2020 4th International Seminar on Education Innovation and Economic Management (SEIEM 2020)

Application and Development of Artificial Intelligence and Big Data Technology in Agriculture

Xin Yang*
Business School
Nanfang College of Sun Yat-sen University
Guangzhou, China

Huiyin Zheng
School of Economics
Guangzhou College of Commerce
Guangzhou, China

Xiajun Yi
Department of Finance and Economics
Guangzhou Vocational and Technical University of Science and Technology
Guangzhou, China

***Abstract*—China's agriculture plays an important role in the development of the overall economy. With the continuous development and maturity of advanced technologies, artificial intelligence and big data have been introduced into the agricultural industry, which has brought great changes in China's agricultural development. Based on the development characteristics of agricultural science and technology, this article studied the application of artificial intelligence and big data technology in agriculture and then drafted the shortcomings of the current application of advanced technologies in agriculture. Finally, it is concluded that, with the development path of China's future agricultural economy, artificial intelligence and big data is merged.**

Keywords—artificial intelligence, big data, agricultural development

I. INTRODUCTION

China is a big agricultural country. This is an indisputable fact. With the continuous development of China's science and technology, the application of artificial intelligence (AI) and big data technology has upgraded the development of agriculture. For now, the application of AI and big data technologies in agriculture is a new attempt, providing both an opportunity and a challenge, which can improve the efficiency of China's agricultural production.

II. CHARACTERISTICS OF THE DEVELOPMENT OF AGRICULTURAL SCIENCE AND TECHNOLOGY IN CHINA

So far, there are mainly three characteristics of the development of agricultural science and technology in China:

A. China's agriculture is widely distributed with distinguishable geographical features

Agricultural scientific and technological achievements and applications show regional characteristics. China is at the forefront of the world in terms of geographical location, natural environment, and scientific and technological level. However, the crops and farming patterns between regions are very different, and the natural laws of agricultural production are also different. As for the application of agricultural technology, the situation is also quite different and regional. According to relevant statistics, China's agricultural technology industry has reached 600 billion yuan, ranging from greenhouse cultivation and animal husbandry to aquaculture. Currently, the application of agricultural technology in China is concentrated mainly in Guangdong, Jiangsu and Sichuan. It is expected that the application of agricultural technology in China will continue to rise in the future[1].

B. The purpose of China's agricultural science and technology is to meet the basic needs of the industry

Agriculture belongs to the primary economic sector. Since the 21st century, the importance of agriculture has been emphasized. Various policies have been issued to support the development of agriculture. Due to the long construction and production cycle of agriculture, and is easily affected by external factors, the use of agricultural technology can meet the needs of the production aspect. At the same time, because of the large investment in the integration and development of agricultural technology, it is mainly a government-led model. In recent years, with the continuous integration and development of agricultural science and technology in China, many Internet technology companies have entered the agricultural industry, such as JD.com and DJI. To ensure the social and economic benefits of agriculture, the use of agricultural technology in China exhibits fundamental and service-oriented characteristics[2].

C. National policies continue to promote the development of agricultural science and technology

Since 2012, China has continuously promulgated relevant policies to support the development of agricultural science and technology. Among them, in December 2019, the Central

Copyright © (2020) Francis Academic Press, UK DOI: 10.25236/seiem.2020.033

Government Document No. 1 officially issued the "Several Opinions on Adhering to the Priority of Agriculture and Rural Development and Doing Well the Work on Agriculture, Countryside, and Farmers", which proposed speeding up and breaking through key agricultural technologies and promoting indigenous innovation in the field of smart agriculture. Under the background of supply-side structural reforms and policy support, China's agricultural technology investment has continued to increase. As of December 2019, the market volume of China's smart agriculture has reached USD 23.1 billion. The combination of refined production and the Internet of Things technology has huge market demand prospects.

III. Application of AI and Big Data Technology in China's Agricultural Industry

With the continuous development of advanced technologies in China, integration with China's agricultural industry has become a major trend[3]. Since ancient times, China has been a large agricultural country with a large population and a great demand for crops. Therefore, agriculture is very important to China. The country also attaches great importance to the use of technology in agricultural development. Since 2015, the investment scale in China's agricultural technology has reached 500 billion yuan. At present, big data platforms, sophisticated breeding, drone technology, and 5G technologies are all maturing, and are gradually being applied to the agricultural industry. In some areas, agricultural production automation, artificial intelligence, and remote control have been achieved to improve the management efficiency of agriculture, to enhance the added value of agricultural products, and to accelerate the integration of agricultural science and technology, artificial intelligence, and big data. The main applications of artificial intelligence and big data in China's agriculture are as follows:

A. Application of artificial intelligence in aquaculture.

Artificial intelligence can improve the data collection and information processing capabilities in the breeding process, and provides the basis for animal husbandry informatization. Taking Alibaba as an example, the company uses pig farming as the starting point for developing agricultural technology and endorsed the application of artificial intelligence. Artificial pig farming means that there are no workers on the pig farm. Feeding machines, pigsty cleaning machines, and pig disease diagnosis machines have replaced human resources. The pig farm will be equipped with a pig face recognition system. Data of every pig will be collected, such as gender, weight, and time of birth. A code will be produced. Any subsequent changes of the pig will be detected and recorded in this code. It is truly and fully traceable. For farmers, the diagnosis of hog disease is one of the most difficult areas. Using artificial intelligence technology to detect herds, the computer monitors the food intake of each pig to determine whether it is in an ill state, then issues a reminder for human intervention. Also, the computer can judge whether the herd is abnormal through the body temperature and the sound of the cough, and give a preliminary diagnosis of the disease based on the stored database, and then notify the breeder to give accurate treatment. Therefore, the introduction of AI technology can improve the breeding environment and the feeding management, and thus promote the healthy and sustainable development of the breeding industry.

B. Agriculture uses big data service platforms to achieve the integration of production to sales

In recent years, the research and application of agricultural big data in China have changed the traditional agricultural model[4]. The big data sharing platform involves various links such as cultivated land area, planting, storage, transportation and production, and has included the management from production to sales. Satellite data, drones, and other means can be used to collect crop data and upload the data to the agricultural big data platform, penetrating all aspects of agricultural production and operation, and to provide a basis for decision-making. In the process of agricultural production, information on crop area, yield and disasters estimated by remote sensing are all used to estimate global, national and regional crop output, and to provide data analysis for food supply, monitoring and early warning.

IV. Problems in the Application of Artificial Intelligence and Big Data in Agriculture

China's agricultural technology industry chain is short and its coverage is inadequate. It involves relatively few agricultural fields with a weak driving force. Because of China's agriculture, the development of agricultural technology is limited to a certain extent. The application of artificial intelligence and big data in China's agricultural technology is significantly different from other industries. According to relevant statistics, China's technological progress accounts for about 40% of agricultural growth, equivalent only to one-third of the world average. At the same time, the fields involved in agricultural technology in China are also relatively narrow, mainly in crops such as grain, oil and cotton, and the industrial concentration is relatively low.

The slow development of agricultural technology in China and the low-level utilization of resources have led to the limited application of big data and artificial intelligence in agriculture. Due to historic reasons, there are a large number of agricultural practitioners and farmers with limited professional knowledge and limited educational levels. It is relatively more difficult to apply advanced technologies in agriculture. So, the application is hindered.

For the application of artificial intelligence and big data technologies, the communication between regions is inadequate, and the inter-industry layout is relatively scattered. Due to restrictive factors such as long investment cycles, large funds demand, and long payback periods, the development of agricultural science and technology is limited, and in most cases, dominated by the government. In recent years, the introduction of technology enterprises into the agricultural field has been a breakthrough. However, because the just start of using artificial intelligence and big data technologies, the industrial layout is relatively scattered, and integration between industries has not been achieved.

V. THE FUTURE PATH OF THE INTEGRATED DEVELOPMENT OF AGRICULTURE AND ARTIFICIAL INTELLIGENCE AND BIG DATA TECHNOLOGY IN CHINA

The path of integrated development is, first of all, the integration and mutual promotion of industries. To break through the traditional agricultural development model, to realize the penetration and diffusion of the entire industrial chain, to integrate the development of agricultural science and technology in China, and to form technical assistance before, during and after production, to improve the overall efficiency of agricultural technology application, it is demanded that the development of agriculture need to be integrated with artificial intelligence and big data technology.

To strengthen the integration and development of agricultural technology and related technologies in China is to improve the efficiency of resource utilization [5]. Agriculture is a special field and an industry that integrates and develops in many aspects. The development of modern agriculture not only pursues economic benefits but also pursues the goal of sustainable development. Therefore, in the future, the development of China's agriculture needs to be focused on the fields of planting, breeding and environmental protection, thus improving the efficiency of resource utilization in agriculture. In the past, most of the production work was led by the government. In the future, technology enterprises can be appropriately introduced for joint construction, which not only eases the pressure on the government's financial funds but also promotes agricultural production and income, to better improve the efficiency of resource utilization.

The introduction of talents with artificial intelligence and big data technologies requires international cooperation. At present, the application of agricultural science and technology, artificial intelligence, and big data in China are just in their infancy, and many key technologies are in the breakthrough stage. Therefore, we must recognize the power of science and technology, improve the application of agricultural technology to better serve agricultural development. At the same time, we should carry on training and introducing talents, encouraging professional talents to the field of agriculture, to learn from advanced technologies and international cooperation, and continuously promote the development of agricultural modernization.

ACKNOWLEDGMENTS

This work was supported by the Innovative Young Talents Program of Guangdong Province, China (Grant No. 2018WQNCX285)

REFERENCES

[1] H.Huang, C.Bai, Y.Quan, “Financial exclusion, agricultural science and technology investment and agricultural economic development,” Management World, vol09, 2018, pp.67-78

[2] F.Qian, “Problems and reconstruction of modern agricultural science and technology innovation system in China,” Agricultural Economy, vol01, 2017, pp.38-40

[3] G.Chen, J. Li, H. Chen, Y. An, “Research progress of artificial intelligence technology in the field of agriculture in the era of big data,” Journal of Jilin Agricultural University, vol04, 2018, pp.502-510

[4] S.Xu, D. Wang, Z.Li, “Research on the application of big data in promoting agricultural modernization,” Scientia Agricultura Sinica, vol17, 2015, pp.3429-3438

[5] X.Qiao, Y. Xi, “Artificial intelligence and the construction of modern economic system,” Economic Review, vol06, 2018,pp.81-91