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MODERN TECHNOLOGIES THAT CAN BE USED THE ESTABLISHMENT OF SMART LIVESTOCK SYSTEMS

СОВРЕМЕННЫЕ ТЕХНОЛОГИИ, КОТОРЫЕ МОЖНО ИСПОЛЬЗОВАТЬ ПРИ СОЗДАНИИ УМНЫХ СИСТЕМ ЖИВОТНОВОДСТВА

Abstract

This article discusses the need, importance and stages of implementing a smart farm in our country. This article gives information about government support to smart farms (meat and dairy processing farms, livestock processing businesses). In this case, it is recommended to determine the value of financial incentives for entities involved in the system of financial support of the livestock sector. In addition, modern technologies that can be used in the "Smart Farm" and organizational and economic stages of the organization of a Smart Farm are analyzed in the paper.

Keywords: livestock, smart farm, digital technologies, internet, modern technologies.

Experts predict that by 2050, the world's population would have surpassed 9.6 billion people, possibly requiring 70% more food than is currently needed for food

protection. However, due to the degradation of the ecosystem, the increase in energy carriers, and the danger of decreasing soil productivity of agricultural lands, there are significant obstacles to food production (due to misuse and water scarcity).

Today, as a consequence of bio and non-technology research and development, Internet, GPS, and VRT systems, agricultural organization on the basis of new methods, modern tools, and innovative developments, in short, the sustainable development of the agricultural sector in a high-tech intelligent agricultural system security measures are being implemented.

Smart agriculture is a concept that foresees agricultural producers using innovative digital technologies to organize cost-effective activities, increase profitability, minimize the impact of influencing factors, and use resources and time wisely[1].

Smart agriculture encompasses smart farming, smart field, smart garden, smart greenhouse, smart farm (animal husbandry), smart territory, and smart land use, all of which can function independently while also complementing each other. Through smart agriculture, agricultural producers will be able to accurately select the time and amount of resource use through monitoring and evaluation of changes in crop area. Farmers in the livestock sector can better control the biological condition, needs, diet, and physiological condition of specific livestock with the help of intelligent animal husbandry technology, resulting in high productivity.

According to FAO experts, the extensive period of agricultural development in all countries around the world has passed, and the transition to a "smart" period of development is now in demand. As the world's population grows, so does the demand for modern agricultural technologies[2].

According to Future Market Insights' calculations, the global market value for the introduction of smart agriculture in the world in 2016 was estimated to be around 13 billion US dollars, and by 2026, this figure is expected to reach 40

[1]Uzbekistan will switch to "smart agriculture. https://www.spot.uz/ru/2017/12/11/smartagriculture/

[2]V.Rakhmanin - speeches at the session of the St. Petersburg International Economic Forum. http://radrf.ru/index.php/nashi-publikatsii/9-novosti/627-fao-prizvala-pereklyuchatsya-na-umnoe-selskoe-khozyajstvo.

billion US dollars. The average growth rate of the industry is expected to be about 11.2 percent in the coming years[3].

However, this is implemented mainly in developed countries such as the United States, the European Union, Israel and China. The agricultural economy in a large portion of the least developed and developing countries is focused on traditional technologies, and the implementation of new technologies is relatively slow.

Despite the availability of material, technological, and intellectual resources for the long-term growth of the livestock sector in our country, the factors of extensive development are becoming more important. This has led to high resource consumption, low labor productivity and low livestock productivity. Unsatisfactory economic efficiency in the sector, a lack of financial resources, and non-compliance with the construction of appropriate infrastructure all stymie the mobilization of livestock farms' economic potential and the adoption of modern technologies.

In this regard, President of the Republic of Uzbekistan Sh. Mirziyoyev emphasized the importance of "developing a national concept of digital economy," which provides for the use of digital technology to modernize all sectors of the economy[4].

Decree of the President of the Republic of Uzbekistan dated November 29, 2017 PD-5264 "On the establishment of the Ministry of Innovative Development of the Republic of Uzbekistan" to make proposals on the introduction of modern forms of agricultural production based on the concept of "smart agriculture", which will allow the rational use of land, water and other natural resources in the country, maximize automation of agricultural production in the agricultural sector, significantly increase productivity and improve financial performance, as well as the task of promoting the introduction of innovative technologies that will ensure

[3]A. Ivanov. Agriculture in a smart way. https://iot.ru/selskoe-khozyaystvo/selskoe-khozyaystvo-po-umnomu.
[4]Address of the President of the Republic of Uzbekistan Shavkat Mirziyoyev to the Oliy Majlis of December 28, 2018. https://kun.uz/uz/news/2018/12/28

food security of the country[5].

At the same time, the Ministry of Agriculture and other related agencies and ministries are subject to the President of the Republic of Uzbekistan's Decree[6] PD-5708 "On steps to strengthen the structure of public administration in agriculture" dated April 17, 2019. The mission is to make proposals for projects and funding sources in the field of agricultural digitalization, based on the principle of "smart agriculture."

The need to create a smart farm in the country on the basis of meat and dairy farms can be explained as follows, taking into account the implementation of the above regulations and other conditions. Including:

- low labor productivity due to high manual labor in the livestock sector;

- the ineffectiveness of the prospect of increasing the economic efficiency of production based on traditional methods of management;

- the growing need for new resource-saving advanced technology to be introduced and improved in livestock farms;

- insufficient assessment of the impact of various environmental, bio-physiological, and organizational factors on technological processes that affect production efficiency;

- inadequate ability to ensure that conventional methods are compatible with the quality of dairy and meat products, as well as the quality of animal feed rations;

- the possibility of early detection of animal diseases with the help of modern remote-controlled technological equipment and their use is becoming a necessity;

- the need for daily automated management of livestock storage conditions (possibility of automatic monitoring of the necessary microclimate in storage facilities) in order to maximize the efficient use of livestock genetic potential;

The possibility of introducing digital technologies in the livestock sector is becoming a necessity in connection with the invention of the following technological systems (Figure 1).

[5]Decree of the president of the republic of uzbekistan dated 29.11.2017 PD-5264 "on the establishment of the ministry of innovative development of the republic of uzbekistan", http://lex.uz/docs/3431985

[6]Decree of the president of the republic of uzbekistan dated april 17, 2019 PD-5708 "on measures to improve the system of public administration in agriculture", http://lex.uz/docs/3431985

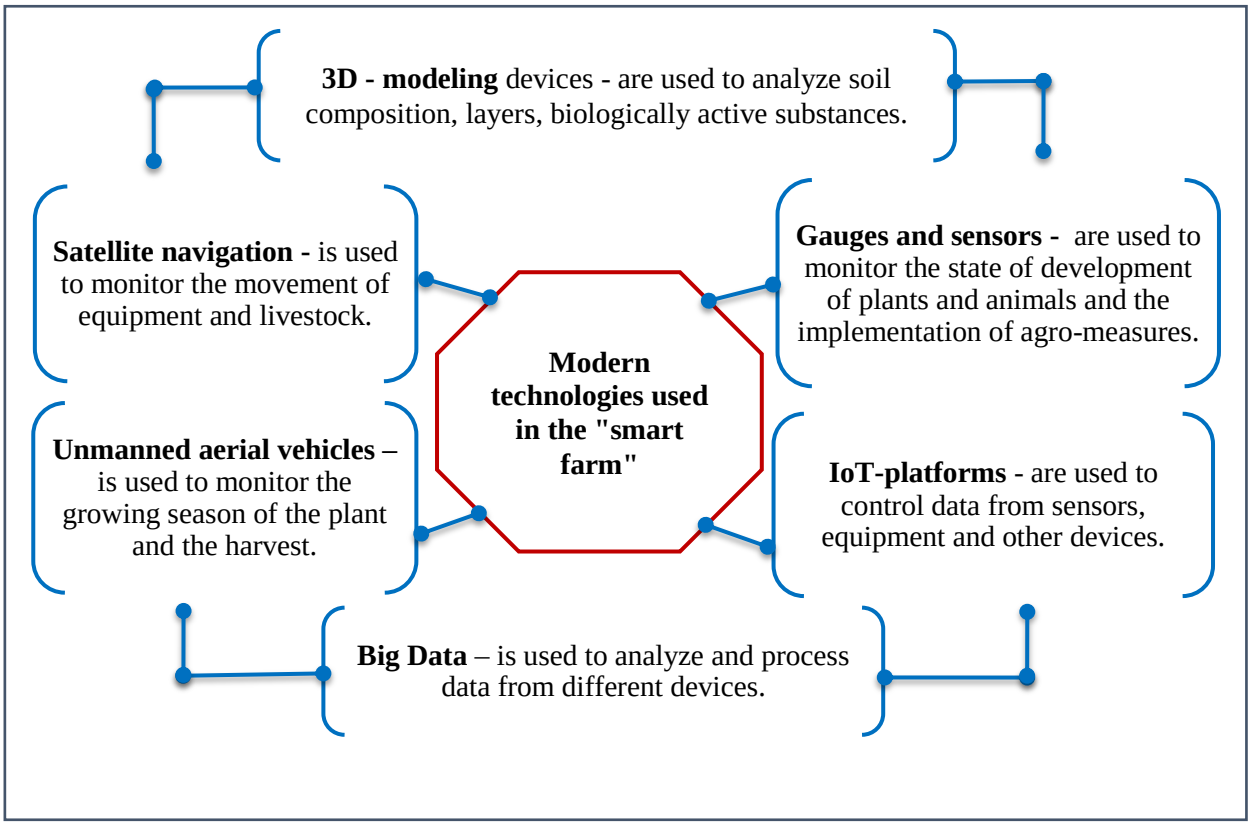

Figure 1. Modern technologies that can be used in the "smart farm"[7]

- 3D-modeling devices - these are used in the analysis and control of soil composition, layers, biologically active substances of arable lands where fodder is grown for livestock;

- satellite navigation - used in the cultivation of feed, machinery for transporting feed and livestock, dairy and meat products, and monitoring the movement of livestock on pastures;

- unmanned aerial vehicles - used for remote monitoring of vegetation, yield and harvesting of fodder crops;

- gauges and sensors - used to monitor the development of plants and animals, physiological and genetic changes, the composition and quality of dairy and meat products, the composition of feed mixtures and the implementation of agricultural measures;

- IoT-platforms - used to control data from digital sensors, equipment and other devices;

[7]Made by based on the authors' research.

- Big Data - used to analyze data from various remote devices, develop short (seasonal), medium and long-term forecasts for business development, make management decisions and monitor.

Given the above, it is necessary to encourage the establishment of smart farms in the country. At the same time, smart livestock farms are the subjects of automated livestock production, most of which require a small amount of human intervention (operator, breeder, veterinarian, etc.)[8].

Such a farm will rely on digital technology (artificial intelligence, Internet networks, data, and related standards) to ensure production cost-effectiveness, customer activity, and the product's negative impact on human health, among other economic indicators.

As part of the "smart farm" - a system of sensors to identify the physiological state of livestock, which allows you to monitor the number of cattle and automate the process of electronic assessment. Furthermore, the use of sensors and software for assessing and treating livestock's physiological conditions through movement and nutrition allows for automated monitoring of milk quality (protein, fat, dry matter, and so on) in milking equipment.

The automated management of feed planning, herd breeding and veterinary services, milking, animal feeding, microclimate management in barns, and boxes within the automated management framework of "Smart Farm" provides automated workplaces of leading specialists (veterinarians, zootechnicians, and engineers) is coordinated in order to control production on the basis of a digital system.

According to research, feeds prepared using automated biocatalytic technology for enzymatic feed preparation increase feed digestibility by 1.5-2 times as compared to conventional technology, and automated milking modules that track livestock condition increase the incidence of mastitis in cows by 25-30%. Increase the time of economic use of cows up to 4-5 lactation periods by reducing and separating irregular milk in the stream.

[8]“Smart technologies in the agriculture” of the Republic of Uzbekistan Concept Project https://regulation2018.gov.uz/oz/document/3085

However, taking into account the country's agricultural sector's growth patterns and industrial and technological capabilities, the following factors restrict the establishment of smart farms:

Organizational and legal constraints: - the fact that small and large farms produce a substantial portion of meat and milk restricts the need for smart technology and real consumer demand. Individual elements of digital technology, on the other hand, can be used on farms.

- lack of rules for the use of smart technologies in animal husbandry and legal requirements for its harmonization with the legislation;

- the mechanism of operation of the "smart farm" is mainly connected to the Internet, the speed of the Internet in areas where livestock farms are located in the conditions of remote radio communication is lower than international standards;

- the complexity and narrow scope of regulatory documents related to the use of unmanned aerial vehicles and geographic information systems (allowed only for certain areas);

- lack of a system of training specialists for modern areas such as digital economy, smart agriculture, digital technologies in agriculture, insufficient system of their teaching methods and internships;

- a lack of trained personnel operation in the agricultural sector, particularly in the livestock sector (working conditions, distance, wages), because the range of local and foreign HEIs training specialists in IT technologies is not focused on narrow and subsystem orders;

- lack of organizational framework for quality higher education in accordance with the basic approach to the "smart farm", i.e., STEM (Science, Technology, Engineering, Mathematics);

- the necessary equipment and technology for a "smart farm" are entirely reliant on imports, and the necessary infrastructure (scientific institutions, factories, and IT parks) to localize them does not exist.

- the lack of financial resources for the import of devices with high technical and technological capabilities in most livestock farms is a socio-economic limiting factor.

- "Smart farms" necessitate the simultaneous efforts of many experts. The inability of small farms to have adequate working conditions and pay for highly skilled professionals such as zootechnicians, veterinarians, programmers, analysts, and engineers;

- lack of mechanisms for economic incentives for activities related to the creation, production and use of high-performance equipment and technologies for livestock farms;

- the involvement, support, and cooperation of social institutions in the organization and management of the "smart farm" are insufficient, due to a lack of culture associated with the use of smart technologies and the knowledge obtained via them.

Given the foregoing, one of the most pressing tasks facing the livestock sector today is to create "smart farms," develop and enforce financial and economic incentives, and ensure the development of world-class quality meat and milk.

The activities of smart farms, it was noted, necessitate the training of specialists in a variety of fields. These professionals are currently trained in various departmental systems and are not organized. There is a need to organize the activities of their planning and study in this sense.

A smart farm will completely manifest itself as part of the modernization of the livestock network if all systems operate efficiently at the same time. A breakdown of the system would result from a violation of the mixed feed supply needed for a complete ration, or a failure of the power supply or skilled personnel supply to operate the technical equipment that regulates the milk content.

Considering the above, the following logical sequence of steps should be followed when establishing a "smart farm" (Figure 2).

First of all, the stages of establishing a "smart farm" should begin with training and retraining. The reason is that the "smart farm" can import technical

and technological equipment, but it will also have to import the appropriate service system. Issues of retraining (internships abroad) on the farm can negatively affect the competitiveness of the product.

And for that, universities dedicated to the training and retraining of trained specialists for the smart farm must open the required areas, open them, and equip them with professional and technological equipment. Simultaneously, particular attention must be paid to the provision of high-quality higher education in line with the new STEM (Science, Technology, Engineering, and Mathematics) approach. Furthermore, frameworks for in-depth analysis of world experience through distance learning and experience sharing in an online system must be created.

The import of technical and technological innovations, as well as attention to their localization, is needed in the second stage. The need for this stage can be explained by the risk of "enclave entrepreneurship" emerging, as well as the emergence of scientific and technological dependency as a result of the importation of equipment and technology needed for a "smart farm."

It is expedient to finance research in this area, encourage authors, expand government grants, encourage the commercialization of research results at "zero value".

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