The Impact of Smart Agriculture on Regional Economy

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Abstract

The deep integration of artificial intelligence and the real economy is an important economic strategy of China. The new generation of artificial intelligence reflects today's advanced scientific and technological productivity. However, some countries and regions still use traditional farming methods. Based on the concept of knowledge agriculture, we first start with the concepts of intelligent agriculture and traditional agriculture and discuss the essential differences between them. Secondly, we compare traditional agricultural methods and intelligent technology, from the price changes of crops after using intelligent technology, The place where intelligent agricultural technology is ahead of traditional agricultural technology is discussed from three aspects: yield change and cost change during farming. Finally, it comes to the conclusion that intelligent agricultural technology can indeed make a great leap in the economy of agricultural products in these three aspects. The research project puts forward detailed suggestions conducive to agricultural modernization. In the long run, these suggestions will accelerate the gradual transformation of China's traditional agriculture to modern agriculture and provide new ideas for the development of some enterprises and regions that maintain the traditional agricultural mode for a long time.

Keywords: *smart technology; regional economy; wisdom agriculture; artificial intelligence; development; strategy*

1. Introduction

As the Chinese population grows, available resources become scarce. The inefficiency of traditional agriculture hinders the optimization of human and land resources, leading to ecological degradation and insufficient recycling of water resources. China's agricultural sector has become unstable due to the deepening financial crisis, the emergence of new competitors at home and abroad, and relatively low profitability. Some listed agricultural companies (LACs) have turned to non-agricultural enterprises or operated illegally, while smart agriculture uses technologies such as new technologies, the internet, cloud computing, data collection, and information sharing to improve the quantity and quality of products and achieve mass production, saving many enterprises on the verge of closure and a weakening agricultural economy.

So far, we have collected several articles exploring existing technologies for smart agriculture. The results of these studies suggest that companies, and High-Tech Agricultural Corporations (HTAC) in particular, should invest in the development of AI and that its executives and policymakers should develop effective knowledge management tools and begin to accumulate the intellectual capital necessary to adapt to changing circumstances. Other reports describe the company's integrated circuits to optimize resource use, minimize ecological impacts, and achieve sustainable economic growth in the region. Some articles describe companies that used the Internet, data collection, and intelligent climate prediction systems to sample agricultural companies (LACs) listed on China's Shanghai and Shenzhen A-share markets between 2009 and 2020. It is divided into High-Tech Agricultural Corporations (HTAC) and Non-High-Tech Agricultural Corporations (NHTAC). They found that smart farming had a significant positive impact on HTAC's Enterprise Sustainable Growth (CSG) but no significant positive impact on NHTAC's CSG, while smart farming had a significant positive impact on both.

Most articles list many of the technologies of smart farming and describe them in detail. In the process, the

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reader will gradually gain some understanding of these technologies. However, the articles do not compare them side-by-side, nor do they specifically analyze which companies or regions are suitable for which smart technologies. The researchers, on the other hand, chose only one or two financial metrics to assess the economic benefits of smart farming technologies. When analyzing the economic benefits of smart farming technologies, profitability, asset utilization efficiency, liquidity, and market share should be considered.

Therefore, to better analyze the relationship between intelligent agricultural technology and the sustainable growth of enterprise or regional economy, this paper will consider various intelligent agricultural technology factors affecting the economy, summarize some common points of existing intelligent agricultural technology through the analysis and comparison of basic concepts, and compare traditional agricultural methods with intelligent technology in many aspects. Through the display data, it shows some shortcomings of traditional agriculture and the advantages of intelligent agriculture. Finally, we discuss new methods to improve the performance of agribusiness through a series of technologies, such as the Internet, cloud computing, data collection, and so on. This research project puts forward detailed suggestions on promoting agricultural modernization and accelerating the process of agricultural modernization technology in China for a long time, which has promoted the development speed of agricultural modernization technology in China.

2. Related Works

Intelligent agriculture will change every link of the agricultural food chain. Intelligent agriculture uses new technologies, Internet, cloud computing, data collection and information sharing to improve the quantity and quality of products and realize large-scale production. It will achieve the most accurate level through digital driven high-speed interconnection, traceability and real-time positioning. Agriculture will create high productivity, predictability and sensitivity to change, such as adaptable natural gas systems. This will further improve food security, profitability and sustainability. In this case, intelligent agriculture has potential through improvement. Agricultural productivity, cost-effectiveness and market opportunities create economic benefits through excellence.[1] We come to the following conclusion, that is, through the use of intelligent agricultural technology to improve productivity, and even increase crop yield, so as to achieve regional economic development.

Since 2010, the Chinese government has formulated a series of policies to support high-tech agriculture. In 2015, Premier Li Keqiang [2] delivered a speech on knowledge agriculture, affirming that China attaches great importance to the development of knowledge agriculture. In the past two decades, we focus on intelligent agricultural engineering technology and serve modern agriculture. Agricultural technology has also achieved remarkable results and is changing the way we grow agriculture [3].

The Agricultural Internet of Things also plays a pivotal role. As an emerging modern agricultural facility, intelligent greenhouse greatly improves crop yield and saves resources and labor.

In 2010, the USDA reported that its widespread popularity had led to a large export surplus. More than 70 percent of companies with annual sales of more than $250,000 have applied smart agricultural technologies to their operations. IC not only has a significant impact on agricultural development, but also has a profound impact on agricultural enterprises. Therefore, Chinese agricultural enterprises should also apply these relevant technologies to realize the modernization of Chinese agriculture and achieve win-win situation [4].

Most farmers believe that they are adopting Climate-Smart Agriculture (CSA) practices and techniques due to limited canal water supplies, climate change, susceptibility to drought, extensive groundwater extraction, rapidly declining water tables, and soil salinity increasing over time.

CSA results show that uniform germination, higher yields and financial returns, the concentration of inputs and improved resource use efficiency are the main advantages of CSA. Econometric analysis shows that the implementation of CSA practices and technologies, such as judicious use of water and fertilizers, groundwater quality, access to extension services, and appropriate picking methods, and timing, has a significant impact on the total value of cotton products (GVP)[5].

3. Methods

Based on the concept of knowledge agriculture, this paper first compares traditional agriculture with intelligent agriculture from the definition and finds out their essential differences. Secondly, the traditional agricultural methods are compared with intelligent technology, which is mainly divided into three aspects: price, output value, and cost. The research project puts forward detailed suggestions that will contribute to agricultural modernization. In the long run, it will accelerate the process of China's traditional agriculture, gradually move forward to modern agriculture, and provide new development ideas. Some regional companies will maintain traditional agricultural methods for a long time.

We distinguish these two different agricultural business models, traditional agriculture and modern intelligent agriculture, from the basic concepts. ① Traditional agriculture is a special economic equilibrium state formed under natural conditions. It is characterized by small scale, extensive management, and self-

sufficiency. Its main performance is that the means of production based on family small farms meet their own living needs, the main production mode is relatively backward, and pure manual tools are used in production activities [6]. ② Compared with the traditional extensive agricultural management mode, the production process of modern smart agriculture is more complex driven by advanced production technology and industrial equipment. Modern intelligent agriculture is characterized by strong science and technology, a strong market, and strong industry [7]. In the process of developing modern agriculture, farmers can be trained into high-quality farmers who can operate and understand technology, forming a new occupation. From the conceptual difference, we believe that modern intelligent agriculture has higher work efficiency, which is very important in today's increasingly abundant material needs. It also has broader market prospects and is conducive to improving the overall quality of local farmers. In the long run, it can improve the basic quality of the people of the whole country. The new generation of information technology has brought a great impact on our production, life, and social governance. First of all, from the perspective of production, information technology is changing our mode of production. Intelligent manufacturing is emphasized in the industrial field, while intelligent agriculture is emphasized in the agricultural field.

Secondly, from an economic point of view, it will bring us economic benefits. At present, the scale of China's intelligent agricultural digital economy is 577.8 billion, and it is expected to reach 1.24 trillion by 2025[8]. The development speed is very fast. Therefore, we should seize the opportunity brought by digital technology and rapidly develop the agricultural data center, which is of great significance to the high-quality development of our agriculture.

Through this table, we can better compare the differences between traditional agricultural methods and intelligent agriculture, and more intuitively see the differences, advantages and disadvantages of the two.

TABLE I. THE IMPACT ON CROPS BEFORE AND AFTER THE USE OF INTELLIGENT AGRICULTURAL TECHNOLOGY IN THREE ASPECTS

Affected aspects	Project type	Before	After
Price aspect	Chengdu grape	20 yuan per unit	50 yuan per unit
	Sichuan corn	1.85 yuan per unit	2 yuan per unit
Increase production	Mianyang greening seedling	150000 plants per unit	290000 plants per unit
Operational aspects	Pengzhou Huang village	Power consumption 650 kwh / h	Power consumption 575 kwh / h
	Artificial watering	1.933 manpower/ year	0.416 manpower/ year
	Pest management in Jintang agricultural research base	2.1 million yuan	Nearly free

3.1. Price aspect

First, take Chengdu grape [9] as an example to compare the price appreciation before and after the implementation of modern agricultural intelligent system facilities. Generally speaking, grapes are planted seasonally, and their growth is difficult to control. With the implementation of scientific plant protection for grapes and the installation of intelligent agricultural facilities, the ripening of grapes can be delayed by two months, diseases and pests can be significantly reduced. This is because of factors such as water, fertilizer and light can be finely controlled. Intelligent facilities play a more obvious role in the fine management of high-quality varieties. After the fine management of the junction vineyard in Xindu District, the sugar content, taste, and quality of grapes have been significantly improved. According to the data of the Fruit Research Institute of the Academy of Agricultural Sciences, the sugar content of the grape "red rose" in the garden increased from about 18% to 20.3% [10], an increase of 2.3 percentage points. The due date was postponed by two and a half months. The price rose from 20 yuan per kilogram to more than 50 yuan per kilogram. Intelligent management operation has certain economic benefits in general crops. It has good economic benefits in medium, high-quality, and high-grade fruits, vegetables, and flowers. For example, the feed corn in Sichuan has reached more than 2 yuan per kilogram. The CIF price of recently imported American feed corn is about 1.85 yuan [11].

3.2. Increase Production

In terms of increasing output, after using the technology of intelligent agriculture, the output of crops has been significantly improved. Seedling raising of Mianyang green spot: before using intelligent facilities, about 50000 green seedlings will be produced per mu per batch, about three seasons a year. That is 150000

seedlings per mu per year [12]. After the use of intelligent facilities, scientific management will produce 58000 seedlings per mu and batch. About five seasons a year. That is, 290000 seedlings per mu per year, nearly doubling [13].

3.3. Operational Aspects

In terms of operation, before the application of the modern agricultural intelligent system, it is mostly traditional agricultural management and farming. That is to directly implement watering, fertilization, and other operations with simple manpower. The growth of seedlings is poor under manual management, and the planted lawn often needs watering at night; This requires the payment of night overtime. Or it can only be watered manually during the day. After using the intelligent facilities, the lawn watering is carried out at night. For example, in the vineyard in Huangcun village, Pengzhou, Chinese Academy of Sciences, the labor costs more before installing the intelligent facilities. After the installation of intelligent facilities, it will costs less, and the labor cost will be saved significantly. The second is the calculation of the cost required for manual management. Taking the seedlings of Chengdu kexinran Technology Co., Ltd. as an example, the growth of seedlings is poor, and the planted lawn often needs watering at night, which requires overtime pay at night, or manual watering during the day. After using the intelligent facilities, the lawn watering operation is basically carried out at night, and other plants operate according to the plant needs when the plants need watering. According to statistics, in manual management, when reaching the standard of plant growth, the labor cost per unit time is about 58000 yuan / S.Y per 600 square meters of shrub plants. (it takes 1.933 person power / year per mu), s is the unit area, and N is the weighted time of one year. When the intelligent management and control operation is adopted and the same conditions are met (the cost of manpower is 12500 yuan / S.Y. (0.416 manpower / year per mu is required), compared with the same growth trend of crops, the benefits of applying intelligent facilities are calculated as follows:

$$G=\frac{58000/XY}{12500/XY}=4.64(G)\ . \qquad (1)$$

That is, after using intelligent facilities, the unit efficiency expenditure will be reduced by about 4.64 times.

Using intelligent facilities and system integration technology, pesticides and fertilizers are accurately used according to crop needs, reducing environmental pollution and comprehensive cost. For example, in Jintang[14]. After using intelligent management and control facilities, the agricultural scientific research base of the Provincial Academy of Agricultural Sciences can not use pesticides because there are no pests. Before that, the cost of disease treatment was about three to five-tenths of the output value.

4. DISCUSSION

At present, the inefficient working methods of some traditional agriculture have greatly affected the optimization of human resources and land resources, while some areas and listed areas still do not realize the great changes and huge economic benefits brought by advanced intelligent agriculture. At present, some literates only discuss some feasible intelligent agricultural technologies, does not compare them with traditional agricultural technologies, and does not highlight the advantages of intelligent agriculture. In this paper, intelligent agricultural technology and traditional agricultural technology, under the condition of the same crops and the same environmental conditions, illustrate the advantages and convenience of Intelligent Agriculture in crop cultivation, and bring new ideas and new directions to those areas enterprises still using traditional farming techniques.

As shown in Figure 1, since the use of intelligent agricultural technology, the output, price and even production cost of many crops have been optimized. For example, in terms of price, the price of grapes in Chengdu rose from 20 yuan/kg to 50 yuan/kg respectively, and the price of corn in Sichuan rose from 1.85 yuan/kg to 2 yuan/kg. In this way, intelligent management operation has certain economic benefits for general crops. In terms of increasing production, the number of Mianyang seedlings increased from 150000 to 850000. In terms of cost-saving, electricity, pest control and labor costs have been saved to a certain extent. From the perspective of data analysis, this paper divides the benefits of intelligent agricultural technology for crops into three aspects in detail, adds the method of comparison based on the existing literature, and uses tables to intuitively show the benefits of using intelligent agricultural technology.

Intelligent agricultural technology has been adopted in some areas and achieved good results. Take the greening of Chengdu Railway Station of Chengdu Railway Bureau as an example. There are about 6650 square meters of medium and low green areas in the green area. There are 15 maintenance workers before, and the absolute value expenditure of annual labor cost. About 30000 yuan per ca-pita, with a total of 500000 yuan per year. After using the special intelligent control facilities for greening, only three people are enough. It can save a lot of labor costs every year.

Although the research of this paper highlights the advantages of intelligent agricultural technology through comparative methods, the research method of this paper is relatively thin, and the data collected also has certain limitations. The collected data mainly comes from the development of the e-agriculture industry in Sichuan,

China. There are certain limitations in the regional selection, because the agricultural development of each region in each country may be different. Intelligent agricultural technology may not be suitable for all countries or regions, and traditional farming methods may be more suitable in some regions, The specific situation still needs specific analysis.

5. Conclusion

This paper mainly discusses the economic impact of intelligent agriculture on regions or enterprises. The comparison method is mainly used to compare some changes in price, yield, and cost of some crops before and after the use of intelligent agriculture. It is found that intelligent agriculture can indeed effectively help regions or enterprises profit from it. It has brought some new reform methods to some countries and regions that are still not in transition. In the future, intelligent agriculture can be expanded to more aspects. For example, artificial intelligence and Internet technology can be combined to build an e-commerce platform for online marketing, give full play to the advantages of online and offline integration, effectively integrate information resources, reduce agricultural production costs and improve the relationship between suppliers and farmers. The Internet of things can even be applied to intelligent agriculture to realize the information management in the process of agricultural production and circulation and the traceability management of agricultural product quality.

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