic agrotechnological works [11]. The information systems used make it possible to provide remote determination and control of specified technological operations. The tractor independently determines its place on the field, the place on the field of other equipment, as well as the terrain, the slope of the terrain. The GIS system includes onboard video cameras, radar installations, laser radars. If there is no GPS signal, the tractor will automatically stop working [12]. Drones are beginning to occupy an increasing place in the system of agricultural production. The leaders here are a number of countries of the European Union, the USA, China, and Japan. Agricultural drones in the agro-industrial complex contribute to the transformation of the agricultural industry into one of the most high-tech sectors of the national economy of these countries. The largest manufacturers of this subspecies of drones are Aero Union Inc, Yamaha, AgEagle. Agricultural drones can significantly increase the efficiency of using plant protection products [13]. The rapid growth of agro-industrial production in China predetermined that by 2023 the use of drones will be more than 40%, which in monetary terms is 2.5 billion dollars. With regard to the livestock industry, GIS solves the following important tasks: 1. Identification of the state of hayfields and pastures; 2. Determining the level of pollution with waste from livestock farms; 3. Determining the level of pasture loading with agricultural animals; 4. Identification of lands prone to desertification, etc. One of the reasons hindering the introduction of GIS in the agriculture of the Russian Federation is the lack of necessary cartographic materials, information about the nature of land ownership, and the low level of information literacy of workers in agricultural enterprises. At the same time, the development of GIS in agricultural practice allows for a relatively short period of time to increase the level of doing business in the domestic agro-industrial complex. In this regard, the payback period for investments in GIS is of no small importance. According to expert estimates, they range from 1 to 3 years [14]. Further digitalization of agriculture will allow increasing global agricultural production by 70% by

2050. That is, in essence, we are talking about the second “green revolution”, which is based on information technology. Therefore, this direction of development of the agro-industrial complex occupies a key place in the development strategy of the leading agro-industrial transnational companies. Thus, information technologies allow for full automation, computerization of production processes in the agricultural production system. The current stage of this objectively determined process is a higher level of digital integration, which leads to significant changes in the organization of business activities in the agro-industrial complex [16]. This circumstance already has a significant impact on the level of profits and the competitiveness of agricultural products and agricultural firms in general.

These indicators are calculated per person or family, and it is also necessary to indicate what is the provision of a person or family with consumer goods. A prerequisite for the development of human capital is the satisfaction of material, spiritual, physiological needs. This requires a balance of social needs and the number of created material services. If these conditions are not met, there is an inevitable overflow of human capital from one sphere of the economy to another. To solve this problem, it is necessary to create in agriculture, i.e. in the agricultural sector of basic conditions to help improve human capital [15]. The fulfillment of these conditions helps to bypass the overflow of capital into various economic spheres, as well as other social spheres. In the agricultural sector and other areas of the economy, human capital is equated to physical capital and makes it possible to use the resources and personal abilities of the individual to make a profit through entrepreneurial activity. Analyzing the effectiveness of the use of human capital, it is necessary to pay attention to the conditions in which the rural population lives in a transitional economy and determine the structure of its reproduction, as well as solve the problem of the ratio of incomes of the urban and rural population. A plan is needed for the quantitative and qualitative layer of workers in the agro-industrial complex and other industries [3]. One of the priority areas for improving human capital in rural areas is: the composition, quantity, quality of migration, wages, incomes of the rural population, education of those living in rural areas, solving the problems of retraining and development of rural infrastructure. For the development of human capital, the level of the innovative economy, the necessary economic knowledge, information systems, modern technologies and the latest forms of entrepreneurial activity play an important role. Human capital and its development is of great importance for all countries, regardless of their income level. Countries with high incomes do not reduce efforts to develop human capital and invest their citizens in improving the quality of skills in order to remain competitive in the world market. Investments in human capital are essential to reduce poverty and develop economic growth around the world. Also, investments in human capital for economic growth and support for people in countries with a weak economic, i.e. developing countries.

## 4 Conclusions

In the face of a growing worldwide demand for food and a change in the consumer basket (demand for organic products is dynamically increasing), the government and the agricultural sector in Russia have opened up a large export potential for the industry. A necessary condition, of course, is to increase productivity. For this reason, digitalization should also be actively promoted in Russia. The standardization and centralization of data and data sources therefore appear to be relevant as a top priority for the government in Russia. It is necessary to focus on the needs of (potential) users. Without constant feedback between developers and users, there is a danger that individual digital transformation projects will not be saved due to the corresponding losses in efficiency.

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