European Scholar Journal (ESJ)
Available Online at: https://www.scholarzest.com
Vol. 3 No.2, February 2022
ISSN: 2660-5562

THE EFFECTIVENESS OF THE USE OF INNOVATIVE METHODS IN THE APPLICATION OF DIGITAL TECHNOLOGIES IN AGRICULTURE

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Article history:

Received: 24th December 2021
Accepted: 26th January 2022
Published: 28rd February 2022

Abstract:

Given the role of agriculture in the national economy, its development is one of the priorities of the state. The government actively supports the agricultural sector of the economy. The modern stage of social development is characterized by high-speed technological development. Over the past 30 years, computers and the information technology associated with them have entered the life of society, including the industrial and non-industrial sectors of the economy. Agriculture is no exception. Today, the acceleration of informatization serves as a basis for ensuring the sustainability of future development.

Keywords: Agriculture, modern information technologies, innovation, digital Agriculture

INTRODUCTION.

Agriculture plays a major role in the country’s economy. It is not only provided food to the state and the population, but also shapes the manufacturing sectors, primarily agricultural raw materials for light and food. Its level of development determines the economic security of the country. Today, agriculture is facing many challenges. The main ones are: the problem of land degradation; high dependence on natural and climatic factors; seasonality of production; excessive depletion of food, etc. Given the role of agriculture in the national economy, its development is one of the priorities of the state. The government actively supports the agricultural sector of the economy. The modern stage of social development is characterized by high-speed technological development. Over the past 30 years, computers and the information technology associated with them have entered the life of society, including the industrial and non-industrial sectors of the economy. Agriculture is no exception. Today, the acceleration of informatization serves as a basis for ensuring the sustainability of future development. At the heart of progressive economic growth is innovation. As mentioned above, agriculture as one of the main sectors of the national economy in many countries faces many challenges and problems. To address them, it is necessary to: reduce the load on the agricultural sector; improvement of applied technologies; increase human capital; increase the safety of food products in the process of their production. This will increase the efficiency of agriculture, which is digital agriculture. Modern information technologies are firmly entrenched in agricultural culture, from crop planning, irrigation automation, and digital crop modeling to the calculation of feed for livestock.

MAIN BODY.

Thanks to the development and introduction of modern information technologies in agriculture, not only its productivity will increase, but also financial and labor costs will decrease. As a result, product quality increases and profits increase. To overcome existing and future threats to biological and food security, society needs a new type of agricultural economy based on the principles of sustainable development and the use of modern information technologies in line with the waste-free economy model. Modernization of the agricultural sector is based on the transition to "smart" agriculture. "Intellectual" agriculture is based on complex automation and production robotization of agriculture, modern technologies for the use of automated decision-making systems, modeling and design of ecosystems. The intellectualization of the agricultural sector will allow, on the one hand, to reduce the excessive use of external resources (agrochemicals, inorganic fertilizers, fuel, etc.), and, on the other hand, local factors of production (organic fertilizers, bioactive, renewable energy sources). , etc. to maximize use). The use of modern technologies of "intellectualization" of agriculture allows: preservation and restoration of useful properties of groundwater and soils; ensuring environmentally safe and effective pest control; remote compliance with the certification requirements of organic agriculture. As a result, the agricultural sector, including production capacity, is expanding and the efficiency of using the resources of the agricultural sector is increasing.

DISCUSSION AND CONCLUSION.

In agriculture, the digital economy ensures the sustainability of agricultural development, the development of agricultural science, agricultural education, and adherence to environmental standards.

Digitization can rapidly expand the possibilities of interaction of all factors of the agro-industrial system, smooth out the factors that hinder the comprehensive increase of efficiency and eliminate existing barriers. Sustainable Internet access allows farmers to obtain technical information and share such information with colleagues in other countries, which helps increase productivity, strengthen immunity to external influences, and enter markets.

The introduction of these digital technologies will enable farmers representing different parts of the agro-industrial supply chain to collaborate in a sustainable agro-ecosystem.

In addition, mobile technology and internet services can connect farmers with commodity distribution chains, giving them access to high quality seeds and fertilizers, which significantly increases production and sells products directly to consumers, bypassing intermediaries and increasing farm profitability.

The use of sensors and new technologies, including big data analysis, provides real-time data collection and in-depth analysis of field conditions, allowing farmers to access data needed for data acquisition and decision-making, and increase productivity through real-time weather forecasts and signals. increases, adapts well to the effects of climate change and strengthens immunity to climate change.

Other technologies, such as blockchain, can make a more perfect food tracking system, help reduce food spoilage, increase transparency and trust in all parts of the supply chain. In-depth study, machine learning and the use of artificial intelligence technologies to improve crop management, disease detection, species identification, water, land and forest resource management efficiency will help improve food safety.

Digital agriculture encompasses various aspects of agricultural production, the main components of which are the construction of a database, metadata standard, monitoring system, forecasting and decision-making system, and information dissemination system, all of which are divided into about four levels. , the level of functional modules, the level of the integrated application, and the system scope of the integrated web portal level that are integrated with each other (Figure 1).

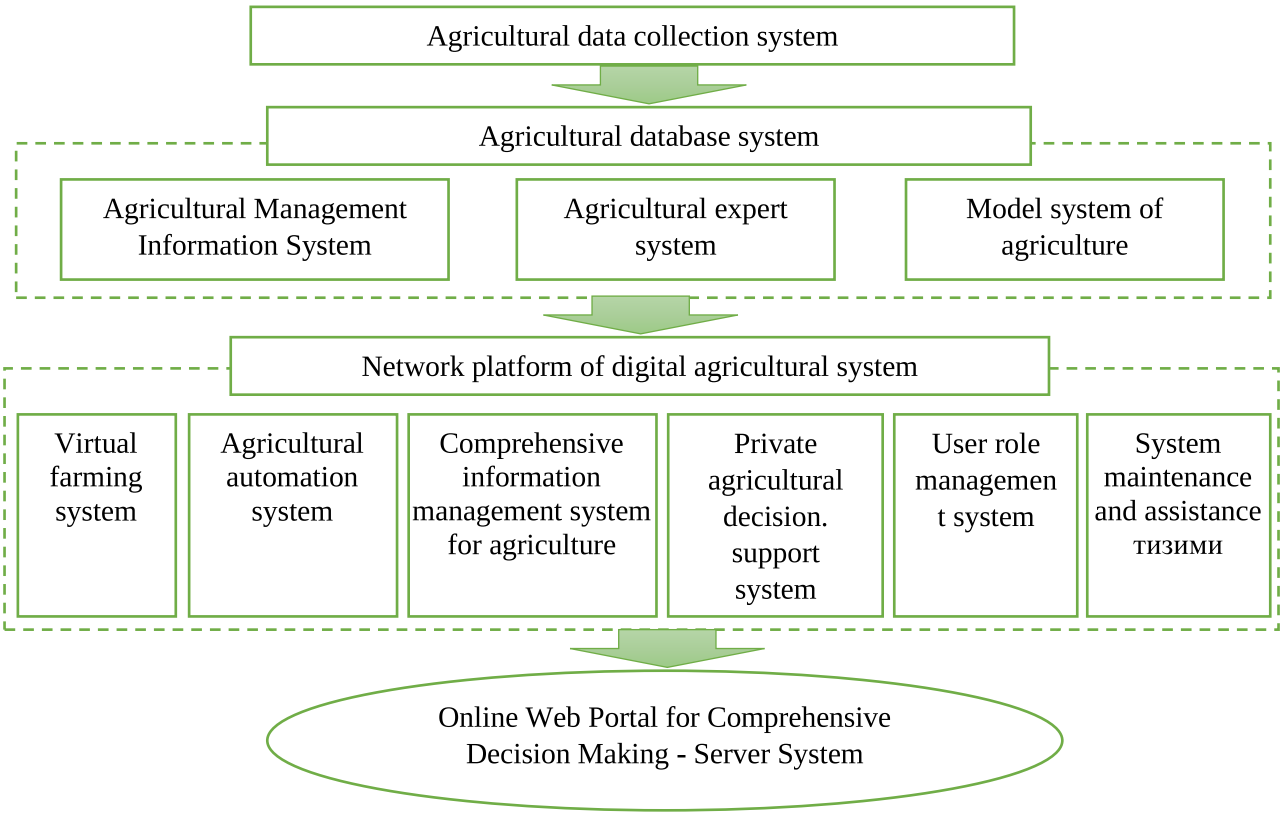

Figure 1. The system framework of digital agriculture

The environment of agricultural lands is a very complex ecological system that covers various factors including soil, fertilizer, moisture, brightness, temperature, atmosphere and so on. All of this information is huge, dynamic, regional, and serial. In addition, the collection and expression of agricultural data includes not only directly related factors, but also recessively related factors that are indirectly related. Thus, the database level, which is responsible for data collection, processing, and analysis, is an important and complex foundation level of this digital farming system.

This level includes media, attribute database, and spatial database tools. The media database includes laws, rules, regulations, and technology standards. The attribute database assumes the management of non-spatial attribute data. A spatial database is a coherent, integral geo-spatial data and service system, including the spatial data structure of digital agriculture, a system for coordinated management, updating and distribution of space data, a standard for spatial data and metadata exchange, and more (Figure 2).

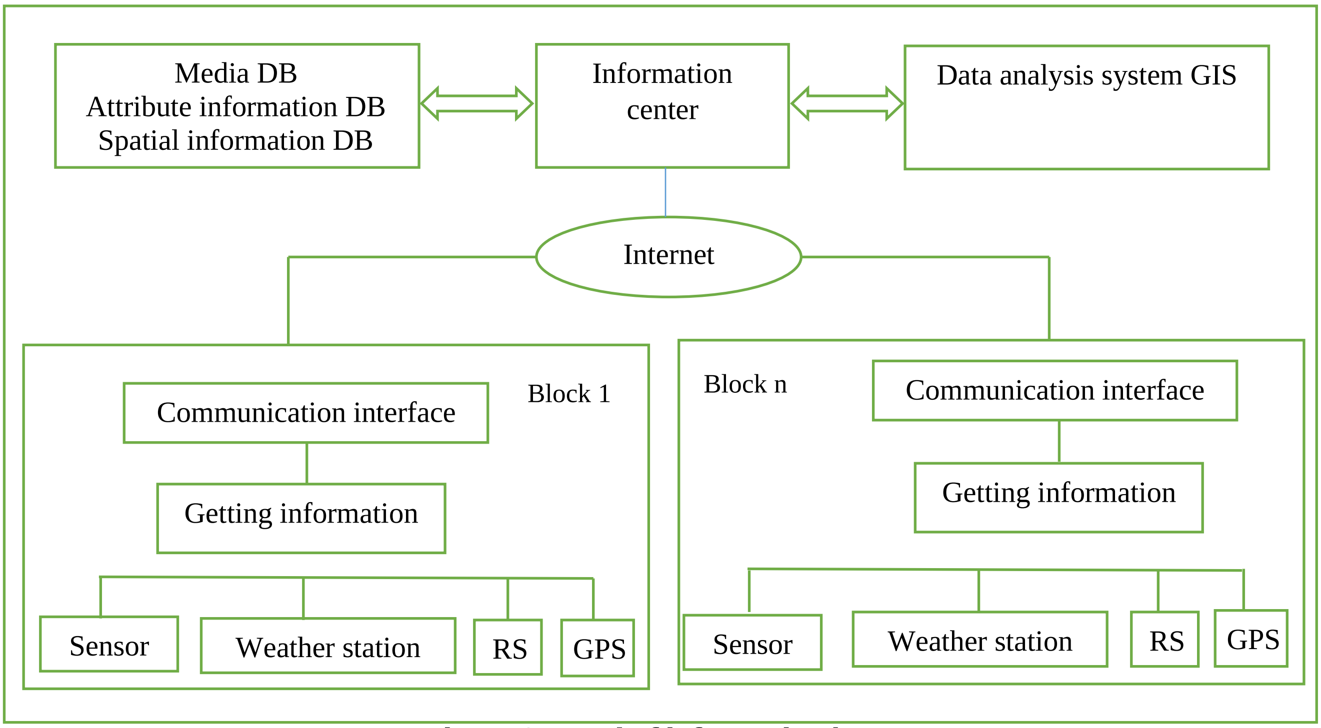

Figure 2. Level of information base

Obtaining this level of data is a key process, and how to access field data quickly and efficiently, and how to deliver data cheaply and with high reliability, is an important research topic. The specificity of the agricultural production environment and the production process of agricultural products make agricultural areas characterized by specific dispersed collection points for data collection, average collection period, low speed, low amount of data, poor field conditions.

This, in turn, increases the difficulty of obtaining complete information on all of the factors. In recent years, the method and technology of data collection has been mainly carried out with manual measurements, analysis of statistical and experimental data, and modern automatic collection methods. Modern automatic collection in these methods has high accuracy, speed, wider range and other features, and has gradually become the main method of data collection. These mainly include RS (Remote Sense), GIS (Geograpfy Information Sytsem), GPS (Global Position Sytsem) and network technologies, and more.

The level of functional modules is mainly agricultural-based database management, updating, search and analysis, agricultural database BAT (management information system), agricultural ET (expert system) and agricultural NT (model), which is a database of experts and agricultural models system) (Figure 3).

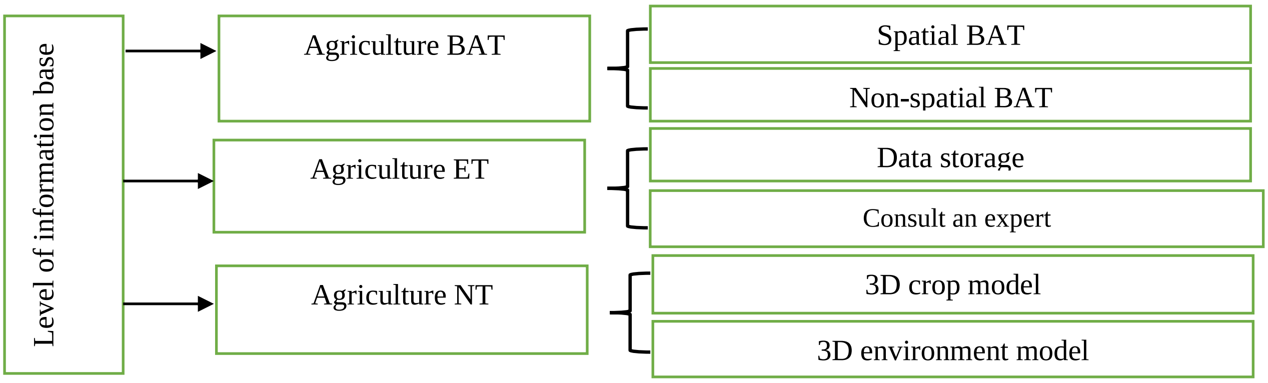

Figure 3. Level of functional modules

The BAT function in agriculture includes the management, updating, search, statistics, and production of basic attribute data of agriculture (product, biology, science, technology, economic data, etc.) and geographical data (environmental resources, agricultural status, etc.). generates data, etc.), as well as attribute data and spatial data management, retrieval, analysis, and generation functions.

Agricultural ET mainly involves the creation of a knowledge base, expert advice, knowledge search and production, and more. The knowledge base mainly stores and manages specialized knowledge on agriculture, which includes basic agricultural evidence (test samples), theoretical knowledge from the book, common sense, and concluding knowledge of agricultural experts. The quantity and quality of knowledge is a key factor in ET and affects the accuracy of user problem solving.

The level of the integrated application, which is based on the network platform and assumes the integration of various special modules of the digital system, is mainly a comprehensive BAT of agriculture, virtual agricultural system, agricultural decision support system (hereinafter - the decision support system - QQQT), automatic agricultural monitoring system and others. Agricultural QQQT refers to the use of QQQT in agriculture and can be considered as a computer-based system that allows the user to solve semi-structural processes using extensive data sets and analytical models.

One of the most important basic subsystems of digital agriculture is virtual agriculture. The rationale for virtual agriculture is the fact that it is possible to calculate the relationship between crops and the environment, and the agricultural system takes networks and computers as a platform to simulate the studied objects of each link in agriculture and their emergence. It also achieves the goals of interaction and visualization of the studied objects and the environment. In a broad sense, virtual agriculture includes virtual crops (Figure 3), virtual animals, production of virtual agricultural machinery, virtual farming, and more. This, in turn, will play an important role in determining the future of the network, as well as various experiences and calculations. To do this, of course, it is necessary to organize the architecture of the system of virtual crops of agricultural crops.

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