

# Improvement of Investment Attractiveness and Efficiency of Agriculture Enterprises as a Result of Digital Technologies



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**Abstract:** *The article considers the main projects aimed at innovative development and digital transformation of agriculture in Russia. This topic is very relevant in connection with programs of the Russian Federation government aimed at the innovative development of the country's economy in general, and in particular within the framework of the project on digitalization of agriculture. The aim of the study is to develop a mechanism for applying blockchain and token decentralized registry systems to improve efficiency of agricultural enterprises. The options for introducing artificial intelligence into the work of the agro-industrial complex, as well as the effect that can be obtained, are analyzed. Ideas of using the distributed blockchain registry system in managing fixed assets of agricultural enterprises and the scheme of creating a database across the country are presented. The methods of using tokens for the conclusion of contracts and sale of agricultural products, which will allow to build mutually beneficial cooperation for buyers and sellers of agricultural products, and receive reliable information about the methods of its cultivation.*

**Keywords :** *digitalization, agriculture, artificial intelligence, blockchain, token, database, fixed assets, investments, productivity, agriculture, innovation*

## I. INTRODUCTION

**The relevance of the study** is connected with the need to increase labor productivity and improve the efficiency of agricultural enterprises through introduction of artificial intelligence and various digital technologies in the operation of data.

Digital technologies are rapidly going into various spheres of economic activity of our country. Various kinds of government projects contribute to this process. Agriculture is no exception.

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A national strategy for the development of artificial intelligence has been adopted, phased implementation of which is planned until 2030, also with the aim of reducing the backlog in labor productivity, productivity and other indicators, by departmental project "Digital agriculture". This project involves the creation and development of a national platform of digital state management of agriculture, which will allow by 2024 to achieve a technological breakthrough and by two times increase the productivity of agricultural enterprises.

Thus, it can be noted that much attention is paid to the transformation of agriculture. At the current stage of the country's economic development, the introduction of digital technologies and digital platforms in their work is crucial to achieve the growth of labor productivity in the agricultural sector, as well as to increase the efficiency of agricultural enterprises.

**The purpose of the study** is to develop a mechanism for applying the system of decentralized registers "blockchain" and tokens to improve efficiency.

Digital transformation is not an end in itself, but a tool used to optimize existing resource potential. Therefore, the diversity of applications requires the development of digital solutions oriented to the needs and problems of all market participants.

Why should we support development and optimization of agricultural processes? One of the most important reasons is the growth of the population, which is directly related to the increase in consumption of products. That is, in 30 years, humanity will need several times more food, and therefore, it is necessary to increase its production. Taking into account the possibility of introducing innovative technologies, the agro-industrial complex is a promising industry for development.

However, agriculture is also one of the most vulnerable and risky areas of business. Most of the processes taking place here cannot be structured in advance. Agricultural business depends on weather, natural phenomena, characteristics of the area where production is located, epidemics affecting plants and animals. In addition, all emerging issues need to be addressed urgently, which could result in losses in the process of crop cultivation, storage and transportation. Scientists have found that 2/3 of the factors leading to losses can be controlled due to automation of control processes [10].

Digitalization of agro-industrial complex will increase the productivity of agricultural crops,

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as well as the productivity of animals through analysis of the obtained results using artificial intelligence; optimize production costs through precision farming and science-based approaches; reduce labour costs and make up for possible shortages by using Internet; take into account climate change based on the calculations of analytical

platforms; reduce the supply chain of products from agricultural producers to consumers by accurate calculation of loading and delivery time for buyers through mobile applications, electronic exchanges for the sale of agricultural products, through a decentralized database.

Considering that the developed countries have set themselves the goal to maximize agricultural productivity and returns per unit area with digital agriculture, blockchain technology can be widely used in the agro-industrial complex as part of its digital transformation. For example, blockchain can be used as a tool for accounting fixed assets of agriculture.

## II. THEORETICAL AND METHODOLOGICAL APPROACHES

Digitalization of fixed assets occurs everywhere, an example is the promotion of high-tech digital equipment by Russian enterprises. Advanced agricultural machinery enterprises produce, for example, digital harvesters. Such a smart harvester is able to calculate the places where there is not enough fertilizer, to assess the harvest, the level of harvesting, to minimize losses and even submit a tax return but only in Germany so far.

Today, more than a hundred different enterprises in the country produce agricultural machinery, they employ more than 38.5 thousand people (with only from 2015 in the industry created 7.7 thousand new working places). Every year these enterprises bring to the Russian treasury about 19 billion rubles. Over the past five years, the shipment of Russian agricultural machinery has increased more than three times — from 30.5 billion to 100.6 billion rubles. The share of products based on digital technologies has also grown significantly.

According to the Minister of Industry and Trade of the Russian Federation Denis Manturov, the country is actively developing smart agriculture, in which many machines are equipped with remote telemetry. In addition, the number of robotic equipment in the country has tripled. To date, the hardware-software monitoring system Field-Monitoring has passed the test, which is equipped with machine vision systems, unmanned control, and is also able to simulate plant growing processes [8]. Innovations of this kind create a platform for digitalization of the Russian agro-industrial complex.

According to the program of transformation of agriculture it is necessary to create and constantly replenish Big Data on objects of agricultural resources (land, crops, yield, farm animals, and agricultural machinery) [3]. What is Big Data? The term is based on big data, namely the management and analysis of large amounts of data. Thus, we can say that Big Data is a set of methods that allows you to record and process a large amount of data in various fields. Due to the fact that the amount of processed information on agricultural resources is large. Also, indicators obtained as a result of its processing should be accurate, it is necessary to use new breakthrough technologies. Modern technologies used in Big Data processing must cope with the

ever-increasing amount of information and be resistant to hardware failures. That is why the technology of decentralized registers can be used to process big data of agricultural resources. Blockchain allows you to record each individual transaction, starting from purchase of fixed assets and putting it into operation, ending with sale or write-off due to wear of fixed assets. At the same time, all operations remain permanently in the database in the form of a data chain, which cannot be deleted.

By using blockchain technology in agriculture, when accounting for fixed assets, it will be possible to track all movements of fixed assets in real time, maintain a full-fledged “transparent” database of available fixed assets, avoid expenses associated with unrecorded fixed assets (shortages, lack of depreciation), conduct analysis available assets, reduce the cost of maintaining excess personnel. At the same time, for the convenience of agricultural producers when using the blockchain system, it will be advisable to develop a mobile platform for smartphones with the possibility of performing transactions. The use of blockchain technology by each household will allow the creation of an up-to-date database of agricultural fixed assets, which will be updated for example, if any equipment is received. Databases existing at the moment are at the direction, of the Ministry of Agriculture. However, many of them contain information that already needs to be updated. That is, there is no common database with relevant information, which consolidates information on fixed assets of agriculture on the territory of our country. In order to create a register of fixed assets, it is necessary to change the mechanism of work with standard accounting programs, such as 1C Accounting, and Contour. Accounting, Parus Enterprise 7, BEST and others in the field of fixed assets accounting. To date, the organization is filling out inventory cards for accounting for an item of fixed assets. It is containing data on the terms of issue of the fixed asset, date of commissioning, initial and residual value, depreciation amount, as well as information on the reassessment, movement and individual characteristics of an item. In order to create a decentralized blockchain data register, it is necessary to enter this information into the system. In order to reduce the path that will overcome the necessary information, it will be advisable to enter the data directly through the accounting program used in an agricultural enterprise. The necessary information will be formed in a summary table on fixed assets of the enterprise, if there is appropriate access to data transfer from a program to the blockchain system. The information that should be in the PivotTable is presented in Table 1.

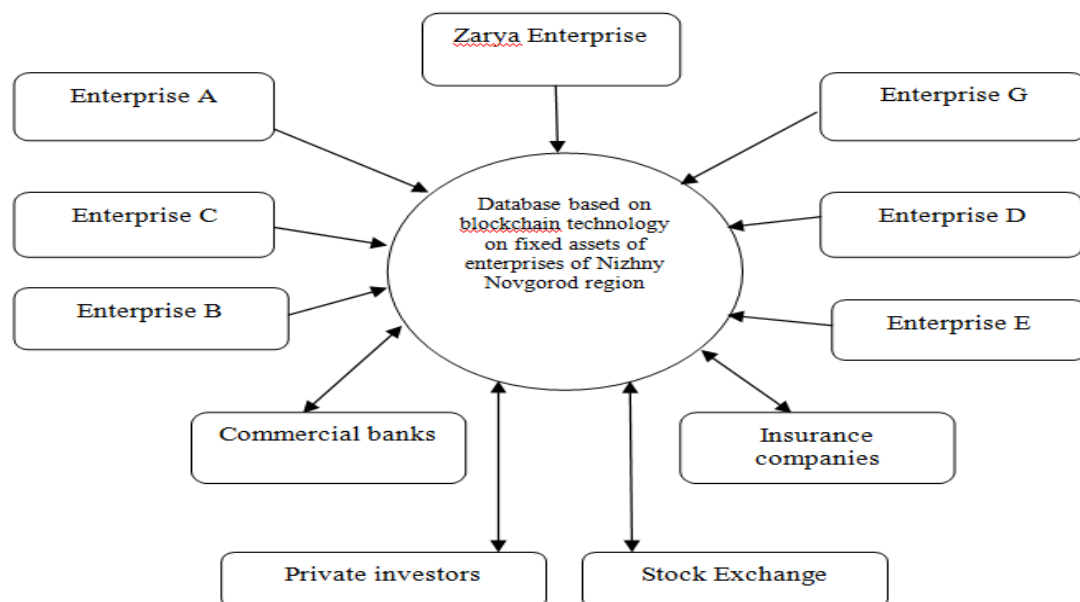
**Table 1 Summary data on objects of fixed assets for placement in the system of decentralized registers of blockchain.**

OS Group Name	Type of OS	Object name OS	Commissioning date	Initial value of an object	Life cycle of an object	Actual service life	Amount of accrued depreciation	Name of owner's enterprise
Machinery and equipment for agriculture and forestry	Harvester	RSM-161	12.08.2014	17 448 000	8	5	14 298 000	ZARYA
Machinery and equipment for agriculture and forestry	Tractor	460DT	22.04.2016	14 516 000	8	3	5 832 000	ZARYA
Machinery and equipment for agriculture and forestry	Forage harvester	DON 680M	03.09.2018	18 620 325	8	1	94 259	ZARYA
Machinery and equipment for agriculture and forestry	Baler	Pelikan 1200	05.07.2018	11 210 111	5	1	2 079 315	ZARYA
Machinery and equipment for agriculture and forestry	Seeders	DH730	22.06.2017	2 978 452	6	2	1 034 658	ZARYA
Machinery and equipment for agriculture and forestry	Sprayer	SP 275	01.10.2019	5 625 789	7	-	-	ZARYA

The use of a system of decentralized blockchain registries will increase the investment attractiveness of agricultural enterprises, and optimize the movement and valuation of their fixed assets. Combining data on agricultural enterprises in the region will provide an opportunity to create a dynamic database of fixed assets, allowing to quickly update and supplement existing information.

Figure 1 proposes a system of creating a database based on blockchain, which will make it possible to optimally estimate fixed assets in agriculture of the Nizhny Novgorod region, as well as to carry out their timely

reproduction. Significant advantages of constant monitoring are: control of depreciation and introduction of new fixed assets, competent and timely accounting, objectivity of data. For each fixed asset, the distinguishing characteristics will be indicated: name of fixed asset group, type of fixed asset, individual name of fixed asset object, place of operation or storage, manufacturer, value at the time of introduction and so on.



**Figure 1. Creation of a common database of data on fixed assets of Nizhny Novgorod region on the basis of blockchain technology**

On the basis of the data on the wear of fixed assets, we can increase productivity, which will directly affect the performance indicators of agricultural enterprises for example: ploughed areas, fertilizers applied on a certain area,

frequency of watering certain crops, and volume of harvested crops, etc.



Also, the use of the blockchain database will allow agricultural enterprises to attract investors, which means that enterprises will have the opportunity of industrial growth, as well to increase yields and profits. Besides blockchain technology, as part of the digitalization of agriculture, it also opens up new tools that are used on crypto currency market. The National Settlement Depository has launched a project on “digitalization of grain”. In April, the Moscow Exchange encountered problems with grain accounting: found embezzlement on elevators. The shortage was identified at six large elevators in different regions, which upon accreditation met the most stringent criteria.

Because of this, the exchange had to create reserves for 2.4 billion rubles. Later on, the fact of theft a criminal case was opened, and the exchange curtailed all swap operations in the grain market.

The National Settlement Depository (NSD, part of the Moscow Exchange Group) together with Rosselkhozbank is preparing a pilot project on digitalization of accounting and grain trading on the spot market. In cooperation with a bank that has excellent resources for operating in the physical market, it offers its own technology for digitalization, storage, trading, settlements, that gives a synergistic effect.

The project represents the accounting of digital assets for goods that are stored and provided with warehouse receipts. For example, the farmer put a ton of grain in the warehouse, received a receipt, then he puts in the Rosselkhozbank receipt for responsible storage, and the bank issues a token for this ton grain [6]. By submitting a receipt, the farmer immobilizes this grain and loses the opportunity to receive a batch without redeeming the token. Tokens are similar to company shares, virtual shares that are issued on the blockchain in digital format. For each token, the distinctive characteristics of the grain will be indicated: class, storage place, manufacturer and so on. Further, this token can be traded in the secondary market, as a result of settlements on the exchange transaction the owner changes. The new owner applies to the bank and receives a receipt on hand, while the token is redeemed. Then he goes to the warehouse where the physical goods are received. Tokenization minimizes the risks of incorrect grain accounting, which was encountered on the Moscow Exchange, and simplifies the trading technology. It will also allow trading in fractional lots of grain, and it will be convenient for small suppliers. Now there is no such possibility, buyers are forced to purchase a large volume of products since the purchase of a smaller batch will lead to higher grain prices [7].

### III. RESULTS OF THE STUDY

Let us examine a possible mechanism for the use of tokens in the sale of agricultural products, as well as their relationship with the decentralized database of fixed assets in agriculture. Tokens can be used as a contract for the supply of finished products: vegetables, grains, livestock products, etc. When a buyer purchases company tokens in advance for a certain number of products, which he plans to purchase next year. The contract of delivery is concluded at the same time with the purchase of the token. The agricultural producer has the means to improve conditions of maintenance/growing products, and the buyer actually concludes a cooperation agreement for a year and solves the issue of product delivery. A feature of the use of tokens, in this case, should be complete

information about the finished product. Starting from types of seeds or animal breeds, ending with the fertilizers or the type of animal feed and additives. This is especially relevant in the conditions of popular organic agriculture, associated with the minimization of used synthetic, fertilizers or feed additives. By providing transparent information about the full cycle of growing products, farmers thereby ensure the trust of buyers. In addition, the availability of a database of blockchain on agricultural objects will allow buyers to assess the potential of an agricultural enterprise and analyze possible risks associated with wear and tear of equipment.

### IV. CONCLUSION

Thus, summing up, we can say that the program of digitalization of agriculture opens great prospects for growth and development of agricultural enterprises. The proposed version of a decentralized database system will allow high-quality and timely analysis, as well as records of fixed assets in agriculture. It will be possible to create a single transparent database of fixed assets of agricultural facilities throughout the Russian Federation, containing relevant information, which in turn will be an interesting solution for investors. The use of tokens in the conclusion of contracts for the supply of agricultural products will be a kind of guarantor for both parties of the transaction. For buyers, they guarantee the quality of products. Allow to solve in advance the issue of providing their company with products, and for manufacturers become a source of funds to improve productivity and product quality.

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