

The role of sustainable development of the agricultural sector in reducing the risk of environmental disasters

Olga Nezamova^{1*}, *Alena Stupina*^{2,3}, *Larisa Korpacheva*⁴, and *Polina Muzika*³

¹Krasnoyarsk State Agrarian University, Mira ave., 90, 660049, Krasnoyarsk, Russia

²Siberian Fire and Rescue Academy of the Ministry of Emergency Situations of Russia, Krasnoyarsk, Russia

³Reshetnev Siberian State University of Science and Technology, Ave. named after the newspaper Krasnoyarsky Rabochiy, 31, 660000, Krasnoyarsk, Russia

⁴Siberian federal university, 82A Svobodny Ave., 660041, Krasnoyarsk, Krasnoyarsk Krai, Russia

Abstract. In recent years, more and more attention has been paid to the issues of sustainable development in all countries of the world. Now the world is living in an era of high speeds and rapid changes. New technologies come into our lives and change it in all spheres. New technologies provide opportunities to improve the standard of living, but it is impossible not to notice such global problems as inequality of residents of different countries and different social groups, have unequal access to natural resources and other results of civilization. The environment is experiencing a great anthropogenic load and it is becoming increasingly difficult to ensure the well-being of people whose numbers on the planet are increasing. People can't help but wonder what kind of world they will leave to future generations. The concentration of greenhouse gases is increasing, the average temperature is rising, the temperature of the world ocean continues to rise, the melting of glaciers is increasing. In such a situation, people cannot do nothing. Their inaction will contribute to the emergence of environmental disasters and social crises. Responding to these challenges requires complex and joint efforts of different countries, regions, companies and individuals in all spheres of activity. The agricultural sector occupies an important place in the economy of any country and is very resource-intensive, in this regard, it should be paid attention to first of all. The article discusses possible directions for achieving the greatest sustainability of the agricultural sector. The purpose of this article is to search for these areas and achieve sustainable development of the agricultural sector.

1 Introduction

The issue of food production has always been given serious attention and at all times this issue has been relevant. Our time is no exception. There is still not enough food on the planet and there are still countries where the population cannot afford proper nutrition. At the same

* Corresponding author: tutor.eng@yandex.ru

time, according to statistics, the population throws away about 30% of food, which is not acceptable in the current situation. Providing well-being today, we do not think much about what kind of world future generations will live in. At the moment, according to the World Bank, agriculture on a global scale accounts for 17.3% of carbon emissions. This is the contribution of agriculture to the greenhouse effect. A large percentage of carbon emissions is generated by the constantly developing industrial production and construction of 13.5%, and electricity and heating 31.1%, the contribution of transport 14.6%.

If we continue to develop in the same way as today, then in a decade the ambient temperature will increase by 1.5 degrees. The temperature of the world's oceans continues to rise, which leads to accelerated melting of glaciers. Human inaction leads to the emergence of social crises and environmental disasters [1,2].

Responding to these challenges requires the joint efforts of countries, companies and individuals. Therefore, in 2015, at the United Nations General Assembly, 193 countries adopted 17 global Sustainable Development Goals. The participating countries confirmed their commitment to these goals. These goals are included in national programs in order to ensure real progress by 2030. Businesses around the world are also taking an active position. The UN Global Compact on Corporate Responsibility and Sustainable Development was developed. The UN Treaty describes 10 principles that include the responsibility of business in the field of sustainable development. To achieve the goals of sustainable development, a business must ensure the protection of human rights and the rights of employees, implement environmental principles in its activities, and ensure a balance between the economic, environmental and social objectives of the company.

Sustainable development is understood as such development in which current activities and meeting the needs of society are carried out without prejudice to future generations. This implies an integrated approach, in which it is impossible to consider the solution of one task or problem without considering others. The concept of sustainable development reflects the interrelationship of ecology, economy and society. The concept of sustainable development was adopted and presented at the UN International Conference in 1992 in Brazil, Rio de Janeiro. The biosphere is the basis of society's life, and society forms the realization of economic goals. Guided by the goals of sustainable development, it is possible to achieve economic growth and at the same time not harm the environment. To achieve the Sustainable Development Goals, the contribution of not only the state and business, but also each individual is important. Following the principles of sustainable development, we contribute to the preservation of the planet for each of us and for future generations [3,4].

The issues of sustainable development have received close attention throughout the world over the past ten years. In the scientific environment of our country, there are also some developments on this issue in various fields and fields of activity. Work in this direction is progressing somewhat slower in Russia than in a number of developed countries, since our country is rich in resources and the need to develop sustainable development programs was not so acute. However, scientists, entrepreneurs, and large businessmen are currently working seriously on this problem, since the problem affects everyone.

Sustainable development of the agricultural sector is a very topical issue, since the growth of demand for food (due to population growth) entails an increase in demand for resources. The most consumed resources in the agricultural sector are energy, land and water.

At the Gaidar Forum, it was noted that the requirements for food production conditions are increasing in the world, which can serve as a barrier in foreign food markets if we do not comply with the requirements of sustainable development. The Russian consumer is also becoming more demanding to the conditions of agricultural production.

The constant growth of the population and the need to meet its needs can lead to the loss of natural resources, which can lead to social and economic crises, environmental problems. Restoring the environment will require significant costs, social problems will cause

instability in society, and economic problems will cause general discontent. To avoid this, it is necessary to develop a development strategy that will save resources and preserve them for future generations. The sustainable development model makes it possible to solve these problems, but their solution takes time [5,6].

Based on behavioral research and the study of scientific literature on this topic, the main ways of sustainable development and the most frequently proposed measures for their implementation were identified.

As a result of the conducted research, we will try to propose a similar table in which we will give the main ways of development, but specifically for the agricultural sector and propose measures that, in our opinion, will help us move in the right direction.

Table 1. General ways of sustainable development and recommended measures.

Common ways of sustainable development	Recommended measures
Introduction of new technologies and equipment	Automation, computerization
Optimal use of resources	Use of alternative energy sources, new materials
Optimal use of professional personnel	Professional development. Creation of new jobs
Production process management	Cooperation, specialization
Conservation of ecology	Organization of waste-free production

2 Materials and methods

In carrying out this study, such methods as analysis, synthesis, systematization, comparison were used. Statistical, economic, logical analysis, content analysis was used for the study, if we consider more specifically, marketing research methods were used, for example, in-depth interviewing and the method of expert surveys and assessments.

In the process of working on the article, Russian and foreign scientific literature on the issue of sustainable development was studied. Among Russian scientists, we would like to mention such as A. Fridman, A. Askarov, L.V. Shchukin, E.V. Goncharova, N.S. Timofeeva, K. Suleymanov, A.A. Kiritsa, A.B. Melnikov, etc. Among foreign scientists, the works of such scientists as J. Molina-Maturano, S. Spielman and H. Steer are of interest. Interesting practical developments are demonstrated by M. Shut, L. Clerks. The basis for the study is the legislative framework of the Russian Federation.

The purpose of this study is to identify ways that will lead our country to sustainable development.

Before determining the ways of sustainable development, it is necessary to understand on what principles this development is based. Sustainable development is a concept that assumes a balance of factors such as economic, environmental and social. In short, our generation should live in such a way that the resources available to us now are available to the next generation. It is impossible to spend the resources that we have inherited in the current time. The principles of the concept of sustainable development are the following:

- a systematic approach that says that we cannot pay attention to one of the listed principles and ignore the others;
- long-term orientation. The effect cannot be obtained in the short term;
- efficient use of available resources;
- engagement and motivation.

In our country, the concept of sustainable development is being implemented at an insufficiently rapid pace in comparison with developed countries, and not evenly across the country.

The analysis should help to understand why some regions do not pay due attention to sustainable development, although this is a global, planetary and universal concept adopted by 193 countries of the world at a UN meeting.

3 Results

The concept of sustainable development includes three areas as the three foundations of this concept. The first area is ecology. We all live in this world, constantly think about the cleanliness of the environment and wish it to improve. The environment seriously affects people's health, which has been especially noticeable lately. The second area is the economy. The economy is also a very important factor for a person. It is the economy that determines whether we will be able to meet our needs, what our standard of living will be, whether we will be able to do business and much more. The third area, which is an integral part of the concept, is social, i.e., it is society, or rather, the level of its development.

The concept suggests that these areas should be developed comprehensively and in a balanced manner. The task facing modern society is to make its development more harmonious, which is facilitated by the concept of sustainable development.

Agriculture, food production in any country, including Russia, is a strategically important industry. This industry provides the country's population with food and is responsible for food security. At the same time, it should be noted that this particular industry consumes a large amount of resources: land, water, energy and makes a fairly significant contribution to the greenhouse effect, which causes significant damage to nature. Therefore, the transition of the industry to the application of the principles of sustainable development is an indispensable condition of the present time [7,8].

The concept of sustainable development involves providing food products to the population, while not causing damage to the environment or making it minimal. It is in the present period of development that the whole society is interested in applying this concept.

There are no large virgin lands in Russia now, and the increase in arable land is carried out due to deforestation, which has a very negative effect on people's health, since the forest is the lungs of the planet. Therefore, there is a need to accelerate the sustainable development of agriculture.

The Krasnoyarsk region is not a leader in the sustainable development of agriculture, but work in this direction is already gaining momentum. In general, there are already companies in Russia that can be a beacon for others. In order to determine which ways and in what sequence to move towards sustainable development, it is necessary to consider what problems are present at the present time and hinder the sustainable development of the agro-industrial complex. There are many problems concentrated in agriculture that do not contribute to sustainable development.

One of the significant problems is the irrational using land and the deterioration of the environmental situation. This problem accumulates many components, for example, the insufficiently rapid introduction of advanced technologies, non-compliance with crop rotation rules, low rates of organic fertilizers, the using mineral fertilizers and pesticides with violation of application technologies. It is also necessary to note the increasing erosion processes and the increase in areas of acidic and saline lands unsuitable for agricultural production. In the context of sustainable development, it is necessary to introduce environmentally sound principles of agriculture. In Russia, the means of microbiological protection of plants are not actively used. The quality of control over the quality of agricultural products should also be improved, and control over the use of GMO organisms should be strengthened, but this can be achieved only with the introduction of innovative technologies in agriculture. Innovative technologies should be aimed at energy and resource

conservation, ensuring the biologization of agriculture. The system of land relations also requires reform.

A big problem is the loss of products in the production process and, especially, in the consumption process. The problem is both the low level of food availability and the high level of imported products on the market. Insufficient financing hinders the modernization of fixed assets. It can also be noted that not enough attention is paid to the conservation and reclamation of soil resources.

A big problem of the agricultural sector is the staffing of the industry. The situation in the countryside is currently very alarming. In recent years, the rural population has been steadily decreasing, partly due to migration processes, partly due to natural decline. In recent years, the deterioration of the demographic situation in rural areas has acquired features of stability. The low standard of living and high unemployment, as well as the salary level, do not cause professional specialists to want to work in rural areas. Wages in agriculture are 39.4% of the national level. The poverty level in rural areas is 1.5 times higher than that of the urban population [9,10].

One of the most serious problems of the agro–food system is fertility, but in Russia they are not even monitored, not to mention that there are no devices for rapid soil diagnostics in farms and we cannot determine changes in soil changes in the current period, we do not know how much it loses fertility and what trace elements need to be added to preserve it fertility.

It seems to people that we have a lot of water in our country and there is really a lot of it, but the main part of it is beyond the Urals, and the main agriculture is up to the Urals. We rarely talk about losses, and losses are the most unproductive use of agricultural resources. There is an excessive concentration of property in agriculture. Large farms are the main suppliers of agricultural products, they feed the country and this cannot be denied, but small forms should also exist, since they are a buffer in all crisis situations and they need help. In addition, there is a significant layer of consumers who prefer farm products. But since the pandemic, the situation of small producers has only worsened [11,12].

It is no longer possible to conduct business as before, there are not enough resources for this and new technologies are needed that will help more rational use of available resources. But for all of the above, significant investments are required, and it is not desirable to help an increase in product prices.

Thus, we have considered the most important factors and problems that hinder the implementation of the concept of sustainable agricultural development. Only a very important problem of insufficiently rapid implementation of digitalization in agriculture has not been considered. The importance of this problem is due to the fact that digitalization can significantly contribute to the accelerated development of agriculture. Digital technologies make it possible to make the process of agricultural production resource-saving.

Resource conservation occurs in a number of ways:

- saves working time due to fast processing of large data arrays;
- optimal crop rotations are calculated;
- losses in the field are minimized by monitoring crops and detecting diseases at early stages;
- reasonable fertilizer application rates are determined;
- optimal planting dates are determined;
- the amount and timing of the introduction of necessary mineral additives is determined;
- optimal routes for equipment are determined;
- the required amount of fuel is calculated;
- the movement of equipment along the specified routes is monitored;
- the process of product storage is monitored;
- creation of an optimal diet for feeding animals;
- optimization of the promotion process and much more.

Digital marketing contributes to the effective promotion of the company's products through digital channels, which helps to significantly increase the targeting of marketing activities, expand the reach of consumers and at the same time save the budget and helps to adapt advertising to a specific consumer. This area of marketing is often called digital marketing [13,14].

The main factors that contribute to the development of digital technologies are:

- availability of large data arrays and the ability to process them quickly;
- the ability to build long-term relationships with customers that can be built on a large number of channels;

- the ability to quickly receive feedback from the consumer and adjust their activities.

Thus, we see how much benefit digital technologies bring, optimizing almost all production and implementation processes. Economy and resource conservation are quite obvious here. However, it should be noted that the introduction of digital technologies requires considerable costs and, most importantly, professional specialists who need to be trained.

Employees of all levels working in the conditions of digital transformation are required to:

- high level of digital literacy;
- thorough professional training;
- possession of the required competencies;
- knowledge and skills in the field of digital technologies;
- changing the goals and content and methods of educational work;
- go from teaching everyone to teaching everyone;
- optimize the materials, tools and services used;
- the possibility of continuous development and training continuously.

In this paper, we have considered in some detail the problems and factors that hinder the transition to the concept of sustainable development and which require resolution in the near future.

Therefore, we offer activities that need to be carried out in the near future.

In order to accelerate the sustainability of agriculture, in our opinion, it is necessary to carry out the following measures:

- to improve the system of land relations;
- to perfect the system of land use on a scientific basis;
- to ensure the reclamation of lands that have fallen into disrepair;
- to improve lending to agricultural producers;
- to improve the quality of manufactured products;
- to strengthen state support for small businesses;
- to stimulate the introduction of digital technologies in agricultural production;
- to enter a graphic sign confirming the high quality of products.

The main factors that contribute to the development of digital technologies are:

- availability of large data arrays and the ability to process them quickly;
- the ability to build long-term relationships with customers that can be built on a large number of channels;

- the ability to quickly receive feedback from the consumer and adjust their activities.

Table 2. Ways of sustainable development of agriculture and recommended measures of achievement.

Ways of sustainable development of agriculture	Recommended measures
Optimal use of resources	Use of alternative energy sources, science-based land use

Optimal use of professional personnel	Professional development and digital literacy. Creating new jobs, raising wages
Production process management	Cooperation, specialization, partnership on mutually beneficial terms
Conservation of ecology	Organization of waste-free production, economical use of water and electricity, restoration of depleted lands. The use of highly productive, environmentally friendly industries
Introduction of new technologies and equipment	Automation, computerization, application of resource-saving technologies. The use of biological plant and animal protection products
Scientifically-based feeding and fertilization diets	Development of special computer programs
Improvement of the control system	Quality control of products, medicines, pesticides, chemicals, soil testing, examination of genetic material using mini-laboratories
Legal regulation of sustainable development	Legal advice

4 Conclusion

The article considered the concept and essence of the concept of sustainable development. Analysis of Russian and foreign sources show that this topic is relevant all over the world. 193 countries of the world voted for sustainable development, as following this concept enables future generations to live safely on our planet, continuing to use its resources.

This concept suggests that we must maintain a balance between economic, environmental and social factors. This concept is based on the fact that we must live and develop in such a way that the resources available to us now are available to future generations, so we must preserve them. For Russia, this topic is quite new, it has been seriously developed for the last 3-4 years.

Other developed countries started doing it much earlier, about 20 years ago. Russia's lateness is caused by the fact that Russia is rich in natural resources and, unlike most countries, the issue of resource conservation was not so acute.

We have considered possible ways of transition to this concept. The article analyzed the problems in agriculture that hinder this transition, outlined measures to eliminate these problems and identified ways to further work on the transition to the concept of sustainable development.

References

1. A. Rozhkova, E. Stepanova, E3S Web of Conferences **247**, 01026 (2021)
2. O.A. Nezamova, A.A. Stupina, O.A. Shagaeva, IOP Conference Series: Earth and Environmental Science **1076(1)**, 012053 (2022)
3. A. Olga, Z. Olga, O. Julia, SGEM **18(5.3)**, 863–870 (2018)
4. A. Rozhkova, IOP Conference Series: Earth and Environmental Science **677(2)**, 022045 (2021)
5. O.V. Zinina, O.I. Antamoshkina, J.A. Olentsova, IOP Conference Series: Earth and Environmental Science **548(2)**, 022033 (2020)

6. O.A. Nezamova, J.A. Olentsova, IOP Conference Series: Earth and Environmental Science **839(2)**, 022060 (2021)
7. O. Zinina, N. Dalisova, J. Olentsova, ACM International Conference Proceeding Series, 3444480 (2020)
8. A.A. Stupina, O.I. Antamoshkina, I.R. Ruiga, et al., IOP Conference Series: Materials Science and Engineering **1047(1)**, 012039 (2021)
9. A.V. Rozhkova, N.A. Dalisova, IOP Conference Series: Earth and Environmental Science **677(2)**, 022048 (2021)
10. O.I. Antamoshkina, O.V. Zinina, A.O. Stupin, IOP Conference Series: Materials Science and Engineering **862(4)**, 042029 (2020)
11. O.A. Nezamova, J.A. Olentsova, IOP Conference Series: Earth and Environmental Science **981(3)**, 032018 (2022)
12. O.V. Zinina, J.A. Olentsova, IOP Conference Series: Earth and Environmental Science **677(2)**, 022038 (2021)
13. N.A. Dalisova, O.V. Zinina, J.A. Olentsova, IOP Conference Series: Earth and Environmental Science **677(2)**, 02203 (2021)
14. E. Stepanova, ACM International Conference Proceeding Series, 3444479 (2020)