

Nature Management Imperatives in the System of Ensuring Food Security in Russia

Victor OVCHINNIKOV^{1*}, Natalia KETOVA¹, Alla LYSOCHENKO¹

¹Southern Federal University, Rostov-on-Don, Russia, info@sfedu.ru

*Corresponding author: 105/42 ul. Bolshaya Sadovaya, 344006 Rostov-on-Don, Russia; E-mail: ovchinnikov victor@rambler.ru

Abstract

The purpose of the paper is to explore the opportunities of observing nature management imperatives in solving the problem of ensuring the food security of countries and their regions. A case study of the Rostov Region – a typical region of the South of Russia – covers the opportunities of solving the issues of food supply using the methods and technologies for the greening of agriculture. It is shown that on the basis of nature-like technologies, it is possible to organize the production of valeologically safe and economically affordable food products, providing a favorable living environment for the population. The results obtained and proposed may be of interest to managers of farming enterprises and their business practices. Researchers can use the recommendations in terms of substantiating a conceptual model in which the production function – ensuring food security – is represented by three system-complementary components: sufficiency (necessary quantity), affordability (institutional and economic conditions for the use of food products) and quality (environmental friendliness and valeology) of food while the boundary conditions for the realization of this goal are the imperatives of nature management (compliance with the requirements of nature-friendly agrotechnologies and environmental protection measures). The algorithm of the research conducted using the Russian empirical base can be adapted to the conditions of the institutional-economic environment of any state.

Keywords: nature management imperatives; food security; Sustainable use of natural resources; greening; nature-like technologies; food sufficiency and safety; agrifood sector.

1. Introduction

Environmental issues, including those in the field of agrarian environmental management, have ceased to be the subject of research of individual scientists, but have moved into the category of socially significant, actively discussed and requiring urgent actions at the global level. At the end of the 20th – beginning of the 21st century, along with the issues of sustainable use of natural resources (including land use), such as the rigidity of the imperatives of accounting for natural constraints of economic growth (Sengupta, 2013; Kryazhimskiy, Tarasyev and Usova, 2015), the following emerged: the need to restore the impaired balance of metabolic processes (König et al., 2017), heightened socio-economic contradictions of the transition to a post-industrial society, acceleration of the urbanization process, domination of market preferences in the motivation of economic activity, overcoming of negative factors of unsustainable use of natural resources.

Ensuring food security is the most important link in the system of measures of guaranteed normal existence of society, and, at the same time, a multidimensional macroeconomic problem. Global Food Security Index defines food security as “the state in which people at all times have physical, social and economic access to sufficient and nutritious food that meets their dietary needs for a healthy and active life”, namely affordability, availability, quality & safety, natural resources and adjustment (The Economist Group, 2018). This multidimensional aspect is associated with the need to ensure the growth of the efficiency of public production, increase the level of individuals’ incomes and reduce their differentiation, preserve a green natural environment as a condition for ensuring the valeological safety of food and the welfare of the human noosphere.

Food security includes three aspects: quantitative (the degree of realization of the current demand for agricultural and food products), qualitative (meeting the need for high-quality food safe for health), and socio-economic (growth of household incomes, ensuring the availability of food for all groups of the population at the reproductive level). The first aspect is projected onto the sphere of reproduction of material values, the second – onto the sphere of reproduction of natural resources and environmental goods, and the third – onto the sphere of reproduction of economic relations guaranteeing the real availability of ecologically pure and valeologically safe food as the categorical imperative of the reproduction process of human life. It is the agro-industrial sector (AIS) that is the main manufacturer of vital products, most of them being not replicable in other industries, which uses for this purpose such specific production facilities as land, cultivated plants, and productive animals. Economic ties in the agro-industrial sector, in this regard, can be viewed as a relationship in connection with the supply of natural resources for agricultural production, products processing, market exchange, and consumption.

The system of modern agricultural technologies includes, first of all, fight against soil erosion, use of organic fertilizers, agroforestry, cultural and technical reclamation, grass sowing, liming sour soils, minimizing the anthropogenic impact on the soil, soil-protective technologies, biological methods of protecting plants, optimal crop rotation. These measures to improve the soil quality are considered “soft”, because they do not make drastic changes in the ecological balance of agroecosystems and contribute, at the same time, to an increase in soil fertility. These technologies should take priority over the “deep” transforming amelioration (primarily hydro-technical), massive use of chemical and technological impacts on the agro-ecosystem of

high doses of mineral fertilizers and pesticides, use of powerful heavy machinery with a heavy ground load in agriculture. Fully replacing such "tough" technologies and methods with *environmentally friendly* ones and implementing, at the same time, anti-erosion measures makes it possible to increase crop production by about 1/3. As a result of the implementation of the program of *general greening* in agriculture, the possible increase in agricultural products in terms of grain, according to experts, may reach 50-70 million tons.

The use of *nature-like* technologies in the process of the greening of agriculture is very promising for solving this problem. Nature-like technologies are fundamentally new technologies for generating and consuming energy modeled on living nature. They do not cause damage to the surrounding world, but exist in harmony with it and allow maintaining the balance disturbed by man between the biosphere and the technosphere. They combine materials, technologies, and functions of animate and inanimate nature, and are based, as a rule, on bioindustrial technologies, electronics, and robotics (Osipov, Rummyantseva and Eremina, 2018). Ideally, such technologies are able to restore the balance between the biosphere and the technosphere disturbed by man, since *the meaning of nature-like* technology is to restore homeostasis, a natural, self-consistent resource cycle, broken by "hard" technologies, taken out of the natural environmental context. The tools for creating such a technosphere are convergent nano-, bio-, information, cognitive technologies (Lyons and Smith, 2018; Ali et al., 2014; Bhattacharyya et al., 2011; Handford et al., 2014). The sectors using nature-like technologies associated with the agro-industrial sector are: energy saving and alternative energy (Brown et al., 2011), environmentally friendly waste recycling, biotechnology, genetic engineering and gene therapy, environmentally friendly production technologies in various fields, microbiology.

The simplest example of a conglomerate based on nature-like technologies is a solar vegetarianism. It is a structure (system), which, due to its optical and physical properties, is able to accumulate solar energy, distribute and use it (for example, for growing vegetables). The life-support systems of such a vegetarianism allow for repeated use of water, carbon dioxide and other elements necessary for maintaining the growth of plants. The inventor of a solar vegetarianism is the Russian physicist Anatoly Ivanov, who built his first version in the mid-1950s. After 35 years (in 1989), regardless of the discoverer, a similar invention was repeated by the Chinese peasant Wang Lei. Due to the support of the Government of China, which abolished taxes on agricultural producers, such vegetarianisms became widespread, first in the south of China, and then throughout the country as a whole. Currently, they are common in India.

This study is focused on resolving the existing contradiction in the practice of nature management between mental targets to maximize food production and the need for green and environmentally friendly measures with a lack of financial resources. The subject of the research is the technology of compliance with the environmental imperatives of nature management while ensuring the food security of the country and its regions.

Purpose of research: justification of the environmental imperatives of nature management in solving the problem of food supply at the national and regional levels.

Objectives of research:

- (a) identification of the general natural and climatic conditions for the functioning of the agri-food sector of Russia,
- (b) diagnosing the state of the system of economic use of natural resources in the domestic agri-food sector,
- (c) regional interpretation of the targets of the "Doctrine of Food Security of Russia",
- (d) development of a system of measures for the mass development of natural agrotechnologies and environmental protection activities in the region (Rostov Region).
- (e) justification of practical recommendations on the implementation of the environmental imperatives of the process of ensuring food security in the regions of southern Russia.

2. Methods

The instrumental and methodological tools of this research include the following methods: conceptual-categorical and comparative analysis, analysis of the empirical information background, evolutionary genetic and historical-logical approach, subject-objective determinacy, use of econometric characteristics (indicators) of the state of nature management systems, instrumental-functional opportunities, the cognitive validity of which, due to the effect of complementarity, significantly increased the heuristic potential of this research.

The study was conducted within the framework of the tradition of the classical economic doctrine in the format of the reproductive approach in the unity of all its moments (aspects): reproduction of material goods (food and other goods of agriculture); reproduction of ecological benefits of the environment (favorable natural conditions of human activity); reproduction of the social genotype of nature management relations (sustainable nature management) and reproduction of the individual as the main general civilizational social value. The authors consider the problem of food security (providing people with food in the required quantity and of proper quality) while observing the imperatives of sustainable nature management. In the meantime, in the ratio of the above aspects (moments) of the reproductive approach, the gradient of green development of the nature management system of the agri-food sector is determined by the imperative of human personality development, while other aspects reflect the conditions for solving this problem, fundamental for the fate of humanity.

The information and empirical background of the research is presented by statistical data of the Ministry of Agriculture and Food of the Rostov Region, reference information of Rosstat, the authors' results of previous studies of the problem, facts cited in academic publications, materials of the Internet.

3. Research Background

Such systems, which significantly reduce damage from natural-meteorological anomalies, play a special role in the republics of the North Caucasus, a significant area of which is represented by mountains and foothills, while employment of the population in agriculture is dominant (Kolesnikov and Ovchinnikov, 2017)

It should be noted that in the agro-industrial sector of the South of Russia, in general, there are significant environmental risks – the situation associated with non-ecological technologies for the disposal of solid industrial and household waste, removal of construction debris from cities to rural areas and lands unused in agricultural production. As a result, spontaneous ignition of debris often occurs with the release of poisonous gases. The decomposition products of solid waste are washed away with sediments, untreated water from sewage systems is discharged into open aquatic bodies, thereby polluting the atmosphere, hydrosphere, and lithosphere, causing significant environmental damage to the natural resources system.

At the same time, there are also positive "breakthrough" projects, testifying to the progress in solving this problem. One of them is the implementation of the Pure Don regional investment project. The project is focused on the qualitative improvement of the sewage collection and treatment system, in compliance with the current environmental protection requirements for reducing anthropogenic and industrial impacts on the soil, water, and air.

Improving the environmental safety of the sewage water treatment process is achieved by the disposal of sludge and effective disinfection of the water mass, including through the operation of an ultraviolet neutralization unit. The creation of a 10-km strip of planting and landscaping of the adjacent territory contributes to the solution of environmental problems within this project. A significant part of the project (total investment in it

being 4.7 billion rubles) has already been implemented by CJSC ABVK-EKO. The project is planned to be completed by the end of 2020. The positive effect of this innovative investment project is already obvious, and similar nature protection comprehensive projects will be implemented in other regions of Russia (Expert South, 2018).

The importance of such projects increases as the environmental situation in Russia becomes more complicated, which has caused deterioration in the quality of agricultural raw stock and food products in recent years according to a number of indicators. Thus, in some regions of the country, there is an acute problem of contamination of food with mycotoxins, the level reaching 18%. There are some cases of poisoning associated with the emergence of a large number of highly dangerous carcinogenic mycotoxins in poor quality cereal products, peanuts, sunflower, fruits, and vegetables. And this is despite the fact that Russia, along with Brazil, is rated as one of the most food-safe countries of the BRICS, especially in comparison with India and China (Tantri and Shaurav, 2018).

The main reason for the decline in the quality of grain is the forced (due to a lack of finance) refusal of producers from the basic elements of the nature-based wheat cultivation technology, non-compliance with the deadlines for the implementation of agricultural practices. This leads to a deterioration of the phytosanitary condition of crops, which is often aggravated by the non-execution of procedures for the preliminary assessment of the quality of grain in the formation of the seed stock.

As for fruit and vegetable products, in recent years, the range and types of vegetable and fruit crops have been significantly updated, but their nutritional, flavoring and technological properties have improved slightly, and in some cases have deteriorated. In fruit and vegetable raw stock, there are fewer vitamins and other biologically active substances, while environmentally harmful components are more.

Along with the deterioration of technological properties and reduced nutritional value, the level of ecological safety of food products decreases. Violation of regulations on the use of pesticides and the use of outdated technologies lead to the fact that in a number of areas, a high content of pesticides is noted in the analysis of food samples; they do not meet the hygienic standards for heavy metal salts. The level of food contamination increases in areas with unfavorable environmental conditions. The unfavorable situation develops in areas with high industrial pollution.

The most important reasons for this situation are often noncompliance with environmental (sanitary and epidemiological) standards and imperfection of the existing standardization, which does not meet modern requirements from the standpoint of product safety guarantees and consumer protection. The existing system of sanitary and hygienic monitoring does not cover the whole cycle "production – storage – processing – sale". When analyzing the quality of finished products, it is often not taken into account, in what conditions it was made, what pesticides were used.

In Russia, the system of material incentives for the production of organic food (subsidies, concessional loans, tax incentives) is not sufficiently effective. This actualizes the formulation as the ultimate goal of agricultural production: providing in sufficient quantities the processing and food industries with high-quality raw stock, and people – with valeologically safe products consumed in a natural form.

The main purpose of the food and processing industry is to develop safe food for health in the required quantities and in a sufficient assortment, providing all major groups of the population, taking into account the national, age and sex composition, health status, location and working conditions.

Achieving this goal is complicated by the fact that in recent years a significant proportion of raw stock that does not meet modern requirements has been supplied to enterprises of the processing industries. Thus, a large amount of low-quality grain with low content and quality of protein and gluten was supplied

for processing. A similar picture is observed in the production of raw materials of animal origin (Lunze et al., 2015).

An important problem for the agro-industrial sector is the opposition to imports and to using genetically modified organisms in agriculture and the processing industry. Evidence of the magnitude of the risk of their use is the cost of 15% of GDP in health care in the United States, where much of these funds are directed at combating the effects of mass obesity from food intake, which preferentially contains amino acids produced by genetically modified organisms. In the Russian Federation, the use of genetically modified organisms can worsen the health of the population. The way of solving this problem is the examination of food for biodiversity, regulation of the process of using GMOs. In a broad sense, one should speak about sustainable nature management, which contributes to the conservation of natural resource potential and human health, the rational use of natural resources and the provision of an effective method for their reproduction.

The main objectives of the "Doctrine of Food Security of Russia in the Production of Agricultural and Fish Products, Raw Materials and Food" (hereinafter referred to as "Doctrine") are aimed at providing high-quality food for the country's population, as well as expanding food exports (Decree of the President of the Russian Federation, 2010).

As for the achievement of the indicators established by the Doctrine of Food Security of Russia, in 2016 the share of domestic own grain production was 99.2% (the Doctrine's threshold was exceeded by 4.2 percentage points), potatoes – 97.4% (the Doctrine's threshold was exceeded by 2.4 percentage points), sugar – 94.6% (the Doctrine's threshold was exceeded by 14.6 percentage points), meat – 86.3% (the Doctrine's threshold was higher by 9.6 percentage points).

These figures were improved in 2017. The President even instructed to develop some measures to reduce commercial risks from lowering the purchase prices for agricultural products due to high yields. Production volumes in the domestic agro-industrial sector exceeded all expectations. Practically, the tasks set in the Doctrine of the country's food security were fulfilled (Medvedev, 2017). Russia in 2017 had a record grain harvest in the last 100 years. According to the Ministry of Agriculture of Russia, 132.7 million tons of grain was harvested in the country. This is facilitated by the development of modern and high-tech agribusiness, enabling to compete in the international market.

This leads to the formulation of a rather ambitious task: by the early 2020s, Russia's agro-industrial sector should become a cluster of the "food spiral of growth", get on a wave of growth. Such a statement means the formation of a set of industries with the single driver (namely, the AIS), which "draws into the growth funnel" all related sectors. In this spiral, experts say, innovations are taking root well, making it possible, in terms of serious investments, to efficiently update the economy of the whole country (Gurova, Kolerova and Polunin, 2018).

However, despite the successes, the tasks of mastering environmentally sound, non-exhaustive models of nature management remain topical; the transition to agricultural technologies that guarantee the maximum conservation of soil fertility and increase in yields; the expansion of crops via unused arable land; the reconstruction and construction of land reclamation systems; the accelerated development of the livestock sector. The main threat to food security in the field of reproduction of material values in Russia is the instability of agricultural production in areas of high-risk farming – they amount to 80%, a high probability of adverse weather conditions (Shokri, Arkhipov, Belokrylova, Filonenko, 2017) and the lack of systemic measures of agro-economic policies conducted in the regions. Significant damage from natural and meteorological anomalies in the agricultural sector adversely affects the economic performance of agricultural producers and reduces the investment attractiveness of the agricultural sector (Pacheco et al., 2018).

The expansion and more intensive use of the potential of aquatic biological resources and new bioindustrial technologies

for their reproduction provided for in the Doctrine is very important; the creation of new technologies for deep and comprehensive processing of food raw stock, the improvement of methods for storing and transporting agricultural and fish products; the increase in the rates of structural and technological modernization of the agro-industrial and fishery sectors.

Taking into account the imperative of localization of resources, production, and marketing of agri-food products at the level of the constituent entities of the Russian Federation, it seems reasonable to solve the problem of ensuring regional food security based on environmentally friendly nature management. It is advisable to illustrate its solution taking as the case study one of the most important "granaries of Russia" – the Rostov Region.

The region is in the top ten of the all-Russian rating for the making of basic agricultural products:

1st place in the production of wheat, sunflower;

2nd place in the production of grain and leguminous crops, eggs;

3rd place in the production of vegetable oil, meat, sausages.

Exports of food products and agricultural raw stock in 2017 amounted to 4.1 billion US dollars (50% of the total exports of the Rostov Region). Products of the agro-industrial sector of the region are exported to more than 60 countries. In addition to grain, the farmers of Don export vegetable oil, cereals, bread, flour, molasses, confectionery (Ovchinnikov and Lysochenko, 2013).

These data provide a basis for concluding that the Rostov Region belongs to a group of constituent entities of the Russian Federation with developed industrial and agro-industrial sectors. The share of the agro-industrial sector of the region is 4.3% in the gross output of the national agri-food sector.

The Rostov Region has significant advantages compared with other regions. The index of the level of land resources is 2.28. In Russia, in general per inhabitant, 1.44 hectares of farmland and 0.87 hectares of arable land are accounted for, which is almost 1.5 times less than in the Rostov Region. In the field of agriculture, there are many companies being new "gazelles" with a growth rate of at least 15% per year.

State support for enterprises of the agrarian sector of the region was carried out in the past years as part of the program activities of the Regional Long-Term Target Program "Development of Agriculture and Regulation of Agricultural Products, Raw Stock and Food in the Rostov Region for 2010-2014". It was continued in the format of the State Program of the Rostov Region "Development of Agriculture and Regulation of the Markets for Agricultural Products, Raw Stock and Food", providing for the implementation period 2014-2020 (Girard, 2015).

Measures are taken to assist food and processing industries in promoting products to the regional trading networks. Enterprises attend the meetings of the Regional Commission on the Development of Trade Activities in the Rostov Region with the consideration of problematic issues. In addition, procurement sessions are held with representatives of trading networks and regional manufacturers, where problems and conditions of cooperation are discussed.

In order to enhance the motivation of regional manufacturers, especially agricultural enterprises, to improve the quality and competitiveness of products made, a voluntary certification system "Made on the Don" was introduced in the Rostov Region, registered by Rosstandard (Federal Agency for Technical Regulation and Metrology) and in the Unified Register of Voluntary Certification Systems of the Russian Federation. Today, 39 enterprises have been issued valid certificates confirming the quality of products, including 22 enterprises of the agro-industrial complex sector (56%). In 2017, some 13 AIS enterprises received for the first time or extended their certificates for 25 types of products. So, the certificate "Made on the Don" was granted to such regional producers as the Tatsinsk Dairy Plant, Belyi Medved company (one of the active participants in the dairy market), Yug Rusi bakery factory, Aksai

confectionery factory.

To build up export potential, the Don area manufacturers are invited to participate in exhibitions. In January 2014, at the Green Week 2014 international exhibition in Berlin, thirteen Don enterprises of the food and processing industry took part in the tasting contest "Safety and Quality of Agricultural Products and Foodstuffs". As a result, food products of the Rostov Region were awarded 23 gold medals, one silver medal, and one bronze medal.

In 2017, local agribusiness entities attended the II All-Russian Forum of Food Security, the XX Agro-Industrial Forum of the South of Russia, the international exhibition of food products and specialized equipment "SIAL CHINA 2017" (Shanghai, China), the international exhibition of food, beverages, equipment for the HoReCa sector of the Gulf countries "GULFOOD 2017" (Dubai, United Arab Emirates), the international agricultural exhibition-forum "Agriscap" (Abu Dhabi, United Arab Emirates), joined the business mission aimed at promoting Russian products to the market of Saudi Arabia and raising investments in the domestic agro-industrial sector (Riyadh, Kingdom of Saudi Arabia), and also took part in the food exhibition "Hospitable Rostov" (Rostov-on-Don), in the 19th Russian agro-industrial exhibition "Golden Autumn 2017" (Moscow). At the "Golden Autumn 2017", some products of Don manufacturers were awarded 100 medals, including 49 gold.

For the first time, the Ministry of Agriculture of Russia at the "Golden Autumn 2017" exhibition, to demonstrate the best regional practices, organized a collective exposition "Family Livestock Farms" of 4 constituent entities of the Russian Federation, among which was the exposition of a peasant farm in the Rostov Region.

In 2017, the II All-Russian Forum on Food Security was held, at which the issues of implementation and the need to make changes to the Food Security Doctrine were discussed at a high expert level. In early 2018, the Russian Ministry of Agriculture submitted a new draft of the Food Security Doctrine.

The updated Doctrine should ensure food security as an essential component of the country's national security. For the Rostov Region, it seems to be a prescribed and reasonable strategy for the inclusion of the agro-industrial sector in the "food growth spiral" cluster. In order to strengthen the position of the region in conditions of very tough competition, it is necessary to carry out accelerated technical and technological modernization of the agro-industrial sector of the South of Russia as a whole. This implies the introduction of new plant varieties, the expansion of the range of resource and energy-saving technologies, advanced scientific developments.

An example of promising technologies for the agricultural sector is the method of microclonal propagation. It plays an important role in the accelerated cloning of fruits, berries, tubers, ornamental plants and tree species. Experience in this area clearly indicates the achievement of obvious results: plants acquire more pronounced viable characteristics (compared to naturally produced planting material), have high reproduction rates, and in the case of fruits and berries, a significant increase in yield is achieved. All this testifies in favor of the fact that clonal micropropagation is an advanced technology in crop production. The promise of this technology is ensured by the fact that the project "Construction of the Center for Clonal Micropropagation "Black Sea Biotechnology Center" is being implemented in Crimea. The amount of investment is 3.3 billion rubles; the completion date of the project is 2025.

Innovative projects and new technologies, of course, require the provision of agricultural sectors, food and processing industries with highly qualified personnel.

The reasons for limiting the competitiveness of domestic products in the world market, according to the players of the agro-industrial sector, are: insufficient efficiency of state tools for supporting agricultural exports, high transport costs, lack of processing facilities, high protective duties in foreign markets, lack of practices in modern sales and marketing of agricultural

goods, insufficient information about markets, poorly developed logistics infrastructure of agricultural exports, failure to comply with strict sanitary and phytosanitary standards in importing countries, insufficiently developed transport infrastructure for exports of agricultural products, poor quality of products, lack of accredited certification centers and laboratories in the Russian Federation.

4. Results

The economic externalities of natural disasters are not limited only to damage caused. The development of state, municipal, corporate systems for fighting disasters, ensuring the functioning of these systems, including their facilitation and remuneration of employees, measures to prevent disasters and reduce the magnitude of possible damage, require large expenditures.

In order to improve the financial sustainability of agricultural producers, the need to adopt a new federal regulation to restructure agricultural producers' debts to credit institutions is becoming increasingly obvious – in terms of granting a delay or installment payment of loans for 15 years.

To increase the competitiveness of domestic products, the support of economic entities from the state in the following areas is necessary:

- conducting negotiation processes aimed at creating a favorable regime for exported goods;
- study of the issues of lowering interest rates on loans: the average rate on loans in Russia currently stands at 12-13% (in cases where repayment of a part of the loan is not foreseen), which significantly reduces the possibility of lending to agricultural producers, especially farmers.

Taking into account a number of restrictions on the volumes and the applied mechanisms of state support for agricultural production, it is necessary to adjust its measures in the basic areas in order to adapt them to the conditions of referring to the "green basket". Thus, analyzing the state of food security in the region in the field of material facilities for food production, it can be noted that the resource and economic potential is sufficient. The main problems remain in the reproduction of environmental benefits.

The ecological situation in the Rostov Region, as in the entire Russian Federation, is characterized by a high level of anthropogenic and technogenic impact on the environment and significant environmental consequences of past economic activity. In the Rostov Region, more than 1.5 million people live in cities with high levels of air pollution. The volume of wastewater that is not sufficiently treated and discharged into surface aquatic bodies remains high. The tendency to the deterioration of soil and land continues. The processes leading to the loss of fertility of agricultural land and its withdrawal from economic circulation are developing intensively. Desertification, to some extent, covers the eastern districts of the Rostov Region. The amount of waste that is not involved in the secondary economic turnover and delivered to landfills increases. At the same time, the conditions of storage and disposal of waste often do not meet the requirements of environmental safety (Ovchinnikov and Ketova, 2015).

About 600 thousand tons of pollutants are emitted annually into atmospheric air (2014 – 650.6 thousand tons, 2015 – 618.7 thousand tons, 2016 – 629.3 thousand tons). The main sources of pollution remain motor vehicles, enterprises of the fuel and energy and machine-building sectors, construction industry. According to the quality characteristics, a high level of air pollution for the period 2014-2017 is observed in the cities of Novocheerkassk and Rostov-on-Don.

The dynamics of wastewater discharge without proper treatment tends to decrease (2014 – 54.6 million m³, 2015 – 53.8 million m³, 2016 – 53.8 million m³).

The main sources of pollution of aquatic bodies are the

utilities of the region. In addition, a significant part of pollutants enters the watercourse with unorganized discharges from the catchment areas (from agricultural facilities, territories of cities and settlements). There is an acute problem of storm sewers in urban areas.

In order to ensure environmental safety in the Rostov Region, the following strategic forecasting-policy tools have been adopted and are being implemented. The strategy of preserving the environment and natural resources of the Rostov Region for the period up to 2020, approved by the Decree of the Government of the Rostov Region of February 5, 2013 No. 48, is a document defining the main directions and priorities of the state policy of the Rostov Region in improving the environment.

The State Program of the Rostov Region "Environmental Protection and Rational Nature Management", approved by the Decree of the Government of the Rostov Region of September 25, 2013 No. 595, has been implemented since 2014 and includes 6 sub-programs: "Environmental Protection in the Rostov Region", "Development and Use of Mineral Wealth Reserves of the Rostov Region", "Development of the Water Management Complex of the Rostov Region", "Development of Forestry in the Rostov Region", "Formation of an Integrated System of Waste and Secondary Material Resources Management in the Territory of the Rostov Region", "Ensuring the Implementation of the State Program".

From the beginning of the implementation of the said Program, 5.3 billion rubles were allocated from all sources of funding to implement its actions. This is all the more important because 2017 was declared by the President of the Russian Federation as the Year of Ecology and the Year of Specially Protected Natural Territories. At the end of the year, 100 environmental projects were implemented in the Rostov Region. The total amount of financing is 3.2 billion rubles, of which 2.3 billion rubles is the funds of investors. "Ekostroy-Don", "Eco-Spas Bataysk", "Kamenskvolokno", "AMILKO", "Chisti gorod", Rostov Electrometallurgical Plant, "Rostovtorpererabotka", "Mars", "Brewing Company Baltika" introduced technologies for separate collection, recycling, and disposal of waste. In the Myasnikovsk District of the Rostov Region, "Center-100 Rostov-na-Donu" company built the first complexes of the centralized system for collection and disposal of medical waste.

Thus, in the Rostov Region, a holistic program of greening the environment is being consistently implemented. In the field of reducing the negative impact on the environment by production and consumption waste in 2017, some 20 projects were implemented; in the field of environmental education – 19 projects; 18 projects are aimed at the conservation of water resources and the same number – at the development of specially protected natural territories and the preservation of the animal world. In the area of standardization of the impact on the environment and the transition to green technologies in the Year of Ecology, 13 projects have been implemented; 6 other projects are dedicated to the protection of forests and 6 more – to the region's adaptation to the changing climate.

The experience of the Rostov Region in environmental safety was presented in December 2017 at the V All-Russian Congress on Environmental Protection and the II International Exhibition and Forum "ECOTECH-2017". In the format of this exhibition, cooperation agreements on the implementation of projects aimed at reducing the negative impact on the environment and the preservation of biological diversity were signed between the Government of the Rostov Region and "Brewing Company Baltika", "DonBioTech", Association for the Conservation and Repopulation of Rare and Endangered Species of Animals "Living Nature of Steppe". The planned volume of investments is 947.0 million rubles worth.

Actually, measures are taken to protect the environment in completely new formats. As part of the All-Russian campaign "Russia – the Territory of Eco-Pioneers – Young Defenders of Nature", more than 1,700 events were held. The following events were organized and carried out: interregional festival of

ecological tourism "Sung Steppe", the educational campaign "Ecology and Culture – the Future of Russia!", the seventh regional meeting of young environmentalists, which launched the social project among schoolchildren "Environmental Future of the Rostov Region". With the participation of the business community, the Rostov Region is developing a network of environmental education centers. The Ecorium center was opened in the city of Rostov-on-Don, hosting training seminars for volunteers on the organization of separate waste collection.

In 2017, in the Rostov Region, the initiative project "Green Marathon" PRO-Motion of ECO-Movement on the Don" was implemented. The same name web page on the Internet posts more than 1,000 pieces of news on environmental topics. In the Year of Ecology, the 2018 volunteer project "I am for a clean HOME! My home is the Quiet Don!" was presented (Don State Public Library, 2018). Its action covers a five-year period.

According to the results of road activities and work with the "Interactive Map of Dumps", 384 places of unauthorized disposal of waste were eliminated, which is by 73% more than in 2016. The Rostov Region was among the ten best among other regions of the Russian Federation for cleaning landfill sites within the framework of the All-Russia People's Front project (General Arrangement, 2018).

As the analysis has shown, the Rostov Region is very interested in solving the problems of environmental remediation and protection. To ensure the raw material needs of the economic sector, 183 licenses were issued for the right to use subsoil areas; 55 state examinations of mineral reserves were carried out. In 2017, the search and appraisal work on groundwater for domestic water supply to Milyutinsk rural settlement was continued; work began on the assessment and exploration of groundwater reserves for drinking water supply to Northern rural settlement of the Zimovnikovsk District of the Rostov Region. In the field of environmental analysis, the following was carried out: monitoring of the state of disposal of pesticides and agrochemicals in the city of Bataysk; monitoring and control of environmental quality in the territory of the Rostov Region; monitoring the state of atmospheric air using an automatic monitoring station; regional accounting and control of radioactive substances and radioactive waste; maintaining a regional inventory of industrial and household waste. Work continued on the conservation of the biological diversity of the natural resources of the Rostov Region: maintaining the Red Book of the Rostov Region in terms of monitoring protected animals and plants and the development of a nursery of Red Book plant species.

5. Discussion

Practical recommendations:

- (1) transition to nature-like agrotechnical methods, methods of agricultural production, ensuring harmonization of the interaction of agro-industrial nature management systems with the natural environmental conditions, ensuring the safety of the reproductive potential of the natural state of homeostasis and the production of organic food;
- (2) increasing the motivational effectiveness of state programs to support agricultural producers introducing environmentally friendly agricultural technologies in plant growing and animal husbandry; the allocation of targeted subsidies to organic food producers;
- (3) adoption of a state program of grant support for agricultural machinery producers, ensuring the introduction of nature-like technologies in the functioning of the agri-food sector of Russia;
- (4) strengthening in the system of training of agricultural production personnel a component focused on the formation of general cultural and professional competences of specialists in the field of resource-saving and environmental agricultural technologies.

The national economic significance of the study consists in

the socio-economic and environmental-economic effect expected as a result of the implementation of the proposed practical recommendations.

6. Conclusions

In the system of measures for the region's strategic development, the priorities in the field of ecology and environmental management are:

- ensuring the water quality class 4A; conservation and re-production of the forest reserve;
- increasing the share of specially protected natural areas in the total area of the Rostov Region to 4% by 2024;
- preservation of the biological diversity of the area of the Rostov Region, increasing the level of public ecological culture.

The core projects for the implementation of these priorities include:

- (1) clearing aquatic bodies in order to improve them and prevent the negative impact of water; reduction of unauthorized discharges of pollutants into aquatic bodies; overhaul of hydraulic facilities in poor condition, located in the territory of the Rostov Region and owned by municipalities;
- (2) ensuring the sustainable protection of forests from fires, preventing emergencies associated with fires in forest plantations; reforestation on forest land; prevention of unauthorized logging of forest plantations.

The development of the system of specially protected natural territories in the Rostov Region, preservation of flora and fauna, improving the functioning of the system of specially protected natural territories are of fundamental importance.

The issue of food security in the region is closely related to food production technologies and ensuring the ecological safety of food. From the point of view of the economic theory of welfare, the problem of food safety and quality is one of the specific features of the agrarian market, causing its equilibrium to be in the Pareto-inefficient state. This, in turn, is the economic basis of the need for state policy to support the agrarian sector and the possibility of redistributing the company's financial resources for its development. At the same time, ecological well-being and environmental cleanliness are very important.

In order to ensure food security, it is necessary to intensify activities in the field of compliance with the imperatives of food quality and safety, including:

- (a) development of fundamental and applied research in the field of biotechnological production methods and biomedical assessment of the quality and safety of new types of food sources and ingredients;
- (b) widespread introduction of educational programs on healthy nutrition with the involvement of the media;
- (c) financial support for the production of valeologically safe and economically affordable food products (subsidies, concessional loans);
- (d) establishment of tax incentives for enterprises producing ecologically safe food products and investing in technical re-equipment of facilities through the introduction of innovative nature-like technologies that ensure the production of environmentally friendly products;
- (e) introduction of fines for the production and sale of environmentally "hazardous" products and taxes on the use of environmentally hazardous technologies.

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