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QUALITY 5.0 OF AGRICULTURAL PRODUCTS IN THE MANAGEMENT OF SUSTAINABLE DEVELOPMENT OF THE GREEN AGRARIAN ECONOMY

Abstract: *This paper elaborates on certain types and characteristics of the directions for raising the quality of agricultural products in managing the sustainable development of the green agrarian economy. These directions are most relevant and conform to the Quality 5.0 paradigm, which includes resource-efficient agricultural production, connected with the reduction of the use of renewable and non-renewable resources as the basis of sustainability and economic results and forecasting of crop yields. We prove the nexus between these directions of Quality 5.0 and the possibility of raising the indicators of sustainable development of the green agrarian economy subjects. A special role in this transition belongs to subjects that participate in resource supply chains and technological solutions together with farms. The efficiency of implementing the paradigm of Quality 5.0 of agricultural products is more characteristic of developed or quickly developing countries, which aim at supporting and raising market competition in the domestic and foreign markets.*

As a result of the research, we reveal that countries that implement modern digital smart solutions in managing the sustainable development of the green agrarian economy demonstrate stable development in all spheres (ecologisation, economic growth, and social well-being). This research encompasses digital smart solutions that contribute to the effective implementation of the directions of Quality 5.0 of agricultural products.

The scientific novelty of this research lies in identifying the nexus between an increase in certain parameters of the quality of agricultural products and the results of the sustainable development of green agrarian economy management.

Keywords: *Quality 5.0, Quality 4.0, agricultural products, sustainable development, green agrarian economy, fifth industrial revolution, digital smart solutions, resource efficiency, eco-friendliness*

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1. Introduction

The concepts of Quality 5.0 and sustainable development in the mid-2020s became the basis of the Fifth Industrial Revolution in all sectors of the economy (including the green agrarian economy). Within the Quality 4.0 concept, agricultural manufacturers, the R&D agrarian sector, and IT and ICT manufacturers that create new smart technological solutions to ensure new parameters of products, have been seeking the goal of raising productivity and revenue with the help of digital technologies and new approaches to precise farming (Uztürk & Büyüközkan, 2024). The age of Quality 5.0 has led to a shift in the target to eco-friendliness of production, the possibility to raise the labour conditions of farm employees, and their optimal interaction with robotised systems for economic productivity and competitiveness in the conditions of reduced spending of resources (Tóth et al., 2023). In the conditions of transition to the Quality 5.0 concept, participants of the system of the management of sustainable development of the green agrarian economy use smart digital and agrarian technologies not only for the growth of revenue and market positions but also for solving problems in the sphere of ecology and social well-being that were created in the course of previous stages of agricultural production evolution (Taha et al., 2025). The importance of the focus on quick transition to high environmental parameters of products is the key priority of many national and supranational strategies of development (Burkhanov et al., 2026).

Countries with a high level of technological development, whose main economic sectors are connected with high-tech industrial production, can build a sustainable green agrarian economy. Their experience and leading green agrarian technologies contribute to the sustainable development of territories and countries. In developed countries, the transition to Quality 5.0 of agricultural products in managing the sustainable development of the green agrarian economy allows supporting food security, which is relevant in the conditions of increasing instability in many agrarian countries. Developing countries, aimed at integration into foreign markets and growth of the economy, strive towards raising the quality of agricultural products in the context of the focus on the management of their green parameters. This will allow increasing GDP, raising living standards, and expanding sales markets in the long term. Management of environmentally-oriented growth of the parameters of quality of agricultural products in the long-term is connected with manufacturers' (farmers and large farms) planning to further develop and conduct their economic activities with the focus on environmental protection.

New parameters of the quality of agricultural products become factors in the effective management of the sustainable development of the green agrarian economy. Their development allows reaching results in different spheres, including meeting consumers' expectations and complying with environmental requirements of sustainability that are set in the domestic and foreign markets. Within the management of Quality 5.0 of agricultural products, leading agricultural manufacturers, when developing new parameters of products, take into account the need to comply with national and international standards. Since at present, the process of sustainable development of the management of the green agrarian economy and the phenomenon of Quality 5.0 of agricultural products are at the stage of conceptualisation, their research poses a large interest.

The goal of this paper is to identify the directions for raising the quality of agricultural products in managing the sustainable development of the green agrarian economy. For this, we need to disclose the main aspects of Quality 5.0 of agricultural products and analyse the efficiency of these directions in managing the sustainable development of the green agrarian economy.

2. Materials and methods

The research methodology and order consist of the following stages.

1) Review analysis of scientific and analytical materials on the directions of creating parameters and sectors of Quality 5.0 of agricultural products.

2) Establishment of the efficiency of the Quality 5.0 of agricultural products in the context of sustainable development of green agrarian economy management (ecologisation, social aspect and/or economic component). This stage involves the application of comparative analysis to determine the change in results due to the implementation of certain tools of Quality 5.0.

3) Revealing the specifics of the tools for managing the sustainable development of the green agrarian economy in the context of their sectoral or multifunctional direction. Using the method of induction (systematisation of approaches and information to establish a general view of the object), we reveal whether the used tool can be assigned to the system of sustainable development management of the green agrarian economy or whether it is universal and can be applied in different spheres of the green economy.

We also offer the research hypotheses that the parameter of agricultural product quality "Change in the volume of water resources consumption by agriculture at the national level" (conforms to SDGs 6 and 12) has a positive effect on the parameter "Change in GDP from the agrarian sector", as an element of the economic component of sustainable development; and the parameter "Change in grain yield" (conforms to SDG 8) has a positive effect on the parameter "Change in GDP from the agrarian sector", as an element of the economic component of sustainable development. To test these hypotheses, we conducted a correlation analysis (Pearson's correlation coefficient), which is necessary to establish the connection between these variables. Each assessed variable is considered in the percentage calculation. They are calculated based on the data on the factual volume of water resources consumption by agriculture at the national level (CEIC, 2024), grain yield (Trading Economics, 2026), and GDP from the agrarian sector (Trading Economics, 2025). The hypotheses are checked by the example of China.

Criteria for assessing the level of variables' effect during the analysis of the results of Pearson's correlation coefficient calculation are as follows (Mukaka, 2012):

- Values in the range of 0-0.3 (or 0-(-0.3)) conform to insignificant influence between the variables.
- Values in the range of 0.3-0.5 or (-0.3)-(-0.5) demonstrate a medium level of correlation between the variables (positive and negative, accordingly).
- Values in the range of 0.5-0.7 (-0.5-(-0.7)) point to moderate positive or negative correlation.
- Values in the range of 0.7-0.9 (or -0.7-(-0.9)) show a high positive (or negative) connection.
- Values in the range of 0.9-1 (or -0.9-(-1)) demonstrate very high positive or negative correlation.

We analyse the features of managing Quality 5.0 of agricultural products in the context of the focus on sustainable green agrarian economy according to the works of various scholars and researchers.

In certain works, the differences in the sustainable development management of the agrarian economy are considered within the Quality 4.0 and Quality 5.0 concepts (Naim & Boukhizzou, 2026; Taha et al., 2025; Tóth et al., 2023; Uztürk & Büyüközkan, 2024). The key aspect of the agrarian sector's sustainable development is the real and ubiquitous implementation of Quality 5.0 tools in the conditions of farm activities.

An important role belongs to works that disclose directions and possibilities to bridge the environmental gap in the management of crop yield. Ittersum et al. (2025) prove that innovative environmentally-oriented management of grain yield is directly associated with such economic and environmental benefits as cost reduction. Gupta et al. (2024) dwell on the list and individual characteristics of the most effective algorithms of machine learning, which are used most often in information predictive solutions, which are connected with the modelling of crop yields.

Ergasheva et al. (2021) and Shukhova et al. (2024) presented a comprehensive analysis of the specifics of accounting in agriculture, which includes a focus on the need for transformations connected with digitalisation.

There is a range of works that aim to consider methodological approaches to the management of agricultural production based on the decision-making mechanism in the context of the focus on economic efficiency, not sustainable development. For example, Melkamu et al. (2024) do not put emphasis on sustainable development, but are dedicated to the positions of the Quality 4.0 concept, according to which profit and yield are the main priorities. The focus on the economic component in agriculture is the top priority for developing countries (example of Ethiopia).

Litvinova et al. (2025) analysed approaches to quality management of agricultural products in the context of the focus on food security, which is an important element of the sustainable development of the green agrarian economy. Żywiołek et al. (2026) presented an approach to the management of Quality 5.0 growth based on the autonomous poka-yoke systems, which allow eliminating, in real-time, errors in the creation and implementation of new parameters of products. Ávila et al. (2026) presented an approbated methodological approach to analysing and proving the effectiveness of offers on the improvement of processes (including in the sphere of quality support) and determined the mechanism of eliminating errors and problems with optimisation programmes.

This paper aims to systematise and disclose characteristics of the most competitive directions for improving the quality of agricultural products in managing the sustainable development of the green agrarian economy.

3. Results

It is necessary to reveal the directions for developing the parameters and spheres of Quality 5.0 of agricultural products to study the sectoral direction of implementing the concept of the Fifth Industrial Revolution in the green agrarian economy. We systematise and study the characteristics of these directions that have been formed at the modern stage of the sector’s development.

The first considered direction is resource-effective agricultural production, based on the reduction in the use of non-renewable and renewable resources, as the basis of economic efficiency. In this case, digital smart tools for resource efficiency of the new generation are used, connected with the decrease in spending resources (natural, energy, material, and labour) and an increase in productivity (Naim and Boukhizzou, 2026).

Within this direction, the focus on data management, characteristic of Quality 4.0, shifts in favour of using data in digital smart tools, which are convenient for farmers and take into account the specifics of territories in which agricultural production is conducted, traditions, experience, and resources of the agrarian sector's subjects. This direction involves the technological possibility of transition from the tools used for the collection, storing, and analysis of data to the tools of supporting sustainable decisions (ICL Group, 2026). The tools of this category include information systems of decision-making based on data from various digital sources. The key digital sources of data collection for the management of Quality 5.0 in the modern economy are satellite images, aerial videography made with drones, and data from digital sensors.

It is necessary to systematise the main categories of information systems of decision-making based on the data aimed at decision-making in the context of resource efficiency, which are used in the conditions of the growth of Quality 5.0 of agricultural products.

An important type of these systems is information systems of decision-making based on the data on climate indicators of areas where agricultural companies are located. These systems allow using information about weather and climate conditions, which is fed to databases in real-time; developing adaptive smart solutions for concrete farms, with information on weather and climate, care and irrigation, planting and harvesting; and developing animal care (especially in areas where climate and weather are not stable) (Farmonaut Technologies Pvt. Ltd., 2026). The main features of these systems compared to regular systems of monitoring and forecasting of data on climate and weather, used in the age of Quality 4.0, are as follows:

- Possibility to create various options of care for the object of agricultural production (plants and livestock). In case of crops, precise volume of energy, water, fertilisers, etc. that has to be used daily is determined, given the negative, positive, or optimal scenario of events (climate, weather, and possible emergencies connected with increased precipitation or droughts); the option of the growth of yield given potential weather and climate emergencies in the specific territory is modelled; reduction of risks of overexpenditure of resources (water, non-renewable energy, plant care products, etc.) is modelled. If these systems are used in the management of livestock production, the main advantages are the possibility to model the calculation of energy required for care; forecasting of the necessary volume of forage in the conditions of different options of herding.

- Raising the efficiency of resource spending, as the indicator of environmental and economic efficiency of agricultural products within the course towards the achievement of Quality 5.0. An important aspect of this research is identifying the efficiency of using information systems of decision support based on data in the context of resource efficiency. Examples of these systems include the following:

1) The system of Farmonaut Technologies Pvt. Ltd. (USA), which operates in a browser and a digital app. It allows farms dealing with crop research to reduce aggregate spending of resources of all types by 16-22 %, which contributes to an increase in their sustainability in the environmental and economic spheres. This system allows saving funds due to reduced spending of resources (including water, materials, and care products) by 14-20 % (Farmonaut Technologies Pvt. Ltd., 2026).

2) The system of AgriERP (USA), which is among the leaders in the world market of similar digital smart tools (SaaSworthy, 2026). Its features include the improvement of efficiency of the main activities of agricultural production by 35 % (growth of economic results due to optimal modelling of processes based on the entire range of data); possibility to reduce waste and disposal costs by 20 %, which is achieved due to precise modelling of the need for resources given the data on the object of agricultural production, weather, climate, and other indicators; possibility to reduce spending of resources by 40 % (all types of resources, including water, energy, care products, optimal distribution of labour resources in view of their knowledge and skills on the use of digital tools, experience, readiness to make decisions in the conditions of uncertainty, etc.) (AgriERP, 2026).

3) The Cropin Intelligence system of Cropin Technology Solutions Private Limited (India) (Cropin Technology Solutions Private Limited, 2026). This system is based on modelling the processes of precise crop production management, given the key information on weather, climate, and emergencies. The system allows 100 % elimination of non-productive spending of water and energy.

Information systems of decision-making based on climate indicators of territories are a sectoral IT product and are developed specifically for agriculture.

There is another type of the considered systems: information systems that function based on field data on crops, collected through the Internet of Things technologies and ensuring quick managerial decisions. In this case, digital sensors, installed on agricultural land, are used. Table 1 presents the main characteristics of the market of information solutions with the Internet of Things technology in the agrarian sector.

Table 1. Specifics of the market of information solutions with the Internet of Things technology in the agrarian sector

No.	Parameter	Characteristics and/or value
1	Sales of IoT-based information solutions in agriculture, $ billion	2025 – $17.8 billion, 2029 (forecast) – an increase of 43.8 % compared to 2025, 2032 (forecast) – an increase of 31 % compared to 2025, and 2034 – an increase of 19.8 % compared ot 2032.
2	Character of information solutions	Sectorial, developed for application in the agrarian sector.
3	Key indicators of the information solutions in the regional dimension	Farms and farmers of the Asia-Pacific region. Expenditures for purchase and maintenance of IoT-based information solutions in agriculture by this category of users were as follows: in 2024 – 44 % of world expeditures of this category, in 2025 - $8.5 billion (48 % of world expeditures of this category), the forecast for 2029 is $12.3 billion (48 %), 2032 году – $16.2 billion (48 %), and 2034 – $19.4 billion (48 %).
3.1	The main countries that use the tools	India and China.
4	General structure of world users of IoT-based information solutions in agriculture, %	As of 2024: Asia-Pacific region – 44 %, Europe – 25 %, North America – 20 %, Latin America – 7 % and the Middle East and Africa – 4 %.
5	Factors of an increase in the use of these information solutions	Focus on the sustainable development of agricultural production. Growth of demand for these systems in India and China is due to the orientation towards Quality 5.0 in agricultural production and the reduction of the sector's negative impact. Dissemination of farmers and farms' awareness of the innovative smart methods of agricultural production has led to an increase in interest in these information solutions. Government support (China's national model of economic regulation) allowed for the development of these systems, which are connected with such parameters of Quality 5.0 of agricultural products as resource efficiency (saving energy, water, and fertilisers) and eco-friendliness (reduction of the use of natural resources and reduction and prevention of environmental pollution).
6	The main elements of IoT-based information solutions in agriculture	1) Technologies and communication means (Internet and real-time data transfer). 2) Software (browser or digital app). 3) Hardware: LED Grow Lights; RFID Tags and Readers; Smart Harvesters & Forwarders; Displays; Handheld Computers; Drones; Guidance and Navigation; Sensing and Monitoring Devices; Automation and Control Systems; Sensors for Livestock; Climate Sensors; Water Sensors; Soil Sensors; Variable Rate Controllers; Flow and Application Control Devices and Irrigation Controllers.

Source: Prepared by the authors based on Precedence Research (2026)

Let us consider the influence of using IoT technologies on the parameters of Quality 5.0 of agricultural products in managing the sustainable development of the green agrarian economy in China. Similar to India, China is the leader in the Asia-Pacific region in implementing these technologies in agriculture. The key aspects are as follows.

1) The volume of water resources consumption by agriculture was as follows: 390.25 billion Cub m3 in 2012; 385.220 billion Cub m in 2015; 378.13 billion Cub m in 2022; and 367.24 billion Cub m in 2023 (CEIC, 2024). Over 2024-2026, these parameters have been further decreasing. This reduction in water consumption by the agrarian sector is a sign of the positive influence of transformations on the results of sustainable development management in the process of ensuring Quality 5.0 of agricultural products.

2) The agrarian sector's share in GDP is the economic component of sustainable development. Analysis of its dynamics demonstrates the balance of management in this sphere. In 2012, this parameter equalled CNY 4.96 trillion, in 2015 – CNY 5.6 trillion, in 2022 – CNY 8.83 trillion, in 2023 – CNY 9.01 trillion, in 2024 – CNY 9.3 trillion, and in 2025 – CNY 9.33 trillion (Trading Economics, 2025).

3) Improvement of crop yields is also an indicator of the enhancement of the management of sustainable development of the green agrarian economy. This indicator has been growing in China in recent years: 5,830 kg per hectare in 2012, 5,990 kg per hectare in 2015, 6,380 kg per hectare in 2022, and 6,420 kg per (Trading Economics, 2026). An increase in this indicator was achieved due to the positive effect of information solutions that are based on tactical modelling of the processes of ensuring Quality 5.0 of agricultural products with the use of IoT technologies.

The second analysed direction of ensuring the growth of agricultural products' quality in managing the sustainable development of the green agrarian economy is the forecasting of crop yields. This direction is important because precise forecasting of the volumes of harvests and sold products enables farms to create precise forecasts of the financial support of their activities and plans for financial turnover. The forecasting involves information systems of modelling based on data obtained through the Internet of Things.

The processes of forecasting crop yields are performed with the use of information systems of process management in the agrarian sector. This could be specialised digital apps or software for the calculation of this indicator. There is a direct connection between an increase in yield, achieved with the help of digital smart solutions, and the growth of the efficiency of sustainable development management of the green agrarian economy. This connection consists in the following (Ittersum et al., 2025).

- Due to optimal identification of the volume, time, and means of applying pesticides and synthetic fertilisers, which features digital smart solutions, the growth of crop yields is achieved. Economic benefits are reached with compliance with environmental norms.

- Growth of yield, which is based on sustainable approaches and methods, allows reducing areas of agricultural land, which contributes to the preservation of the planet's ecosystems.

- Application of sustainable models and mechanisms of raising yield in the context of the Quality 5.0 concept leads to a decrease in the spending of natural resources and emissions from agricultural production.

Gupta et al. (2024) showed that the application of such algorithms of machine learning as K Nearest Neighbor (KNN), eXtreme Gradient Boosting (XG Boost), and Random Forest in information systems of crop yield forecasting allows ensuring its precision within 97.1-97.5 %. Including these machine learning algorithms in the information and prognostic digital smart solutions involves mainly the use of initial data on the management of crop yield. These could be parameters on such aspects of the green agrarian economy as optimisation of volumes and processes of applying pesticides and fertilisers (or replacing them with eco-oriented means given the specifics of care, territories, weather and climate conditions, etc.); resource efficiency (water, energy, labour resources, planting material, productivity of robots and cobots use, etc.); cyclicity (environmentally-oriented recycling of agricultural production waste); diversification of agricultural land to raise yield in the context of implementing innovative methods of precise farming and crop rotation.

As of year-end 2025, the following smart solutions were used in the world practice of yield management, as an element of Quality 5.0 of crops, at the level of R&D in green agronomy, IT, and ICT. These smart solutions ensure the achievement of the balance of the Sustainable Development Goals and include the following examples.

Information systems of data integration, which are used in precision smart farming. These systems are employed to form links between the main smart technologies, used in financial accounting software of farms, digital sensors of information collection in the field, cobots, and other robotised technology. Data integration is further used to develop and implement machine learning algorithms, which forecast crop yields. This type of smart digital solution allows data integration for forecasting of yield at the initial level. This solution is purchased mainly by large agricultural companies, which perform complex management of data collection for their further usage in other digital solutions. This tool can also be used by consulting organisations. For small and medium farms and individual farmers, the application of such a smart digital tool can entail additional costs. This tool allows large companies to be autonomous in the sphere of data integration, which positively affects the protection of corporate data on crop growing and care.

Prognostic information systems of risk assessment and early risk detection in the sphere of crop management. This smart digital tool has the following characteristics: the possibility to detect and trace abnormal conditions of agricultural production (extreme weather conditions, diseases, pests, etc.); early warning for interested parties to change approaches or make corrections in the processes of agricultural production management. Application of such smart digital tools is most relevant for farm centres and farmers' support, for quick reaction to challenges. Such information, smart solutions are also used by the insurance sector to forecast yield in the context of agricultural sector insurance.

There are digital smart platforms for the analysis of supply chains and interaction without intermediaries. These digital solutions allow preserving yield quality for longer periods and enable farms and farmers to achieve a good price-quality ratio. Since there is a possibility of finding the consumer in proximity to the manufacturer, such parameters of agricultural products as freshness and correspondence to physical and chemical indicators are preserved. There is also a possibility of not using packaging that negatively affects the environment. Creation and management of such digital smart platforms are performed by central and local authorities and agricultural associations that support the sector's subjects.

Another type of digital smart platforms includes the ones ensuring calculation of yield and formation of exhaustive recommendations for farmers on the achievement of certain options of forecasted yield; establishment of forecasted yield given factual changes in fields. Information systems of monitoring are used to analyse information on all parameters, received by databases, over various periods of activities and in real-time, which is required to calculate forecasted yield and correct it given any changes.

There are information systems for forecasting the growth and state of crops. They use machine learning and digital twins technologies to determine yield given a large number of factors and ensure readiness to react to challenges and threats in the development of crops.

Attention should be paid to the analysis of the efficiency of using smart digital solutions for forecasting crop yields that are developed and promoted by Cropin Technology Solutions Private Limited (India) (Muralidharan, 2025). This company provides a digital smart solution for modelling the processes of precise farming based on weather, climate features, and emergencies, with the emphasis on resource efficiency. This digital smart solution has the following features:

- Users select the satellite to record images of plants, soil, and agricultural land according to the required resolution of images and frequency of observation.

- Forty types of data were studied for forecasting.

- Yield forecasting periods: from ten days up to one year.

Let us elaborate on the research hypotheses offered in this work. The first concerns proving a connection between the reduction in water consumption in agriculture, achieved through innovative solutions, and GDP from the agrarian sector; the second concerns the connection between grain yield growth and GDP from the agrarian sector (Table 2). For this purpose, we analysed the development of China’s agriculture.

Table 2. Correlation between sustainable development variables of China’s agriculture

Variables	Values of the variables, %			Pearson’s correlation coefficient	
	2012-2015	2015-2022	2022-2023	Influence of the parameter “Change in the volume of water resources consumption by agriculture at the national level” on “Change in GDP from the agrarian sector”	Influence of the parameter “Change in the volume of grain yield” on “Change in GDP from the agrarian sector”
Change in the volume of water resources consumption by agriculture at the national level, %	-1.3	-1.84	-2.88	0.358 (medium positive effect)	0.992 (High value)
Change in grain yield, %	2.74	6.5	1		
“Change in GDP from the agrarian sector” as an element of the economic component of sustainable development, %	12.9	57.7	2.04		

Source: Calculated by the authors based on (CEIC, 2024; Trading Economics, 2025; Trading Economics, 2026)

The results of the analysis in Table 2 indicate that the first hypothesis was partially supported, as only a medium positive effect was observed. The second hypothesis was fully confirmed, as we observed a very high correlation between grain yield growth and GDP growth from the agrarian sector. Reduction in water consumption is an important direction in the sustainable development of agriculture, requiring the application of the most optimal digital smart technologies.

The considered directions for improving the quality of agricultural products in the management of the sustainable development of the green agrarian economy are based on the use of digital smart tools and technologies, adapted to industry solutions that contribute to the achievement of Quality 5.0 parameters. We disclosed specific features, forms, and types of innovative solutions used to raise resource efficiency and environmental friendliness of the sector's products.

4. Discussion

In this research, we proved the nexus between Quality 5.0 of agricultural products and the effectiveness of the sustainable development management of the green agrarian economy. This nexus relies on the creation and implementation of a new paradigm of product quality management in agriculture, which involves recognition of the importance of well-balanced and responsible agricultural production. Its growth should not lead to environmental consequences, but, in certain cases, it contributes to environmental protection. This new paradigm (Quality 5.0 of agricultural products) involves the need to reconsider management, accounting, and forecasting of companies' economic development. We should note the importance of reforming the approaches to the management of sustainable development of the green agrarian economy in the context of supporting and raising Quality 5.0 of agricultural products. This involves the need to change and determine, at the regulatory level, the marginal rates of resources, which are to become a new standard within the focus on energy efficiency.

It is also necessary to transform the framework and rules of financial accounting and reporting to adapt them to new results of economic activities, which are connected with the focus on sustainable agricultural development (Ergasheva et al., 2021). The paradigm of Quality 5.0 management for agriculture allows developing new parameters for accounting and reporting: from the indicators of resource efficiency by types and parameters of emissions to the indicators of resource saving. It is also possible to introduce the parameters of supporting the social well-being of personnel within the formation of the social component of sustainable development.

Assigning new parameters to agricultural products requires control over their observation. This leads to a change in the mechanism of agricultural production in the conditions of the Quality 5.0 paradigm. This mechanism involves the attraction of new specialists or the training of current specialists. In particular, it is necessary to perform monitoring and analysis of environmentally-oriented qualities of products and analyse the balance of economic results with the obtained environmental and social results. These organisational aspects entail additional costs, which leads to the need for thorough control over the implementation of new parameters of product quality. It should also be noted that agricultural products with environmental characteristics are in higher demand in the market.

5. Conclusion

Summing up the conducted research, we can note that the modern concept of formation of the quality of agricultural products has changed in the course of the evolution of society's approaches to the characteristics of consumed products and business's approaches to the selection of products that are further processed. In societies that have adopted the sustainable development concept, transition to green methods of production and new qualities of products is treated positively by most consumers and personnel who may show initiative to master new knowledge and skills. In societies where ideas of sustainable development are insufficiently presented, modern manufacturers of agricultural products may face serious opposition in the adoption of new approaches and methods of the management of sustainable development of the green agrarian economy. Here it might be expedient to adopt the national policy of promoting the principles of sustainable development in all sectors and spheres of life activities.

Another important aspect in the management of the sustainable development of the green agrarian economy is attracting companies and other economic subjects to this process (agricultural associations, scientific and industrial parks, etc.). This will allow for progress in the creation of innovative technological solutions for the development of new parameters of quality. This measure will also contribute to the competitiveness of green agricultural products.

Transition to the management of sustainable development of the green agrarian economy in the context of Quality 5.0 of agricultural products shows that stable functioning requires resources, labour resources' readiness for changes in the production model, and consumers' expectations for certain green qualities of products.

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Author Contributions

1st author conducted a systematisation of the positions of scientists on the issue of Quality 5.0 management of agricultural products in the context of the focus on a sustainable green agricultural economy

2nd author developed the methodology for this study and identified areas for improving the quality of agricultural products in the management of sustainable development of a green agricultural economy, which are discussed in the work.

3rd author carried out an analysis of the specified areas and selected statistical and analytical materials related to the study of the market for information solutions using Internet of Things technology in the agricultural sector

4th author conducted an analysis of the state of the market for information solutions using Internet of Things technology in the agricultural sector and contributed to the selection of research materials.

All authors reviewed the results and conclusions of the manuscript and approved the final version.

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