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# DIGITALIZATION AS A WAY TO ACTIVATE INNOVATIVE ACTIVITY IN AGRICULTURE

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**Abstract.** The relevance of the research topic is determined by the fact that at the present stage the tasks of modern agricultural production are the need to increase the volume of production of animal husbandry and crop production while maintaining quality. At the same time, this topic has a certain problem field, since the growth rate of product production in the industry under consideration today is impossible without the use of advanced technologies. In this context, the leading role belongs to the digitalization of Agriculture, since at the present stage it is possible to ensure the highly competitive work of agricultural enterprises only through high-tech approaches. The goals that smart agriculture seeks to achieve and respond to include not only the impact of climate, but also other environmental factors, as well as social and economic aspects related to the lives of farmers and rural communities around the world. Therefore, the concept of "smart" agriculture should be expanded to cover all these aspects. In the process of writing the work, comparative, analytical methods were used, with the help of which a number of publications and monographs of recent years were studied within the framework of the topic of this article. The results of the study should include the justification of the need for the implementation of a number of activities, including retraining and training of personnel, synchronization of existing production processes with innovative solutions, as well as the organization of the necessary funding for the implementation of these

activities. It was concluded that these measures will optimize the process of digitalization of the agro-industrial complex and increase the productivity of agricultural enterprises.

**Keywords:** digitalization, agriculture, innovative solutions, socio-economic consequences

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## ЦИФРЛАНДЫРУ АУЫЛ ШАРУАШЫЛЫҒЫНДАҒЫ ИННОВАЦИЯЛЫҚ ҚЫЗМЕТТІ ЖАНДАНДЫРУ ТӘСІЛІ РЕТІНДЕ

**Аннотация.** Зерттеу тақырыбының өзектілігі қазіргі кезеңде қазіргі ауылшаруашылық өндірісінің міндеттері сапаны сақтай отырып, мал шаруашылығы мен өсімдік шаруашылығы өнімдерін өндіру көлемін ұлғайту қажеттілігі болып табылатындығымен анықталады. Сонымен қатар, бұл тақырыптың белгілі бір проблемалық өрісі бар, өйткені қазіргі кезде қарастырылып отырған саладағы өнім өндірісінің өсу қарқыны озық технологияларды қолданбай мүмкін емес. Бұл тұрғыда жетекші рөл Ауыл шаруашылығын цифрландыруға тиесілі, өйткені қазіргі кезеңде ауылшаруашылық кәсіпорындарының жоғары бәсекеге қабілетті жұмысын қамтамасыз ету тек жоғары технологиялық тәсілдер арқылы мүмкін болады. "Ақылды ауыл шаруашылығы" қол жеткізуге тырысатын және оған жауап беретін мақсаттарға климаттың әсері ғана емес, сонымен қатар қоршаған ортаның басқа факторлары, сондай-ақ бүкіл әлемдегі фермерлер мен ауылдық қауымдастықтардың өміріне қатысты әлеуметтік және экономикалық аспектілер кіреді. Сондықтан" ақылды "ауыл шаруашылығы тұжырымдамасы осы аспектілердің барлығын қамту үшін кеңейтілуі керек. Жұмысты жазу барысында салыстырмалы, аналитикалық әдістер қолданылды, олардың көмегімен осы мақаланың тақырыбы аясында соңғы жылдардағы бірқатар жарияланымдар мен монографиялар зерттелді. Зерттеу нәтижелері персоналды қайта даярлау мен біліктілігін арттыруды, қолданыстағы өндірістік процестерді инновациялық шешімдермен үндестіруді, сондай-ақ осы іс-шараларды іске асыру үшін қажетті қаржыландыруды ұйымдастыруды қоса алғанда, бірқатар іс-шараларды жүзеге асыру қажеттілігінің негіздемесін қамтуы тиіс. Бұл шаралар агроөнеркәсіптік кешенді цифрландыру процесін оңтайландыруға және ауыл шаруашылығы кәсіпорындарының өнімділігін арттыруға мүмкіндік береді деген қорытындыға келді.

**Түйінді сөздер:** цифрландыру, ауыл шаруашылығы, инновациялық шешімдер, әлеуметтік-экономикалық салдарлар

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## ЦИФРОВИЗАЦИЯ КАК СПОСОБ АКТИВИЗАЦИИ ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

**Аннотация.** Актуальность темы исследования определяется тем, что на современном этапе задачами современного сельскохозяйственного производства

являются необходимость увеличения объемов производства продукции животноводства и растениеводства при сохранении качества. В то же время у этой темы есть определенное проблемное поле, поскольку темпы роста производства продукции в рассматриваемой отрасли сегодня невозможны без использования передовых технологий. В этом контексте ведущая роль принадлежит цифровизации сельского хозяйства, поскольку на современном этапе обеспечить высококонкурентную работу сельскохозяйственных предприятий возможно только за счет высокотехнологичных подходов. Цели, которых стремится достичь "умное сельское хозяйство" и на которые оно реагирует, включают в себя не только воздействие климата, но и другие факторы окружающей среды, а также социальные и экономические аспекты, связанные с жизнью фермеров и сельских общин по всему миру. Поэтому концепция "умного" сельского хозяйства должна быть расширена, чтобы охватить все эти аспекты. В процессе написания работы использовались сравнительные, аналитические методы, с помощью которых был изучен ряд публикаций и монографий последних лет в рамках темы данной статьи. Результаты исследования должны включать обоснование необходимости осуществления ряда мероприятий, включая переподготовку и повышение квалификации персонала, синхронизацию существующих производственных процессов с инновационными решениями, а также организацию необходимого финансирования для реализации этих мероприятий. Был сделан вывод, что эти меры позволят оптимизировать процесс цифровизации агропромышленного комплекса и повысить производительность сельскохозяйственных предприятий.

**Ключевые слова:** цифровизация, сельское хозяйство, инновационные решения, социально-экономические последствия

**Introduction**

Innovative technologies developed in various fields of science (nanotechnology, artificial intelligence, genetic modification, etc.) have opened up new and endless opportunities for several stakeholders who carry out their activities in different sectors of the economy. For agriculture, these new approaches are especially relevant and can give interesting results, given the specifics of the sector, which is often associated with abandoned lands and low incomes. However, the problem with these continuous evolutions is related to stability. In this context, the purpose of this study is to highlight the main conclusions from the available scientific literature on the links between new trends and sustainability in agriculture (Barrett et.al., 2020).

The literature on the digitalization of Agriculture and rural areas is extensive and at the same time sectoral. Both international political institutions and practices are interested in promoting digital technologies by highlighting and describing potential benefits and risks. In addition, scientists will analyze the real and potential impact of digital technology using a case study. However, extensive literature makes it difficult to comprehensively analyze the potential impact of digital technology on rural areas. In this context, this work aims to create a framework that provides the first classification of the effects of digital technologies for use in both research and political agendas(Nambisan et.al., 2017).

The agricultural sector is also constantly being improved to overcome the challenges associated with population growth. The overall goal of smart technologies is to increase efficiency and at the same time not harm natural resources. An example is the use of technology for more efficient use of water, which is an important parameter in agriculture. One of the areas in which smart agriculture contributes the most is the ability to grow many crops on certain agricultural land and monitor and control the infrastructure that best suits each crop.

Smart agriculture uses sensors, drones, artificial intelligence, robots and precision measuring devices in agriculture. Thus, it promotes the development of farms in the areas of control, control, detection, storage, cultivation, soil structure and pest control.

By installing imaging systems such as satellites and drones, the productivity of agricultural land is maximized. Visual technologies also make it easier to identify agricultural pests. Data collection through images of drones provides the best detection on Earth.

Sensors are also used in smart agriculture. Sensors measure the weather, soil temperature precisely on agricultural land, which ensures a more efficient process. Sensors also monitor the health of animals on livestock farms.

Intelligent technology benefits agriculture at all stages such as irrigation, fertilization, maintenance, processing and harvesting.

The main goal of smart agriculture is to reduce the use of chemical pesticides and fertilizers so as not to harm the environment.

In the future, using more robots and artificial intelligence in agriculture, precision farming methods will increase productivity and save time.

Smart farming methods help to develop and ensure effective organic farming.

The technology is used for recycling to solve environmental problems through smart agriculture (Salemink et.al., 2017).

**Research material and methods**

Digitalization, or the socio-technical process of using digital innovations, is becoming an increasingly common trend in all aspects of modern life. Agriculture also becomes digital agriculture, the definition of digital agriculture is" the use of digital technologies, innovation and data to transform business models and practices across the value chain in agriculture." New technologies such as artificial intelligence, robotics, big data, the Internet of things, gene editing and drones are used to solve problems related to food production. The emergence of digital technology in Food Systems provides farmers with many advantages. For example, soil data generated numerical maps that help farmers use agrochemicals in a targeted manner. In other applications, sensors were used to determine soil moisture at the level of plants and sites, apply fertilizers, weeds and diseases. Weather forecast data has helped farmers more accurately adjust production decisions. Satellite imagery provided many data on crop growth, improving the measurement of agricultural productivity. Finally, Big Data approaches were used to predict agricultural operations, make operational decisions in real time.

**Results and discussion**

Developed countries have invested heavily in digital agriculture. For example, the UK government's £ 4.7 billion" industrial strategic task fund " views artificial intelligence and data as one of four problem areas and has clear plans to focus on Real Farming. In 2019, Canada allocated US.50.3 million over five years to support its strategic priority plans in agriculture (CASPP), including digital agriculture. The EU also allocated about 100 million euros between 2018 and 2020 to finance the development and use of digital agriculture.According to UN forecasts, by 2050, the food system should feed more than 9 billion people around the world. In order to feed everyone without harming the entire ecosystem, urgent intervention is needed by changing the system of effective and sustainable food production. In addition, rural communities suffer from a series of problems (difficulty entering the market, aging of the population, depopulation, lack of public and medical services, etc.) that can negatively affect sustainable food production. In light of these concerns , the reports suggest that the digitization process can contribute to agriculture (e.g. by promoting more efficient use of resources) and rural communities (e.g. by identifying new and expanded services). In addition, it claims that digitalization can contribute to the

achievement of the UN Sustainable Development Goals (SDGs) in rural areas, 17 interrelated goals, such as "eradicating poverty", "zero hunger" and "combating climate change". Despite the positive picture, some scholars suggest that in order to promote digital transformation, international institutions and politicians underestimate the social complexity and possible negative consequences of these technologies. Lajua-O'malley et al. Note that how digital technology can change the socio-economic context depends on expectations, perceptions and perceptions about the role these tools play for social actors, in particular, according to the main international agencies (e.g. FAO, World Bank). The dominant narrative of these organizations seems to support the status quo of global industrial agri-food systems. According to academics, international agencies offer a neo-Malthusian interpretation of agricultural problems and technological optimism as a solution. In short, there is a discrepancy between population growth and the availability of food, which, it is believed, can be resolved through technological innovation, which optimistically leads to social, political and even moral progress and environmental protection, not just technical (Khrustek et.al., 2020).

Countries that have achieved a high level of general technological development in the leading sectors of the economy have similar indicators in the field of Agriculture.

*Table 1.* Global leaders in technology industries

| Industry | Ratings of the leading countries | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Agriculture | USA | China | India | Brazil | Japan |

Digitalization of the agro-industrial complex will help increase competitiveness and labor productivity, ensure food security and attract investment in the industry.

IoT in smart agriculture.

The ITU (International Telecommunication Union) defined the Internet of things as "a technology that basically solves the relationship between a person and a thing, a thing in a person." The Internet of things is a revolutionary technology that marks the future of computing and information exchange. it is based on the connection between intelligent sensors, RFID. The main goal of IoT is to create a large network through a combination of various sensor devices such as GPS, RS, RFID, laser scanner and networks to understand the exchange of information about global things.

There are several ways to implement "smart agriculture" using the Internet of things in IoT agriculture.

1. Precision Farming
2. Agricultural drones
3. Animal monitoring
4. Smart greenhouses

1. Precision Farming

Precision farming is the most popular application of smart farming using the Internet of things. Precision farming is the practice of increasing the accuracy and control of agricultural processes for animal husbandry and crop production. The main components of precision farming are, among other things, ot-systems, sensors, control systems, automated equipment and autonomous vehicles. IoT comes up with the idea of connecting these systems and devices over the Internet for better data storage and analysis. The Internet of things improves services such as livestock monitoring, soil moisture sensors, stock monitoring and vehicle tracking. Precision farming involves data collection through sensors and analysis for farmers to use to make informed and fast decisions.

Precision farming refers to a set of technologies that reduce production costs by providing the farm operator with detailed spatial information that can be used to optimize field

management methods. The introduction of precision farming technologies has so far been limited mainly to a part of developed countries.

In developing countries, the use of Real Farming is limited. In Malaysia, special fertilizers are used for certain plots on rubber plantations. In India, technology has been adopted precisely related to agriculture, including drip and sprinkler irrigation, which, although they account for only a small part of the irrigated areas in India, are steadily developing.

2.Agricultural drones. Drones are used to improve several farming methods in smart agriculture using the Internet of things. There are two types of agricultural drones: surface and air. Drones are used for activities such as assessing crop conditions, spraying crops, sowing, analyzing soil and arable land, monitoring crops, and irrigation(Gupta et.al., 2020).

Drones can collect multispectral, thermal, and visual image data that provides farmers with a wide range of indicators, such as Plant Health, number of plants and expected productivity, nitrogen and humidity in the soil, drainage mapping, and vegetation mapping. The data will help the farmer make the right decision and use only the necessary resources to avoid losses.

Air drones cover more territory than a ground observer at the same time with the ability to avoid obstacles. Automation of drones to conduct daily assessments eliminates the need for human control. Drones are deployed to cover large areas of land that require constant monitoring. In addition, drones are very useful in situations where it is difficult to control bacteria, fungi or pests and requires constant spraying and monitoring.

3. Animal monitoring

Animal control was also "smart" in intelligent agriculture using the Internet of things . This will allow farmers to monitor the condition of their animals. The farmer can monitor the animals ' movements, eating habits, weight and reproductive cycle, among others.

IoT solutions for livestock monitoring include wearable animal devices that connect to the gateway using low-cost, low-bandwidth (LoRaWAN) technology to transfer data to the cloud. Wearable devices have sensors that monitor aspects such as blood pressure, breathing, heart rate, body temperature and digestion. The data is used to make decisions and monitor health. Farmers can take corrective action in time. For example, they can identify a sick animal and call a veterinarian in time to prevent death or disease from spreading to other animals. The reproductive cycle and calving are monitored by collecting data regarding estrus time and delivery time.

Controlling animals in groups is difficult even for the best shepherds. Precision animal husbandry involves the automatic remote detection and monitoring of detected ososbeys to the health and well-being of animals using images, sounds, monitoring data, body weight and condition, and analysis of real-time biological indicators.

To better understand how modern technologies affect the world of precision animal husbandry, it is necessary to have a general idea of remote monitoring sensors, the process of developing algorithms and training machines. Remote sensors such as cameras, microphones, thermometers and accelerometers monitor or capture information such as images, sound, heat or movement from groups or individual animals(Zhao et.al., 2019).

An example of an IoT device for monitoring livestock is the Cattle Traxx . This device has battery-powered and solar-powered sensors that transfer data over LoRaWAN (low-power global network). The sensors in the cow form a Mesh Mesh that ensures efficient data collection. Cattle Traxx collects animal health data through sensors and location information through geo-enclosures.

4. Smart greenhouses

Traditional greenhouses relied on manual intervention to control environmental parameters for crop growth. However, manual intervention has its drawbacks, such as loss of energy and loss of performance. Smart greenhouse solves these problems with IoT systems by monitoring and monitoring aspects such as temperature, light, soil and minerals, and humidity. Using the collected data, it is possible to maintain optimal plant growth conditions to ensure maximum yield. The discs are automatically controlled to monitor situations by performing actions such as opening a window, turning on the lights, and controlling the heater and fan.

Smart greenhouses help reduce costs in intelligent agriculture with IOT. By controlling the humidity, the correct amount of water can be used for irrigation and this prevents losses, which also applies to the mineral content in the soil, since the correct minerals are used in the correct amount. This reduces costs and maintains a favorable balance for crop growth.

There are a number of advantages to using the Internet of things in agriculture. The use of IoT leads to an increase in crop and livestock production by creating the right environment, monitoring and controlling various aspects. Secondly, IoT helps to reduce the cost of production, especially in large-scale agriculture. IoT devices reduce the need for human intervention , thereby reducing the number of employees on the farm. In addition, the IoT application reduces resource loss.such as water, fertilizer and machine spare parts. They ensure that only the required amount of water and minerals is added to the soil. Sensors on vehicles and agricultural machines only help with preventive maintenance to ensure timely repair and replacement of defective parts. Finally , the use of the Internet of things increases the overall efficiency of the firm by providing data that allows each process to be performed optimally.

In accordance with the resolution of the Government of the Republic of Kazakhstan dated December 12, 2017 № 827 on approval of the state program "Digital Kazakhstan" in 2018–2022, budget funds in the amount of 108,683,142 thousand tenge*1 will be allocated for the implementation of the program, including: in 2018–20,103,128 thousand tenge* in 2019–15,791,384 thousand tenge* in 2020–32,691,920 thousand tenge* in 2021–20,923 618 thousand tenge. tenge* 2022–19,173,092 thousand tenge*, as well as funds received from other sources of financing not prohibited by the legislation of the Republic of Kazakhstan.States are taking various measures to increase the coverage of the population with the internet. Particular attention is paid to rural areas, where it is more difficult to provide the necessary infrastructure. According to the results of 2022, the internet coverage of urban residents in the world increased from 78 % to 82 %, and the internet coverage of rural residents increased from 42% to 46 %. The gap between rural residents and urban residents in providing access to the World Wide Web remains very clear.

In the regional context, Europe has the smallest gap: 91 % in urban areas and 83 % in rural areas. In general, the internet coverage of rural residents in the CIS countries by macroregions is 74 % — 6, in America — 68 %, in the Arab world — 56 %. made up.

In Kazakhstan, the provision of rural residents with the internet has been taken under special control and is one of the main tasks of the development of the Republic. It should be recalled that more than 7.5 million people or 38.2 % of the total population live in rural areas of the Republic of Kazakhstan.

The situation in Kazakhstan is much better not only in the Middle world, but also in comparison with the EAEU countries, as well as with many developed countries. For example, in Armenia, the penetration of the internet into the village is 90 %, in Belarus — 79 %, in Russia — 78 %. In some developed countries, the share of rural internet users is as follows: in Switzerland — 95 %, in Japan — 87 %, in Italy — 74 %, in Canada — 77 %, in Belgium — 93 %, in France — 85 %.

The need to create conditions for large-scale digitalization of the agro-industrial complex as a whole sets two big tasks for the Ministry of Agriculture of the country:

– Digitalization of the state regulation system of the agro-industrial complex;

– Technological re-equipment of the production sector.

Digitalization will become a key tool for the development of four areas of state regulation of the agro-industrial complex: availability of financing for agribusiness entities; availability of sales markets and Export Development; Effectiveness of state control and supervision; effective management of water and Bioresources.

These areas will cover 101 automation of public services and relevant processes in the field of agribusiness.

Kazakhstan's Internet of Things (IoT) market is to some extent the successor to M2M technological solutions, which have been actively developing in the country for more than a decade. IoT is a set of vertically integrated industry solutions that include not only data transmission between active elements of the inter-machine network, but also sensors, platforms for processing data from them, software and executive devices. As part of the IoT study of the Kazakhstan market, a PEST analysis of the market was carried out to assess the qualitative factors of market development, the results of which are presented in the table below in Table 2.

*Table 2.* Internet of Things of Kazakhstan

| Factors | Value | Effect |
|---|---|---|
| POLITICAL FACTORS | | |
| Legislation in the field of IoT is actively developing-since 2017, new standards for the implementation of IoT solutions in various sectors of the economy have been introduced | average | positive |
| The Government of Kazakhstan actively promotes the introduction of IoT projects in the field of economics through the development and financing of programs for the development of the segment (financing of IoT projects from the unified state fund, the Digital Kazakhstan program | high | positive |
| INFLUENCE OF THE ECONOMY | | |
| The growth of the country's gross domestic product as a whole has a positive impact on investments in new projects in the field of Information Technology . | average | positive |
| In the energy sector of Kazakhstan, the problem of reducing electricity costs is acute. The need to optimize the work of the energy sector segments leads to more active support for IoT projects in this segment, both by the state and by companies. | average | positive |
| SOCIAL FACTORS | | |
| Low cost of mobile communication services of the Republic of Kazakhstan. | low | positive |
| Consumption of mobile and fixed services is growing. Broadband and mobile communications increase penetration outside of large cities. | average | positive |
| On the part of information technology users, there is one-sided concern about the possibility of replacing large information technologies with Workforce Solutions. | low | positive |
| TECHNOLOGICAL INNOVATIONS | | |
| The availability of Larawan technology and the relatively low cost of network deployment in this technology contribute to the active development of IoT projects in the cities of Kyrgyzstan, especially in the "Smart" City and "Smart" Housing and communal services. | high | positive |

Source: Json & Partners Consulting

The results of the analysis show that the Republic of Kazakhstan has developed a positive climate for the development of the "Internet of things" market, it is especially worth noting the efforts of the state to develop the industry (J'son et al., 2020).

So far, the indirect development of the IoT industry is primarily facilitated by state programs to eliminate "digital inequality" and programs of development in the field of construction, Policy and basic principles of industrial development in the Republic, including the Nurly zher program and mortgage lending programs 7–20–25.

The total share of the three most widely represented market segments will decrease in relative terms due to the outpacing growth of other segments, such as the supply of energy resources to enterprises and organizations, as well as due to the introduction of automated accounting systems for the supply of energy resources and the introduction of Smart Grid technologies, "smart" agriculture and industrial "Internet of Things".

Despite the negative consequences for the market in 2020 caused by the coronavirus pandemic, the Internet of Things market in Kazakhstan will continue its dynamic growth in 2021, maintaining growth rates of at least 25% per year. The structure of the market will change in favor of a more even distribution of business between the rest of the market segments.

**Conclusion**

Today, the share of agricultural producers using digital technologies in the Kazakh agro-industrial complex is negligible. This negatively affects the development of the industry in the country and reduces the marginality of agribusiness.

The policy vector of the Ministry of Agriculture of the Republic of Kazakhstan is aimed at digitalizing the entire cycle of interaction between subjects of the agricultural sector market and the state. Kazakhstan strives to create a single architecture of digitalization of the activities of the agricultural sector. One of the first steps taken by the state of Kazakhstan to digitalize Agriculture was the work on the formation of a global map of fields.

In order to stimulate the development of all sectors of the agro-industrial sector of Kazakhstan, it is necessary to form a digital platform that will unite administrative departments at all levels to automate the monitoring of agricultural land and monitor the quality and safety of agricultural products. These measures will be a significant incentive for the development of digitalization of Agriculture.

The introduction of digitalization technologies can have the following economic effects:

– reduction of the trade allowance for food products in the field of wholesale and retail trade by 2–3 times while maintaining the quality of products;

– More than double increase in the volume of consumption of products in Kazakhstan at the current level of income of the population in kind;

– significantly increase labor productivity in the agro-industrial sector, reduce the cost of manufactured products and increase the marginality of agribusiness.

As a rule, in economically developed states, the agricultural sector, on which the level of the country's well-being largely depends, is also strong.

The spread of digitalization technologies in the agricultural sector of Kazakhstan will contribute to increasing labor productivity, increase the contribution of the agricultural sector to the growth of the country's GDP and become an accelerator for the export of agricultural products to world markets.

So, after learning about some IoT applications in agriculture, we can say that they will revolutionize the agricultural sector in a few years. IoT is used in several areas of Agriculture. Currently, a lot of research is being done to facilitate the management of farms and ensure the use of more IoT devices to increase productivity. The Internet of things allows farmers to easily obtain useful data in many ways, such as decision-making. Due to the

growing demand for food due to rapid population growth, we expect more IoT applications in the next few years.

Smart agriculture and IoT-based agriculture laid the foundation for the "third Green Revolution", which meant the combined use of information and communication technologies. This includes precision equipment, sensors and devices such as IoT drives, geoposition systems, UAVs ( UAVs ) and robots.

IoT technology helps to better monitor agricultural processes, reduces production risks and expands the possibilities of predicting production results, which helps farmers better plan and distribute products. For example, data on specific batches of crops and crop sizes can help farmers reduce labor and waste.

At the same time, in a number of sectors, including agriculture, service providers, and mobile operators, they are upgrading their network infrastructure by bringing network resources to the edge and combining large distances through technologies such as small cells and Massive MIMO to prepare for 5G deployment .

Experts from the largest IT company IBM believe that the use of IoT will allow farmers to increase production volumes by 70 % by the end of 2050. In any case, IoT in terms of simplifying the daily tasks faced by farmers: regular maintenance of equipment, assessment of water requirements, assessment of the correct planting time, measurement of soil temperature and humidity, pest control, etc.. can offer a lot.

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