Green investments in agriculture: modernization and sustainable development of the agricultural complex

Ismail Abdulkerimov[1,*], *Aida* Ramazanova[2], and *Seda* Aslakhanova[3]

[1]Branch of Dagestan State University in Derbent, Derbent, Russia
[2]Dagestan State University, Makhachkala, Russia
[3]Chechen State University A.A. Kadyrova, Grozny, Russia

Abstract . Currently, green investments in various areas of human activity are understood as a set of current trends in modern Russia and world practice, associated both with the need to introduce the environmental agenda into business processes, and with the emergence and active development of new financial instruments that help in the implementation of ESG- strategies of global companies. At the present stage, "green" investments are a set of financial instruments based on private and public investments aimed at financing "green" projects. The purpose of this study is to examine modern approaches to green investment in the agricultural sector of the Russian Federation. The study also summarizes the results achieved in various countries in terms of investing in new mechanisms for environmentally sustainable development. A calculated forecast model was obtained, taking into account possible risks, characterizing the expansion of the scope of environmental policy in the country. Based on the study, conclusions were drawn about the need to improve the market for "green" securities and long-term lending.

1 Introduction

The discussion around the topic of attracting "green" investments in agriculture of the Russian Federation represents a turning point in the ongoing search for modernization and sustainable development of the agro-industrial complex of our country.

Central to this theme is the recognition of agriculture as the main national security sector of the Russian Federation, and therefore the introduction of green investments is, in a way, an element of increasing productivity, sustainability and environmental sustainability along the entire agricultural value chain.

It can be concluded that currently the agro-industrial sector of the Russian Federation, in terms of the development of innovative technologies, including the use of "green" technologies, is experiencing a rapid leap in its development. In this regard, it must be said that agriculture in the Russian Federation is achieving certain successes from a strategic point of view, since green technologies are necessary for the effective development of the agro-industrial sector of our country. We believe that green technologies will over time displace

*Corresponding author: ismailos77@mail.ru

even more different outdated and traditional approaches to the implementation of agricultural production.

One cannot but agree with various prominent economists who believe that modern, so-called "green" investments play a very important role in solving various problems arising in the agro-industrial sector of our country. It is for this reason that the introduction of green technological solutions in the development of agriculture in the Russian Federation solves a large number of different problems. Notable green investments in 2024 include no-till farming, organic farming, and green, electric-powered machinery.

2 Materials and methods

At the present stage, studying the topic of using "green" investments in agriculture involves the use of various techniques and methods. Among the main research methods, examples include approaches aimed at analyzing and understanding innovative solutions in the field of sustainable use of natural resources.

Some of the basic methods for studying green technologies include the ability to provide a scientific basis for research findings. According to established logic, this method quite often includes conducting fundamental and applied scientific research in the field of ecology.

The next important method in the study of our topic is the use of mathematical models and computer simulations to predict changes in ecological systems under various scenarios of climate change or the impact of human activities.

3 Results

At the beginning, it is worth noting that our research and, in fact, the topic being raised is not new, but it continues to actively develop in 2024. In historical retrospect, the creation of a green financing system was discussed back in 2016, when a draft concept was prepared at a meeting of the State Council of the Russian Federation. In 2017, declared the Year of Ecology in Russia, the topic of green financial instruments continued to gain momentum: for example, the Ministry of Natural Resources developed proposals for their development in May. Later, the topic of green finance was included in the "Main directions for the development of the financial market of the Russian Federation for the period 2019-2021." The implementation of various projects, new approaches and ways to green business were discussed by representatives of government agencies, as well as private stakeholders. In February 2021, a working group on green and responsible financing was created within the Central Bank.

Finally, from November 28, 2022, Russian companies can issue new types of bonds. The first is adaptation, the second is related to sustainable development goals, the third is climate transition bonds. They are provided for by changes in the "Standards for issuing securities" [8, p. 92].

According to the INFRAGRIN report "ESG, decarbonization and green finance in Russia 2023/24," eight Russian issuers carried out nine bond issues in 2023 in the format of sustainable development with a total volume of RUB 142.84 billion, which is 35% more than in 2022. (106.18 billion rubles), but less than the level of 2021 (211.89 billion rubles) by 33%. It is obvious that the Russian market for ESG securities is still small and continues to recover after 2022, when the sharp negative dynamics of rates also affected sustainable bonds.

It is worth paying attention to the fact that the introduction of new tools, as well as the adaptation of best international practices to the conditions of the Russian market, plays an important role in the development of the green investment institution. One such tool could be the "greening" of pensions.

Green pensions are pension savings of non-state pension funds that direct them to green projects. This is a fundamentally new financial instrument for Russia, unlike other countries where such programs are already being actively implemented. Among the most popular international practices in providing the "green pension" service are "Legal & General" with the product "Fossil Fuel Free Plan" (UK), "PensionBee" with the product "Impact Plan" (UK), investment fund "NEST" (UK) , the Henderson Global Sustainable Equity fund with the Zurich pension scheme (Switzerland) and the investment platform CIRCA5000 (UK).

Statistics on green investments in the agro-industrial sector of the Russian Federation show a balance between the rational use of natural resources and the use of innovative solutions in agriculture. At the same time, it is generally accepted that investments in "green" projects have more

Table 1. Costs and green investments in the Russian Federation in 2020-2023, (million rubles)

Year	Total environmental costs	Current environmental costs	Investments in agriculture of the Russian Federation
2020	42039	22167	19872
2021	38401	21039	17361
2022	41695	24579	17116
2023	46451	24960	18249

Source: author's development

Based on the analysis of this table, we can say that the indicators of general and current costs for environmental protection (EP) and investments in fixed capital for environmental protection have an upward trend in our country by 2023. However, investments in this segment of the economy are not enough to achieve a clear result from them.

Thus, the emergence of new products on the market helps stimulate the growth of interest among investors and ensures the development of the green finance institution in Russia. However, the green finance market needs multilateral support measures, such as preferential terms for taxation of bond income for investors, attracting companies to finance green projects, as well as establishing requirements for the minimum share of green products in the banks' portfolio.

4 Discussion

Now let's look at the main provisions of modernization and sustainable development of the agro-industrial complex through the introduction of green investments. We believe that at the present stage, in principle, green investments in agriculture include various processes, including regulatory and organizational ones, aimed at increasing sustainability, sustainability and environmental protection in the agricultural sector. Many researchers believe that the paradigm shift is being driven by the need to mitigate the adverse impacts of traditional agricultural practices on ecosystems, biodiversity and climate stability. In this regard, in the agricultural sector, green investments can bring the introduction of the latest innovative technologies, the adoption of global agroecological principles and, over time, promote the implementation of sustainable land management practices to optimize resource efficiency while minimizing the ecological footprint.

In this regard, it should be noted that one of the key aspects of "green" investments in agriculture involves the introduction of precision farming methods. We believe that this mechanism, using advances in sensor technology, data analysis and machine learning algorithms, allows farmers to optimize the consumption of resources such as water, fertilizers and pesticides, thereby reducing financial losses and reducing environmental pollution. By applying site-specific management strategies based on real-time data, farmers can increase crop productivity while minimizing adverse environmental impacts, thereby helping to create

a more sustainable agricultural production system [1, p.98].

As rightly noted by A.R. Kulov, green investments include promoting agroecological approaches that prioritize ecological integrity and biodiversity conservation. Agroecology integrates ecological principles into agricultural systems, emphasizing the importance of biodiversity, soil health and ecosystem services in agricultural production. Through practices such as agroforestry, cover crops, and integrated pest management, agroecological farming systems increase soil fertility, water retention, and pest control while reducing dependence on external inputs. We believe that in this practice, the introduction of green investments in agroecology will contribute, in our opinion, to the transition to more sustainable and diversified farming systems that are less vulnerable to environmental shocks and climate variability [2, p.55].

It is important to note that by supporting the development of local food networks, agroecological value chains and fair trade practices, green investments contribute to the economic viability of smallholder farmers while promoting food sovereignty and equitable access to nutritious food. In addition, investment in agricultural research and extension services plays a key role in disseminating knowledge, stimulating innovation and enhancing farmers' ability to adopt sustainable practices.

As for our country, it should be noted that the topic of introducing green investments in agriculture is an innovative mechanism aimed at bringing agricultural methods into line with global practices in ensuring environmental sustainability. In this regard, green investments include a wide range of different measures aimed at improving resource efficiency, biodiversity conservation and climate change resilience in the Russian agricultural sector.

One of the important aspects of green investments in domestic agriculture and the agro-industrial sector in general is the introduction of sustainable land management methods. Given the vast areas of agricultural land in Russia, implementing practices such as conservation tillage, agroforestry and organic farming has enormous potential to improve soil health, mitigate erosion and sequester carbon.

It is also necessary to pay attention to the problem of modernization and sustainable development of the agro-industrial complex in the context of agriculturally depressed republics and regions of the Russian Federation. We are talking about the Republic of Dagestan, located in the south of our country. We believe that the agricultural potential in this region is small and has a large number of problems that require modern and timely innovative solutions. Against the backdrop of growing environmental degradation, climate variability and socio-economic imbalances, the possibility of introducing “green” investments in the agro-industrial sector of the Republic of Dagestan is becoming an effective means of promoting sustainability and sustainable development of the agro-industrial complex in the region.

One of the areas of green investment in agriculture in Dagestan is the promotion of sustainable land management methods. By implementing practices such as conservation tillage, agroforestry, and soil conservation measures, farmers can increase soil fertility, water retention, and carbon sequestration while mitigating erosion and land degradation. These methods not only contribute to the environmental sustainability of agricultural landscapes, but also increase the long-term productivity and profitability of agricultural operations [6, p.220].

Additionally, green investments in Dagestan can use precision agriculture technologies to optimize resource efficiency and minimize environmental impact. Through the use of satellite imagery, drones and sensor monitoring systems, farmers can tailor inputs such as water, fertilizers and pesticides to the specific needs of crops, thereby reducing waste and pollution. Adopting precision agriculture techniques has the potential to increase yields, reduce production costs, and improve the overall sustainability of agricultural production in the region.

Now we need to note the main problems faced by scientists, as well as the Government of the Russian Federation, in connection with the introduction of green investments. Thus, we believe that the introduction of "green investments" into the agricultural sector of the Russian Federation faces a complex set of problems caused by institutional, economic and socio-ecological factors. One notable obstacle is our country's persistent dependence on traditional farming methods and infrastructure, which often prioritize short-term productivity gains over long-term sustainability considerations. Shifting to greener agricultural practices, such as the use of green investment finance, requires significant investment in research, technology and capacity building to overcome challenges and promote the adoption of sustainable land management practices, precision agriculture and agroecological approaches.

The economic viability of green investments in Russian agriculture is constrained by factors such as limited access to finance, unstable market conditions and inadequate incentives for sustainable practices. Considering the latest sanctions imposed by Western countries to limit the export of agricultural products from Russia, as well as our country's restrictions on imports, they are reducing the financial capacity of our country to promote the topic of "green" investment. In this regard, farmers in our country face barriers to accessing credit, insurance and technical assistance necessary to invest in new technologies and infrastructure.

The prospects and trends for the introduction of "green investments" in the agricultural sector of the Russian Federation in various subjects, for example, in the infrastructure of the Krasnodar Territory, the Republic of Dagestan, the Stavropol Territory are promising, but are accompanied by a large number of problems discussed above. With vast land resources, varied climates and rich biodiversity, Russia is uniquely positioned to use its agricultural sector as a driver for sustainable food production, carbon sequestration and ecosystem conservation. By accepting "green" investments, Russia can position itself as a world leader in the field of sustainable agriculture, increasing its reputation, competitiveness and influence on the world stage [5, p. 134].

It should also be noted that the growing demand for environmentally friendly food products opens up profitable market opportunities for Russian farmers and agribusiness. As consumers become increasingly aware of environmental and ethical considerations, demand for products produced in an environmentally responsible manner is growing. By investing in sustainable agricultural practices such as organic farming, agroecology and fair trade, Russian producers can enter niche markets and charge higher prices for their products, thereby increasing their profitability and market competitiveness.

We believe that the introduction of green investments in Russian agriculture can become a catalyst for innovation, research and technological development in this sector. The researchers believe that by investing in research and development aimed at sustainable agriculture, our country can facilitate the emergence of new technologies, practices and business models tailored to the specific needs and conditions of its agricultural sector, for example, in the Republic of Dagestan.

5 Conclusion

In conclusion of the study, I would like to note that the prospects for introducing "green" investments into the agricultural sector of the Russian Federation are promising and could potentially become the basis for significant economic, environmental and social changes. In our opinion, in the conditions of the Russian Federation, as well as in a number of regions of our country, the use of green investments will allow us to unlock the full potential of the agricultural sector in a particular region, as a driving force of sustainable development and prosperity. However, realizing this element requires a concerted effort on the part of policymakers, investors, farmers and other stakeholders to overcome barriers, seize

opportunities and chart a course towards greener, more sustainable agriculture and improved food security.

References

1. N.A. Kolomeets, E.E. Khrapov, Modern aspects of economics and management in the Materials of the International Student Scientific and Practical Conference, May 25, 2023, Novosibirsk, Russia, "Golden Colo" (2023)
2. A.R. Kulov, Economics, labor, management in agriculture , **3(97)**, 55-64 (2023)
3. A.V. Kucherov, O.V. Shibileva , Young scientist, **4**, 561-563 (2021)
4. D.A. Markov, N.V. Zhakhov, Bulletin of the Kursk State Agricultural Academy, **9**, 234-241 (2023)
5. A.V. Samoilov, Problems of development of the agro-industrial complex in the post-Soviet space, Kolos (2022)
6. D. A. Saparova, Problems of the agricultural market, **4**, 220-232 (2023)
7. A.T. Stadnik, D.A. Denisoin, Innovation and Food Security, **1(1)**, 50-58 (2021)
8. R.V. Chernyaeva, A.I. Pakhomova, In the world of scientific discoveries, **4**, 92-103 (2022)