ARTIFICIAL INTELLIGENCE IN AGRICULTURE

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Abstract: *Now we can often hear about the use of artificial intelligence in many areas of human activity. Few people know that this technology is also being actively introduced into agriculture. There are many useful and unexpected solutions for automating many labor-intensive processes in this area.*

Keywords: *artificial intelligence, agriculture, AI-technologies, drones.*

Artificial intelligence (AI) - is a set of programs, models and methods that allow you to simulate a number of human skills, such as generating conclusions based on received information [1]. The capabilities of these programs are limited in terms of human creativity and creativity, but the fact that they have access to huge amounts of data and are able to process them in a matter of seconds, as well as the fact that they are not subject to emotional coloring of the input and output data, makes them undeniable useful when it is necessary to process information, analyze and perform many labor-intensive and dangerous tasks. At the same time, agriculture has always required huge expenditures of human and labor resources, so the need for the active implementation of various AI technologies to help employees of agricultural complexes in performing routine actions, mapping, forecasting and analysis is quite obvious [2]. Below are examples of AI development companies.

The Russian company Cognitive Pilot is already providing solutions for autonomous control of various agricultural equipment, such as combines, tractors, and sprayers [3]. The AI-based autonomous driving system Cognitive Agro Pilot with hydraulic steering analyzes images received from video cameras, determining the types and positions of objects, builds vehicle trajectories and transmits the necessary commands to perform maneuvers even in the absence of a satellite signal in “vision” mode [4] . Thus, it allows you to perform almost all basic operations offline: tillage, cultivation, sowing, spraying, etc., while automatically transmitting online progress reports to the owners of the equipment. The system’s algorithms optimize the trajectory and consumption of seed and processing materials, which leads to their savings, as well as to a reduction in fuel consumption, time and a reduction in the influence of weather factors [5].

Mapping uses various AI algorithms that analyze images, producing certain statistics and analytics. Processing satellite images of fields using AI makes it possible to determine how agricultural land is used, which is

necessary for a clear understanding of the areas that are in circulation and planning their processing. Analysis of photographs obtained from drones is used to compile field maps with data on the condition of crops, including the degree of pest or weed damage, aridity or swampiness of certain areas. Prompt receipt of such information allows timely measures to be taken to improve the condition of a specific crop area. In addition, systems such as AssistAgro from the Geomir company can even calculate the density or weediness of crops, types of weeds growing, and more, even in areas without the Internet. In the absence of a network collected by a drone, the data is simply processed immediately after its appearance [3; 7].

In addition to simple photo analysis, drones are also used for direct spraying of fields. In the case of irrigation, AI-powered drones can detect the condition of plants and, if necessary, spray water in certain areas, saving it and preventing excess water in other areas. In the case of spraying herbicides and pesticides, such drones can identify unfavorable areas of fields and spray these substances only on them, applying them where it is really needed, which leads to reduced costs for drugs, reduced risk of unintentional inhalation of vapors by employees, and improved quality of grown products and faster processing, due to covering large areas in less time compared to a person. In addition, there are platforms, such as Aeroservice Ural, that provide not only the opportunity to purchase or rent these devices, but also order services for processing liquid or bulk substances and compiling analytics [8].

Using existing experience in harvesting in areas with similar soil and climatic conditions, data on precipitation, attacks by parasites, as well as data collected using special sensors such as humidity, soil temperature, solar activity, etc., AI-based algorithms are able to make forecasts of the yield of a given area and generate recommendations for employees on the timing of sowing and methods of cultivating fields. One of the software solutions in this direction is “Agroanalytics” of the Russian company “SmartAgro”, which allows for the collection and processing of large amounts of data from equipment, predicting yields, cycles related to plants (flowering, growth, ripening, etc.) and influence fertilizing on the quality of finished products.

Modern technologies allow farmers to track all the information collected by various sensors and equipment. There are already chatbots with built-in AI that can, based on the data received, make recommendations to an employee or answer his questions, which can be difficult to find even on the Internet. Moreover, these issues may relate to both farming and trade. Such prompt acquisition of data helps a person monitor the operation of various equipment and control the production process, as well as quickly respond to various deviations from the norm. All this leads to easier farming and, consequently, to the emergence of opportunities to increase capacity, as well as improve the

quality and quantity of products in short periods of time, which has a positive effect on the profit of agricultural production and on the country's economy as a whole.

Thus, the use of AI technologies takes agriculture to a new level, making it possible to solve constant agricultural problems: pest and weed control, the inability to constantly monitor plants, yield planning, etc., facilitating the work of employees and taking production to a new level. Although the implementation of such systems faces many difficulties, with proper support at the government level, agricultural automation will help farmers and other employees in this field reduce losses by improving the productivity of agricultural land and the quality of various products, which helps to increase the fullness of the entire market and the well-being of citizens.

AI technology in agriculture is not just a catalyst for enhanced productivity and environmental stewardship; it also plays a crucial role in supporting small-scale farmers and fortifying local communities. The advent of AI technologies in agriculture heralds a new era where the disparities between large agribusinesses and local farmers are significantly narrowed. This shift is largely due to the democratization of advanced agricultural technologies, previously the exclusive domain of large-scale operators.

AI provides local farmers with access to a wealth of information and tools, enabling them to make more informed decisions about their farming practices. This includes insights into optimal planting times, soil health management, efficient water usage, and pest control strategies. By leveraging data-driven AI tools, these farmers can optimize their yields and resource utilization, leading to increased crop productivity and income. Such advancements are particularly transformative in regions where agriculture is a primary livelihood and economic driver.

Beyond individual gains, the impact of AI in empowering local farmers resonates through entire communities. As farmers become more efficient and productive, they not only improve their personal livelihoods but also contribute to the broader economic stability and growth of their communities. This collective upliftment can lead to improved standards of living, greater food security, and reduced poverty levels.

Furthermore, the spread of AI in agriculture fosters a more equitable agricultural landscape. Small farms equipped with AI tools can compete more effectively in the market, breaking the cycle of dependency on traditional farming methods and limited resources. This technology-driven empowerment facilitates a more balanced and fair agricultural economy, where success is not solely dictated by scale but also by smart, data-informed farming practices.

In conclusion, the integration of AI into agriculture is revolutionizing the sector. It is enabling smarter, more efficient farming practices that are vital for

meeting the challenges of the 21st century. As this technology continues to evolve, it holds the promise of transforming agriculture into a more productive, sustainable, and equitable industry. This shift, as highlighted in the Technically Speaking podcast, showcases the incredible potential of AI to positively impact farming and underscores the critical role technology plays in shaping the future of agriculture.

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