AN EMPIRICAL ANALYSIS OF THE EFFECTS OF TECHNOLOGY, FINANCE, EDUCATION AND LABOR ON RURAL ECONOMIC DEVELOPMENT

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ABSTRACT

The rural revitalization strategy has always been China's fundamental national policy, and the development of the agricultural economy has always attracted much attention. At present, the industrialization and large-scale development of China's agriculture has accelerated the process of agricultural modernization. At the same time, it has also spawned diversified technical needs, financial needs, and talent needs. However, as far as the current development of China's agricultural economy is concerned, there are specific gaps in the relevant reserves of the above three. For the development of modern agriculture in China, it is necessary to reserve a force to realize a step-by-step transformation. So, at different stages of industrial development, it is essential to weigh the proportion of investment in various elements such as technology, finance, and talents to ensure that agriculture develops steadily and achieves structural transformation. This paper expounds on its impact on agricultural economic growth from the four perspectives of technology, finance, education, and labor. First, this paper expounds on the research motivation and questions, and intends to explain its impact on the agricultural economy from the four perspectives. It also cites domestic and foreign literature and analyzes relevant agriculture research by Chinese and American scholars. Moreover, based on the above analysis, select the relevant data from 1991 to 2020, and use the time series model to carry out empirical regression from the four dimensions of technology, finance, education, and labor force. Through the VEC model, impulse response, and variance decomposition to further analyze the contribution rate of agricultural economic growth and technology, finance, education, and labor to agricultural economic growth. The results show that financial support for agriculture and the growth rate of the rural labor force have

a more significant role in promoting the stable growth of agriculture, and the improvement of education and technological progress also have a certain degree of positive impact on the development of the agricultural economy. Therefore, it is essential to coordinate multiple resources and jointly promote China's agricultural economy's rapid and stable development. Finally, based on the above empirical and theoretical analysis, this paper gives corresponding policy recommendations.

Key words: Technology, Finance, Talent, VEC Model

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CHAPTER I

INTRODUCTION

Research Objective

China's agriculture has always been in a vital position, from the initial cooperative organization to the division of fields to households and the household contract responsibility system. The development of China's agricultural industry has been an industry that has undergone several changes. China's terrain is complex, and most cultivated land is scattered, with mixed good and evil, making it challenging to form large-scale flat land. On the one hand, large machines cannot enter the small, uneven farmland. This agricultural terrain has led to a low level of modernization and mechanized planting in China's agriculture. On the other hand, China's agriculture has always borne the entire burden of the country. 36% of the population is employed through agriculture to achieve a stable life. It has solved the employment problem of a considerable part of China's population to a considerable extent and ensured social stability. At present, agriculture is responsible for the employment problem of the population. Suppose the agricultural modernization reform is vigorously promoted. In that case, a large number of people will be unemployed, and China is now in the process of economic structural transformation. The development of complex technology industries such as biomedicine, semiconductors, aerospace, and new energy is in its infancy. Currently, there is no relatively strong industry that can accommodate the large number of farmers left after the agricultural transformation. The reemployment of farmers will be a significant difficulty in agricultural transformation. Therefore, the development of China's agriculture has always been at a relatively early stage. Whether it is the emphasis on mechanization, the development of modern

agriculture, the cultivation of supporting talents, and the improvement of financial policies, they are all in their infancy.

At present, China's aging population ratio is gradually deepening. The rural population is rapidly losing, especially the young rural population, resulting in insufficient agricultural reserve strength in China. It will lead to insufficient support for the follow-up development of agriculture. Referring to American agriculture, the United States has 2.3 billion mu of good arable land, but only 300 million people, and China has a population of 1.3 billion, but only 1.8 billion mu of not-so-good arable land. Agriculture in the United States can support 1/4 of the world's population, and the agricultural population in the United States only accounts for the United States population of 1%. While the development of American agriculture is based on the model of modern agricultural development, implementing farms and cooperatives, realizing large-scale planting and centralized management. It saves expenses to a large extent and reduces the input of workforce and material resources. It can significantly improve planting efficiency and land utilization, which is totally different from China.

Therefore, China's agricultural development is in the initial stage due to insufficient population reserves and a low degree of mechanized planting. In the future, China will gradually follow the United States to develop into a powerful agricultural country, promote the transformation of agricultural modernization, and strive to become a powerful agricultural modernization country. Based on the analysis of the above macro factors, this paper also wants to explore which factors will play a vital role in the transformation of the agricultural economy, how significant the role of these factors can be, and whether there is a relationship and mutual influence between different factors. Through the comprehensive

analysis of data, this paper intends to explain the above problems and provide new theoretical support and auxiliary basis for the future transformation of the agricultural economy.

Research Question

From a technical point of view, technological progress in agriculture involves many kinds, but the core is to promote productivity through technology. On the one hand, digital agriculture can improve planting efficiency and increase crop products through digital technology. The technology is being gradually promoted and applied in the vast rural areas of China. On the other hand, it is the degree of mechanization. Mechanized planting, similar to the American planting model, can significantly reduce the input of labor costs, the input cost of agricultural production, and the efficiency of agricultural production. So, what is the impact of the degree of mechanization on rural economic development during the development of agriculture? The first question to be investigated in this paper is whether this effect is the most significant. The development of agriculture in China has always been in a relatively backward state. Farmers' income has always been at a low point, and the degree of mechanization and digital agriculture is low. It has always been the main argument for developing China's agricultural economy. Some related scholars have conducted in-depth research on agriculture, aiming to propose targeted solutions by studying the current situation of China's agricultural economy, including agricultural financial support and digital transformation. First of all, from the perspective of financial support, China's agricultural financial support is relatively weak compared to the well-established loan system and the US farm value evaluation system in the United States. Although the country has always had relevant policies, Chinese farmers generally have a

low education level and a relatively poor understanding of financial policies and financial support, many financial policies need to be effectively implemented and developed. So, for the development of China's agricultural economy, what is the role of agriculture-related financial expenditures on agricultural economic development? It is the second question studied in this paper.

In China's development, most farmers are not well-educated, and most are limited to using limited labor experience to grow crops and harvest to make money. Due to the low education level of Chinese farmers, the ability for agricultural re-innovation is weak. Then this article also wants to study if farmers' education level is improved, mainly referring to the improvement of academic education and whether it can significantly promote the development of the agricultural economy. It is the third question to be studied in this article. Finally, with the intensification of the aging population in China, the follow-up reserve of the rural labor force is insufficient. In this case, the future development of agricultural economy will also be obviously affected, but how much is curious. In this direction, this paper proposes the first Four research questions: What impact will the labor force population have on rural economic development?

Through elaborating on the above four directions and problems, this paper also intends to explain the challenges and problems encountered in China's agricultural development through the double evidence of text and data to provide more substantial theoretical guidance and policies for China's agricultural development in the future.

CHAPTER II

LITERATURE REVIEW AND THEORY

Literature Review

Regarding the development of the agricultural economy through technological progress, some domestic scholars have analyzed the development of the agricultural economy from various technologies. Zhu Ruibo (2022) pointed out that from the perspective of international experience, the core of modern agriculture lies in technological and institutional innovation and cannot be separated from the guidance and regulation of government policies. The decentralized operation of farmers still dominates China's current agricultural production. In contrast, small farmers need help identifying and effectively using modern technologies and need help to bear the high-cost input. The author uses the case of Chengdu, Sichuan, as a testimony and proposes that agriculture should develop and innovate. Improving the degree of organization, standardization, and scale of production and operation mode is conducive to transforming Chinese agriculture to the development of the modern agricultural economy. Wang Yibo (2020) focused on the impact and ways of four types of infrastructure, namely farmland water conservancy, rural electricity, and rural education, on agricultural total factor productivity. First of all, a qualitative analysis is made from the scale of rural infrastructure investment and the status quo of four types of infrastructure construction. It is found that although the investment scale of rural infrastructure has increased year by year in recent years, the proportion of infrastructure investment in the total social infrastructure construction investment However, it is very low, and the highest is only 4.68%. Secondly, according to the panel data of agricultural production input-output variables of cities and prefectures in Hubei Province from 2005 to 2017, the three-stage DEAMalmquist model is used to calculate the total factor

productivity of agriculture in Hubei Province, and the results show that During the observation period, the agricultural total factor productivity of Hubei Province has been increasing, and after decomposing the agricultural total factor productivity index, it can be observed that technological progress is increasing year by year, which has an apparent pulling effect on the improvement of total factor productivity, while Technical efficiency shows a decreasing trend, which inhibits the improvement of total factor productivity. Technological progress in rural areas should be completed on time and done according to the actual situation. Sun Yanchun (2018) started from the perspective of agricultural technology progress and scientific research level in Liaoning Province, to explore the relationship between agricultural technology progress and capital investment and labor force. They used the agricultural data of Liaoning Province from 1994 to 2016 as the research basis. Through the VAR and VEC models, the unit root test, cointegration test, error correction, impulse response function analysis, and variance decomposition were carried out to analyze the influence of agricultural technological progress bias on the agricultural economy in Liaoning Province. From the analysis results, the short-term investment in fixed assets of rural households and the level of agricultural mechanization are positively correlated with the development of the agricultural economy. However, the short-term impact of agricultural mechanization on the agricultural economy is relatively weak compared with rural fixed asset investment, and the investment in agricultural machinery lags. The effect is noticeable: mechanized planting can promote the growth of the agricultural economy, but the effect is relatively small. The above articles have verified the positive effect of technological progress on rural economic development through empirical analysis. This paper also puts forward the first hypothesis: technological

progress, that is, the degree of mechanized planting mentioned in this paper, will promote agricultural economic growth.

From a financial point of view, domestic papers have elaborated and analyzed from many angles. Chinese scholars believe that the application of finance in the agricultural industry can be increased. Banks provide long-term loan support for agriculture and encourage social capital to invest in agricultural development. Among them, we must fully use financial capital to develop agriculture and accelerate its rapid and healthy development. Among them: Wang Haihan (2022) pointed out that the agricultural economy has also greatly improved with China's economy's development. After analyzing the data of Henan Province from 2009 to 2018, it is concluded that financial development has a more significant impact on the agricultural structure. For example, farmers' disposable income will directly affect agricultural output value and fishery output value; fiscal support for agriculture hurts agricultural planting. The optimization of the rural industrial structure requires not only investment in the market-oriented mechanism but also the government to provide comprehensive support in finance and education. At the same time, promoting agricultural scientific and technological innovation is also necessary. Qiao Shuchen (2022) pointed out that in the process of promoting agricultural modernization, digital inclusive finance, as a new financial platform, has a profound impact on agricultural development. Based on China's provincial panel data from 2016 to 2020, this paper empirically tests the impact of digital financial inclusion on agricultural development. From a subdivision point of view, digitalization development has played a positive role in promoting agriculture. It has played a relatively prominent role in the development of agriculture in the eastern region. However, it has to play a significant role in promoting the development of

agriculture in the central and western regions. In general, the country should still vigorously develop inclusive digital finance to facilitate the rapid development of agriculture.

Zhang Lezhu (2022) pointed out that strengthening financial support is key to realizing rural revitalization and shared prosperity. The author puts forward the definition of "financial literacy", pointing out that financial literacy refers to the ability of individuals to have practical judgment and decision-making and is more inclined to rational thinking. At the same time, it is intended to verify that farmers' financial literacy will directly affect the development of agricultural finance and then affect the development of rural modernization to achieve shared prosperity. At the same time, it also emphasized the need to strengthen agricultural financial education so that more and more farmers could realize the effectiveness of financial support for agricultural development. Tian Yaqun (2022) proposed the concept of "rural resilience" to study the impact of digital finance on rural resilience. The article expounds on the concept and influencing factors of rural industry resilience and analyzes the problems existing in the improvement of rural industry resilience. Based on the real dilemma faced by digital finance in improving rural industry resilience, they provide services from digital finance to rural industries and enhances rural industries. Starting from the focal point of resilience, it proposes an optimized path for digital finance to improve the resilience of rural industries. Wu Yiting (2022) pointed out that financial risk control is an important issue related to the survival and development of agricultural SMEs. Supply chain finance has become essential to solving agricultural SMEs' financing dilemma. This paper points out small and medium-sized enterprises would mainly face the supply chain financial risks. It focuses on the problems of supply chain financial risk control in small and medium-sized agricultural enterprises from the

aspects of credit risk control, operational risk control, and supply chain financial risk control. Peng Jiang (2022) believes that the financial industry can promote the development of agriculture-related innovation industries. Investment and professional incubation institutions can build a rural agricultural innovation and innovation incubation system. Specifically, it can be expressed as a medium- and long-term credit model for agricultural and rural infrastructure, leveraging financial and social capital to participate, increasing the value of agricultural self-production, optimizing industrial development conditions, and improving rural investment. Rural revitalization provides the impetus. Specifically, it can be expressed as a medium and long-term credit model for agricultural. Rural infrastructure, leveraging financial and social capital participation could enhance the value of agricultural self-production, optimize industrial development conditions, and improve rural investment.

Based on the analysis of the above article, we put forward the second hypothesis: financial development has a significant role in promoting rural economic development.

Regarding the relationship between education and agricultural development, many domestic scholars pointed out that China's agricultural education is in a relatively tricky stage. Biological agriculture urgently needs development, but more relevant supporting talents must be needed. It is due to the aging of the education system and the lack of emphasis on research. At the same time, in response to these problems, many scholars have pointed out related methods, such as reforming the education system, paying attention to the research of students going to the field, and focusing on the transfer of agricultural research to the direction of industrialization. Pang Xin (2022) pointed out that the development of agriculture is now inseparable from vocational skills training and the

improvement of farmers' education. For example, they are analyzing the vegetable production technology in higher vocational schools, exploring the possibility of cultivating new crops, actively promoting them to households, and conducting field trials in experimental farmland. It has vigorously promoted the development of rural industries. Bao Li (2022) pointed out that agriculture has made outstanding contributions to China's economic development as a big agricultural country, especially in recent years. The comprehensive progress at the science and technology level has provided specific opportunities for agricultural development, meanwhile demand is also increasing. In this context, the biological agriculture education system needs to be urgently improved and optimized, from the past education mode of cultivating theoretical agricultural talents to technical and practical agricultural talents. However, as far as the current situation is concerned, there are specific problems in China's biological agriculture education, which urgently need improved and optimized planting methods. To establish a sound bio-agricultural education group operation mechanism, the relevant colleges and universities must reach an excellent cooperative relationship with the local government to deal with the education group. Specifically, the Modern Agricultural Vocational Education Group was established in Liaoning Province. Anhui University of Science and Technology united with other agricultural vocational colleges and related agricultural enterprises to establish the Anhui Modern Agricultural Vocational Education Group. Through establishing the bio-agricultural vocational education group, agricultural colleges and enterprises can establish good synergy. They could build product research, practical training, and technological innovation bases to create a suitable environment for bio-agricultural talents. Liang Qiong (2016), based on the Cobb-Douglas production function, selected the rural economic data

of 31 provinces in China from 2001 to 2011 and established a spatial panel model for research. The result shows that education investment has a positive role in promoting rural economic growth. However, when urbanization factors are considered, the effects of various variables on economic growth tend to be balanced. When urbanization and rural economic development are considered, the role of rural education investment in promoting rural economic growth will be more obvious.

Xu Shulin (2022) pointed out that developing new agricultural management entities is significant to national food security, common prosperity, and agricultural modernization. With the implementation of the rural revitalization strategy, new agricultural business entities such as family farms, professional cooperatives, and leading enterprises have developed rapidly. However, in cultivating and developing new agricultural business entities, the dilemma involves the total number of talents, educational level, skill level, talent structure. While developing new-type agriculture, they should pay more attention to cultivating modern agricultural talents, which involves sweeping changes in the total number of talents, educational level, skill level, and talent structure. For example, to promote vocational education as the key to agricultural education, vigorously promote the education of agricultural technical talents, the education of agricultural scientific research talents, and the cultivation of rural e-commerce talents. Cultivate modern agricultural talents from multiple aspects and angles. At the same time, encourage large agricultural groups to cooperate with universities and build laboratories together to strengthen the combination of production and research. Therefore, we put forward the third hypothesis: rural education development can promote the agricultural economy's growth.

Not only in popularizing and promoting farmers' education, but China's agriculture also needs to be vigorously developed. Regarding the total number of farmers, China has begun to change from an overpopulation to an underpopulation reserve. Currently, China's rural population is seriously aging, the reserve of young people is seriously insufficient, and a large number of young and middle-aged labor forces have migrated from rural areas to cities. With the deepening of this trend in the future, rural labor production will also face new challenges. However, at the same time, mechanized planting and the development of modern agriculture may also bring new opportunities for China's agricultural development. Many domestic scholars have put forward relevant views on this research. Wang Lian (2022) used data to analyze the impact of population quality and population on economic growth. The article is based on panel data from 30 provinces from 2001 to 2019. The analysis shows that the dividend of population quantity will significantly drive the growth of the total economic volume, but it will inhibit improving economic quality.

After China's economic development has entered a new normal, the demographic dividend is gradually replacing the demographic dividend as the dominant force in economic development. The demographic dividend and the population quality dividend indirectly impact economic development through industrial structure upgrading and technological progress. Chang Zhe (2015) pointed out that in the 21st century, China is facing a significant problem of population aging, and the speed of aging is accelerating. It will lead to a low proportion of the working-age population and an insufficient labor supply, which will inevitably have a particular impact on the social economy and increase the burden on the country. Ren Cheng (2022) pointed out that with the transfer of the rural population to the urban population, the reserve of the rural labor force is already

insufficient. However, the development of rural finance and the development of new business formats will significantly inhibit the flow of the rural population to metropolises. The author suggests strengthening rural economic construction and continuing to realize the rural revitalization strategy. Zhang Yingqi (2017) pointed out that with economic growth, China's labor force continues to flow to cities, affecting rural social life and promoting urban development. There are not only positive effects, which include increasing farmers' labor income and daily living standards, but also adverse effects, mainly including the lack of vitality in rural development, resulting in a sharp shortage of rural talents and affecting the normal life of farmers' families. However, there are also adverse effects, mainly including the lack of vitality in rural development, resulting in a sharp shortage of rural talent, and affecting the average life of peasant families. Huang Guiqin (2022) pointed out that changes in the labor force have profoundly adjusted the development mode of the economy and society. The article uses the data from 1997 to 2017 to empirically test the impact of changes in the population structure on economic growth. The expansion of high-quality talents and the population of young adults will accelerate the development of the agricultural economy has a significant role in promoting the growth of the rural economy. China's aging population has grown, but it has not affected the overall economic growth for the time being. However, the flow of high-quality talents and young people to cities inhibits rural economic growth. Based on this, we propose hypothesis 4: The rural population is significantly positively correlated with rural economic development.

Regarding the elaboration of the above four perspectives, some related scholars believe that they jointly affect the development of the agricultural economy. However, in

the process of agricultural economic structural transformation, the impact of different variables will also change accordingly. Zhou Lejing (2019) pointed out that with the severe aging of the population, the rural labor force has declined. The problem of farmers' loans has become more serious, and the farmland has been abandoned and abandoned, which has seriously restricted the development of the rural economy. Because of the above problems analysis, the article suggests that the construction of the rural financial system should be strengthened, and financial institutions should be encouraged to establish trust relationships with large farmers and agricultural scientific research enterprises and increase investment in them. In economies of scale and modern agriculture, to realize the interests of both parties, the new agricultural business entities have received strong support. Small farmers and individual farmers with no labor force or poor management should establish a trust relationship with large farmers and large agricultural enterprises, transfer, and lease land. They make full use of land resources for mechanized production to achieve an appropriate economic scale.

The research on foreign development mainly focuses on green agriculture and modern agriculture. It is believed that green agriculture can protect the environment and bring about the development of the agricultural economy in the reverse direction. It is also a way of agricultural economic and technological progress. The management model has made American agriculture more modernized, and digital technology has been promoted and applied in the United States.

With the proposal of a carbon neutrality scheme, the impact of green agricultural technology on carbon emissions has become a hotspot of academic research. Many scholars have paid close attention to the field of agricultural carbon neutrality. The research on

carbon emission technology of green technology is mainly concentrated in the field of natural science. The carbon effect in the process of agricultural production mainly comes from the mitigation of agricultural products such as farming, irrigation, fertilization, pesticide application, use of agricultural film, use of agricultural machinery, and straw treatment. Chen H (2009) pointed out that the total organic carbon and nitrogen content of shallow rotary tillage in the 0-15cm soil layer was 14.2% and 14.1% higher than conventional tillage methods. Therefore, shallow tillage helps to achieve the effect of carbon sequestration and emission reduction. The government has also introduced a series of policies to promote agricultural emission reduction: A.Bellver-Domingo (2016) analyzed the compensation mechanism of American agriculture, especially in terms of environmental pollution, and introduced a series of policies, strictly implementing the U.S. government's principle of "whoever pollutes will recover. The principle of "whoever benefits, who will be compensated" has established a complete management system. On the one hand, for farmers who actively carry out agroecological protection behaviors, the U.S. government uses monetary funds to subsidize farmers to reduce farmers' losses. On the other hand, the government reduces financial pressure by levying environmental protection taxes on enterprises, organizations, and individuals that utilize agricultural and natural resources.

At the same time, the U.S. agricultural industry is also at the forefront of the world in applying emerging technologies such as the Internet of Things. According to a foreign website, the United States has become one of the most developed countries in the global agricultural Internet of Things. Large farms in the United States (according to the definition of the United States Department of Agriculture (USDA), large farms in the United States

refer to sales of more than $500,000, and small farms). Refer to sales of less than 250,000 US dollars, and medium-sized farms refers to sales of 250,000 to 500,000 US dollars. The adoption rate of IoT is as high as 80%, and nearly 40% of agricultural producers in major corn and wheat-producing areas use IoT technology. The United States has established a multi-technology integrated digital agricultural technology system to provide technical support for the high-quality development of agricultural production, farm management, and agricultural scientific research. Among them, digital agricultural technology includes remote sensing technology (R.S.), global positioning system technology (GPS), geographic information system (GIS), virtual reality technology (V.R.), decision support technology (DSS), agricultural engineering equipment technology, and other types. Taking precision agriculture as an example, the United States uses GPS precision agriculture technology, which can reduce the overlap and gap of the operation area when planting, spraying herbicides, fertilizing, and improve the overall economic and environmental efficiency (according to the United States Department of Agriculture data, in 1000 acres hectares, about 405 acres). Using a navigation system on corn fields could reduce the overlapping area of operations by more than 90%, saving about $13,000 per year. Using variable rate technology (VRT) on farmland, as well as sensors, GPS, GIS, and other technologies to help production farmers apply different proportions of fertilizer to a field.

Relevant research from Harvard University in the United States (Paarlberg, 2021) believes that the integration of digital agriculture and the use of modern scientific and technological means with lower environmental impact and higher informatization could reduce the dependence on material resources on the basis of continuous improving agricultural production efficiency, directly or indirectly improve the environment and

economic benefits of modern agriculture. Specifically, in the entire industrial chain of agricultural production, processing, packaging, warehousing, transportation, and sales, digital agriculture uses digital technologies such as intelligent perception, analysis, and control to accurately serve the decision-making behavior of production and operation entities in the agricultural value chain. Reducing chemical input, energy consumption, and waste of land resources will ultimately increase agricultural carbon sinks and reduce agricultural carbon sources.

Relevant governments abroad have organically combined green agriculture and digital agriculture. A survey by the Organisation for Economic Co-operation and Development (OECD) shows (Henderson et al., 2020) that developed countries have introduced a series of agricultural emission reduction policies and measures in recent years. Introduce data-intensive intelligent "precision technology" to improve the real-time monitoring and analysis capabilities of agricultural greenhouse gas emission sources, conduct efficient management and intervention on emission sources, and achieve the dual goals of low emissions and high output in agriculture.

At the same time, American scholars have also conducted in-depth research on the relationship between financial support and agricultural development. Caverrt (2018) believes that the Agricultural Credit Administration, as a supervisory agency in support of agricultural credit in the United States, should encourage policy, cooperative and commercial agricultural credit to carry out business innovation, and assume more social responsibilities, in order to improve the agricultural foundation. It should be a more significant support role in the facility. Technological progress is crucial for any industry and is no exception in the agricultural industry. Technological iteration can effectively

accelerate the industrial upgrading of the industry, transforming the industry from low-end and low-value-added industries into high-value-added industries. At the same time, the Agricultural Credit Bureau should provide agricultural asset assessment, risk prevention, and other supporting services for agricultural credit. Regarding the evaluation of the agricultural financial support system, Gregg (2015) described the development of agricultural credit in the United States during World War I, arguing that mechanized production made farmers need more funds to invest in production equipment, and the federal government was trying to solve the problem of agricultural development. For capital needs, establish agricultural financial service institutions on the basis of promulgating relevant laws to provide more credit support for agricultural producers. Glauber et al. (2016) pointed out that U.S. agricultural finance has a great influence on U.S. domestic producers, consumers, and the international market. Various U.S. agricultural financial support policies have directly or indirectly increased U.S. agricultural subsidies and the competition for agricultural products Force. Kreider (2018) mentioned that the financial crisis in 2008 raised a warning to the agricultural credit regulatory authorities to strengthen the supervision and management of credit risks. As the main form of financing for U.S. agricultural farmers and other business entities, credit has its positive side in optimizing the allocation of agricultural resources to support the development of U.S. agriculture. However, if there is a lack of a credit constraint mechanism, it may bring about agricultural financial risks and may inhibit reinvestment in agricultural production.

Zhang Zhixin (2022) constructed an index system including seven aspects of agricultural material equipment, scientific and technological information, industrial construction, operation and management construction, green development, output

efficiency, and rural modernization, using the TOPSIS-ESDA method, based on Shandong Province's 2010-2019 The data is analyzed by time series. The difference test, VAR model, variance decomposition, and impulse response function are respectively carried out to study the characteristics of the development level of agricultural modernization. They took Jiangsu Province as a sample research province based on 315 questionnaire data. Guo Xiangdong (2021) took China's agricultural product prices, China's agricultural economic development, and macroeconomic operation as samples and used VAR, nonlinear MS(M)-AR(p), nonlinear MS(M)-VAR(p), etc. The model measures the relationship between the development of China's agricultural economy and the operation of the macro economy. The analysis shows that both the time series of agricultural product prices and the time series of agricultural product price volatility have long memory characteristics. Xiao Zhiguang (2009) used the standard deviation coefficient method to estimate the unbalanced development of the insurance industry in various provinces (municipalities, autonomous regions) in China and analyzed the reasons for the unbalanced development from the perspective of insurance demand. Wu Xiangyou (2009) studied the unbalanced development of the insurance industry in 31 provinces (municipalities, autonomous regions) in China from 1997 to 2007 by establishing a multivariate deviation model and believed that insurance should strengthen the cultivation and introduction of insurance business entities to promote the balanced development of the insurance industry. Hao Nan (2014), based on the empirical analysis of the time series data of Anhui Province from 1978 to 2012, pointed out that there is a long-term equilibrium relationship among urbanization, industrialization, and agricultural modernization. However, automation and agricultural modernization positively affect the effective transfer of the rural population in Anhui

Province. The effect needs to be more significant. Countermeasures and suggestions are put forward to promote the effective transfer of rural people and the development of urbanization in Anhui Province from the perspectives of promoting industrial structure optimization, improving agricultural production methods, and improving the overall quality of the transferred population. Cao Bingyu (2010), based on the empirical analysis of time series data from 1985 to 2005 using practical tools such as the VEC model, variance decomposition, and impulse response function, believes that there is a long-term and balanced relationship between China's rural financial development and agricultural technology progress. One-way causality, that is, the advancement of agricultural technology, can promote the development of rural finance. Still, the effect of rural financial development on the progress of China's agricultural technology could be more obvious.

Theory

Cobb Douglas production function. In economics, the Cobb-Douglas production function is a widely used classical function form to describe the relationship between input and output. The Cobb-Douglas function mainly involves four aspects, namely:

In the production process, capital (financial) and labor forces are indispensable elements. It can be seen from this expression that when the labor forces input is zero, the output is zero, and any technology and capital (financial) are ineffective; when capital is zero, output is also zero.

For the development of any industry, labor forces and capital (finance) are indispensable and essential components, but it is also necessary to reasonably control the ratio of factors. In the process of industrial transformation and upgrading, how to measure these two factors? The relationship between industrial economists also needs to be emphasized by industrial economists.

Therefore, this paper cites the Cobb-Douglas production function to illustrate the issues that this paper wants to research. On the one hand, the capital (finance) and labor effects emphasized in the Cobb Douglas production function also apply in the agricultural industry. Capital (finance) and labor are more critical for agricultural production. In China's agricultural development, labor occupies an absolute part, and agricultural production is mainly contributed by labor. In modern American agriculture, capital (finance) accounts for the proportion of factors. More significantly, the contribution rate to agricultural production is relatively high. Therefore, the Cobb-Douglas function here not only emphasizes the roles of labor and capital (finance) in the production process but can also

explain what roles capital (finance) and labor play in agricultural development. What role will be produced in different industrial upgrading iterations? Moreover, the Cobb-Douglas production function highlights the substantial impact of technological progress. It believes that technological progress significantly promotes improving production efficiency, and the effect is relatively apparent. The increase in production efficiency is multiplied when technology advances, and its impact far exceeds capital and labor. Then for agricultural development, the improvement of production efficiency brought about by technological progress is also more significant. Referring to the development of modern agriculture in the United States, the United States adopts digital technology, drone technology, and large-scale farming equipment technology under the farmer system, significantly improving agricultural production efficiency and increasing crop output value. Technological progress is crucial for any industry and is no exception in the agricultural industry. Technological iteration can effectively accelerate the industrial upgrading of the industry, transforming the industry from low-end and low-value-added industries into high-value-added industries.

Solow's Neoclassical Growth Theory. This theory describes that under the assumption of perfect competition, economic growth's primary driving force comes from capital and labor input. The neoclassical production function determines that under constant labor supply, the marginal product utility of capital decreases. The theory believes that resources are Scarce, and the growth brought by accumulating pure material capital is limited. Under the constant population growth rate and technological progress, the economy will achieve a steady state level of zero growth; this theory is intended to emphasize the two aspects of technological progress and population growth. Technological

progress is believed to improve social productivity and bring about social development significantly. Population growth is the source of power to ensure a country can continue to grow. At the same time, capital expenditures have a limited contribution to economic growth and are purely dependent on capital expenditures. Economic growth is sluggish and sustainable.

We attribute the contribution of economic growth to labor quality + total factor productivity + capital density contribution and found that in the past 30 years, the contribution of labor quality to GDP growth has changed relatively little. While the contribution of capital density (capital/labor quantity) has continued to Improve, after the growth rate reached the highest and lowest levels in 2011, it continued to decline. However, the contribution brought by technological progress has been steadily advancing.

Therefore, the theory also emphasizes the contribution of technology, labor force, and capital to economic growth. This paper also uses this theory to testify further to the issues studied in this paper, intending to provide a theoretical basis for subsequent empirical analysis.

CHAPTER III

MODEL REGRESSION

Model Introduction

ADF test. The smoothness of a series is a prerequisite for regression analysis and causality tests. The main tests for smoothness are the autocorrelation test, the unit root test and the non-parametric test. The ADF (Augmented Dickey-Fuller Test), which has been widely used in recent years in empirical financial analysis, is used in this paper to test the smoothness of the index series and volume series. The principle of ADF is to reduce the residual autocorrelation of the regression equation by adding the lagged term of the dependent variable to the independent variable. (Dickey and Fuller, 1981) The specific model is as follows:

Without the intercept and trend terms: $\Delta y_t = \rho x_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta x_{t-1} + \varepsilon_t$

Existence of intercept term: $\Delta y_t = c + \rho x_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta x_{t-1} + \varepsilon_t$

Existence of intercept term and trend terms: $\Delta y_t = c + \gamma t + \rho x_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta x_{t-1} + \varepsilon_t$

If the series Y goes through the ADF test and the original hypothesis cannot be rejected, the series needs to be re-differentiated and finally brought into the ADF model again for testing to determine whether it is smooth. If the exponential time series is smooth after d differences, the series is said to be smooth of order d, i.e., the I(d) process.

Johansen test. When the original time series is unstable, the VAR or VEC model cannot be directly constructed. Toda and Phillip pointed out that the difference of the same order is stable in the stationarity test, which means there may be a long-term

cointegration relationship between variables. Therefore, a cointegration (Johansen) test was used to determine whether a long-term relationship existed.

For a VAR model of order p can be defined as:

$$Y_t = C + \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + \cdots + \Phi_n Y_{t-n} + HX_t + \epsilon_t$$

Where: C represents $n \times 1$ constant vectors, $\Phi_i (i = 1,2, \cdots p)$ represents $n \times n$ autoregressive coefficient matrix. The ϵ_t represents $n \times 1$ dimensional vector white noise and satisfy the following equation: $E = (\epsilon_t) = 0, E(\epsilon_t \epsilon_t') = \Omega$. Where Ω represents $n \times n$ dimensional symmetric positive definite matrix and 0 means zero vector matrix. In the equation of VAR model, minus Y_{t-1} in each side, we can get:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + HX_t + \epsilon_t$$

Where $\Pi = \sum_{i=1}^{p} \Phi_i - I$, $\Gamma_i = -\sum_{j=i+1}^{p} \Phi_j$. Therefore, the test for the Y_t cointegration relationship translates into an analysis of the matrix Π. If the rank of the matrix Π is 1, it indicates that there is a cointegration relationship between the two cryptocurrencies, otherwise it indicates that there is no cointegration relationship between the two. In the equation of ΔY_t, the ΠY_{t-1} means error correction term, which represents the long-term equilibrium relationships of Y_t. At the same time, the matrix Π can be further decomposed into $N \times 1$ matrices, the matrix α and the matrix β, which are satisfied $\Pi = \alpha\beta'$, where α is the matrix of adjustment coefficients of the vector error correction model, reflecting the direction and speed of adjustment of the system back to equilibrium when it deviates from the equilibrium relationship; β is the matrix of cointegrating vectors, determining the number and form of cointegrating vectors among the components of Y_{t-1}.

The assumption that the characteristic roots Π be $\lambda_1 > \lambda_2 > \cdots > \lambda_k$, the statistical hypothesis test for the number of covariates can be carried out using both the Johansen eigen root trace statistic and the maximum eigenvalue-based statistic.

The statistic of trace test: $J_r = -T\sum_{r-i+1}^{k} Ln(1-\lambda_i) \quad r = 0,1,\ldots,k-1$

The statistic which based on the maximum eigenvalue test: $\epsilon_t = -TLn(1-\lambda_{r+1}) \quad r = 0,1,\ldots,k-1$

VAR Model. Whether it is a VAR or VEC model, we must first determine the lag order q. The sequence criterion of the Akaike information criterion, Bayesian information criterion, and Hannan-Quinn information criterion is adopted. Lütkepohl found that the lag lengths chosen by these criteria have the following relationship: q(SC) ⩽ q(HQ) ⩽ q(AIC). Suppose q(SC) =q(HQ) =q(AIC). The optimal lag order can be identified. Otherwise, the optimal lag length will need to be determined by analyzing the corresponding residual autocorrelations by running Ljung and Box's Portmanteau autocorrelation test. We prefer q(SC) because there are fewer unknown parameters to estimate.

If the variables are not cointegrated, Toda and Phillips suggest that Granger causality tests for VAR models using stationary difference data series have a higher effect than the direct use of finite-sample level data series. Therefore, the VAR model is estimated as:

$$\boldsymbol{Y_t = C + \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + \cdots + \Phi_n Y_{t-n} + \epsilon_t}$$

Among them, Y_t is an N×1 order time series vector, including finance, technology, education, labor force and agricultural economy; Φ_n is a coefficient matrix; C is a constant vector; $\boldsymbol{\epsilon_t}$ is a k-dimensional vector.

VEC error correction model. If the variables are co-integrated, a VEC-based model is used. The VEC model is a restricted VAR model of a non-stationary series known to be cointegrated. Compared with the VAR model, the VEC model adds a term $\boldsymbol{ECT_{t-1}}$ with a coefficient of δ. $\boldsymbol{ECT_{t-1}}$ is known as the error correction term, which contains information on the long-term relationship between cointegrated variables and can be obtained from the Johanson test. δ indicates that the deviation of the dependent variable from the long-run equilibrium is gradually corrected by a series of local short-term adjustments: (Juselius, 2006)

$$\boldsymbol{Y_t} = \boldsymbol{C} + \Phi_1 \boldsymbol{Y_{t-1}} + \Phi_2 \boldsymbol{Y_{t-2}} + \cdots + \Phi_n \boldsymbol{Y_{t-n}} + \boldsymbol{\epsilon_t} + \delta \boldsymbol{ECT_{t-1}}$$

Among them, $\boldsymbol{Y_t}$ is an N×1 order time series vector, Φ_n is a coefficient matrix, C is a constant vector, and $\boldsymbol{\epsilon_t}$ is a k-dimensional vector.

Impulse Response Function. The Impulse Response Function (IRF) reflects the fact that in a vector autoregressive model, a momentary shock is added to the factors affecting the volatility of the variables, or the variables and the model are subjected to a sudden stimulus, which affects the values of the variables in the current period and beyond. As endogenous variables are ranked in the VAR, they have a bearing on the impulse response. Pesaran and Shin (1998) utilised the generalised impulse response (GIR) technique to circumvent the ordering problem. Consider a p-order vector autoregressive (VAR) model:

$$Y_t = C + \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + \cdots + \Phi_n Y_{t-n} + HX_t + \epsilon_t$$

Where Y_t is a k-dimensional vector consisting of endogenous variables, Φ_i is a coefficient matrix, C is a constant vector, ϵ_t is a k-dimensional vector. The covariance matrix is Ω. With appropriate variations, the above model can be finally expressed as:

$$Y_t = C + \sum_{s=0}^{\infty}(\psi_s p)(P^{-1}\epsilon_{t-s}) = C + \sum_{s=0}^{\infty}(\psi_s p)(\epsilon_{t-s})$$

Where ψ is a coefficient matrix, C is a constant vector. P is a non-singular matrix that satisfy $PP' = \Omega$, ϵ_t is a vector white noise. Then the element in row i and column j of the coefficient matrix $\psi_s p$, represents the system as the s-period impulse response of the variable to an orthogonalized shock to one of the standard errors of the variable.

The model's impulse response function shows how a shock to one endogenous variable has an influence on other endogenous variables.

Variance Decomposition. Varying shocks are analyzed for their impact on endogenous variables using variance decomposition (usually measured by the variance). When using a VAR model, variance decomposition provides information about the relative relevance of each random disturbance. Following are a few examples of the fundamental notion (Peng et al., 2011)

$$y_{it} = \sum_{j=1}^{k}(a_{ij}^{(0)}\epsilon_{jt-1} + a_{ij}^{(1)}\epsilon_{jt-2} + a_{ij}^{(2)}\epsilon_{jt-3} + a_{ij}^{(3)}\epsilon_{jt-4} + \cdots)$$

It shows that the contents of each bracket are the sum of the effects of the j-th perturbation term i on y_i from infinite past to present time points. Find its variance, assuming that ϵ_j is not serially correlated, then $E\left[\left(a_{ij}^{(0)}\epsilon_{jt-1} + a_{ij}^{(1)}\epsilon_{jt-2} + a_{ij}^{(2)}\epsilon_{jt-3} + a_{ij}^{(3)}\epsilon_{jt-4} + \cdots\right)^2\right] = \sum_{q=0}^{\infty}(a_{ij}^{(q)})^2\sigma_{jj}, j = 1, 2, \ldots, k$. It is also assumed that the covariance matrix $\sum$ of the vector of perturbation terms is a diagonal matrix, so that the variance of y_i is a simple sum of the k terms of the above variance: $var(y_{it}) = \sum_{j=1}^{k}\{\sum_{q=0}^{\infty}(a_{ij}^{(q)})^2\,\sigma_{jj}\}\ i = 1, 2, \ldots, k$. The variance of y_i can be decomposed into k

uncorrelated effects, so to determine how much each perturbation term contributes relative to the variance of y_i , the following scale is defined: $RVC_{j\to i}(\infty) = \sum_{q=0}^{\infty}(a_{ij}^{(q)})^2\,\sigma_{jj} \Big/ var(y_{it}) = \sum_{q=0}^{\infty}(a_{ij}^{(q)})^2\,\sigma_{jj} \Big/ \sum_{j=1}^{k}\{\sum_{q=0}^{\infty}(a_{ij}^{(q)})^2\,\sigma_{jj}\}$, the relative variance contribution (RVC) is the relative contribution of the j-th variable to the variance of y_i based on the variance of the shock. Relative contribution to variance y_i of j-th variable is determined by the j-th variable's contributions to variance y_i.

Variable Selection

Explained variable. Agricultural economic development level (Y): This paper selects the total agricultural output value as a variable to measure the agricultural economic development level. The total agricultural output value is the total amount of all agricultural, forestry, animal husbandry, and fishery products expressed in currency within a certain period (usually one year), reflecting agricultural production's overall scale and overall results. The data comes from the "China Statistical Yearbook" over the years.

Explanatory variables. Technology (Tech): This paper uses the total power of agricultural machinery to measure technological progress. The total power of agricultural machinery refers to the total power of various power machinery mainly used in agriculture, forestry, animal husbandry, and fishery. The data comes from the "China Statistical Yearbook" over the years.

Finance (Fin): This article selects the state's fiscal expenditure on agriculture. The data comes from the "China Rural Statistical Yearbook" over the years, in which since 1998, "agricultural capital construction expenditure" includes the expenditure arranged for

additional issuance of the national debt. In addition, from 2007 onwards, the national fiscal expenditures for agriculture were adjusted due to the reporting system, and the caliber was different from that in previous years.

Education (Edu): This paper selects the education level of farmers to measure the degree of education's support to the rural economy. The education level of farmers is divided into five categories: no schooling, primary school level, junior high school level, high school and technical secondary school level, and college degree and above. Assuming that the number of years of education without schooling is 0, the number of years of education at the primary school level is 6, the number of years of education at the junior high school level is 9, the number of years of education at the high school and technical secondary school level is 12, and the number of years of education at the college level and above is 15. In the China Rural Statistical Yearbook, the percentage of the primary labor force with education at each level is used as the weight. The average number of years of education for farmers is calculated through the weighted average. Junior high school level × 9 + high school and technical secondary school level × 12 + college degree and above × 15)/100.

Labor force (Lab): This article uses the number of agricultural laborers to measure the degree of education support for the rural economy. The data comes from the China Statistical Yearbook.

Considering the availability and comparability of data, the selection range of the data in this paper is the annual data from 1991 to 2020.

Empirical Test Results

Descriptive statistics of each variable. For time series data, before conducting empirical analysis, in order to avoid the occurrence of spurious regression caused by the time trend of the data, the advanced descriptive statistics and unit root test of the data can be performed, and the regression analysis can be continued after the data is stable. To avoid the impact of the violent fluctuation of data on the empirical results, this paper first takes the logarithmic value of each variable with a significant value. Then it conducts descriptive statistics.

Table 1 Descriptive statistical analysis of each variable

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bare
EDU	7.75499	8.01450	8.345100	6.198600	0.57489	-1.15572	3.331700	6.815943
LNF	7.44049	7.49389	8.924576	5.495528	1.13262	-0.19867	1.620828	2.574906
LNT	11.0853	11.1623	11.62382	10.28836	0.44296	-0.43632	1.798927	2.755099
LNL	10.6552	10.7320	10.80037	10.26789	0.16733	-0.94410	2.579033	4.678125
LNY	10.0283	9.93040	11.18092	8.546059	0.76703	-0.16167	2.008925	1.358478

(1) LNY

LNY is the logarithm of GDP. We can see the key graph and summary statistics below. It can be seen from the distribution chart that the skewness of LNY is -0.16, which is obvious to the left. The kurtosis is 2.01, which is relatively close to the kurtosis of the normal distribution. From the value of Jarque-Bare is much greater than 0, it can also be judged that LNY does not conform to the normal distribution. It can be seen from the line chart that LNY is a gradual upward process.

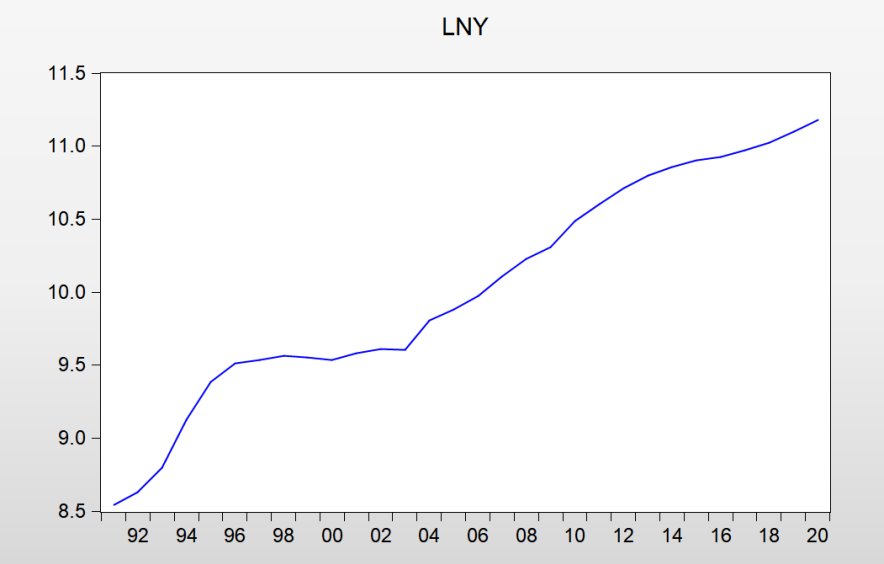

Figure 1 Graph of LNY

(2) LNT

LNT is the logarithm of the total power of agricultural production machinery. We can see the key graph and summary statistics below. It can be seen from the distribution diagram that the skewness of LNT is -0.44, which is obvious to the left. And the kurtosis is 1.80, which is a lower kurtosis. From the value of Jarque-Bare is much greater than 0, it can also be judged that LNT does not conform to the normal distribution. It can be seen from the line chart that LNT is a gradual upward process.

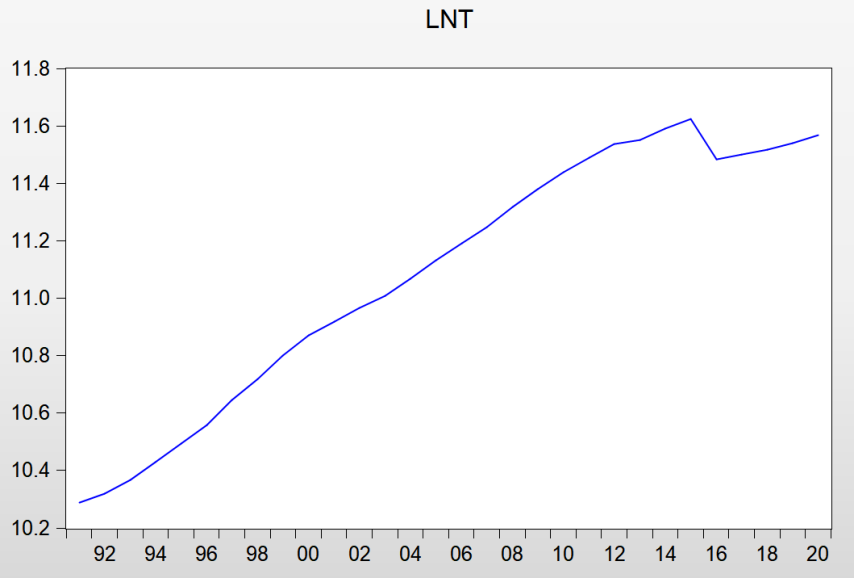

Figure 2 Graph of LNT

(3) LNL

LNL is the logarithm of the agricultural production labor force. We can see the key graph and summary statistics below. It can be seen from the distribution diagram that the skewness of LNL is -0.94, which is obvious to the left. The kurtosis is 2.57, which is close to the kurtosis of the normal distribution. From the value of Jarque-Bare is much greater than 0, it can also be judged that LNL does not conform to the normal distribution. It can be seen from the line chart that LNL is a gradual decline process.

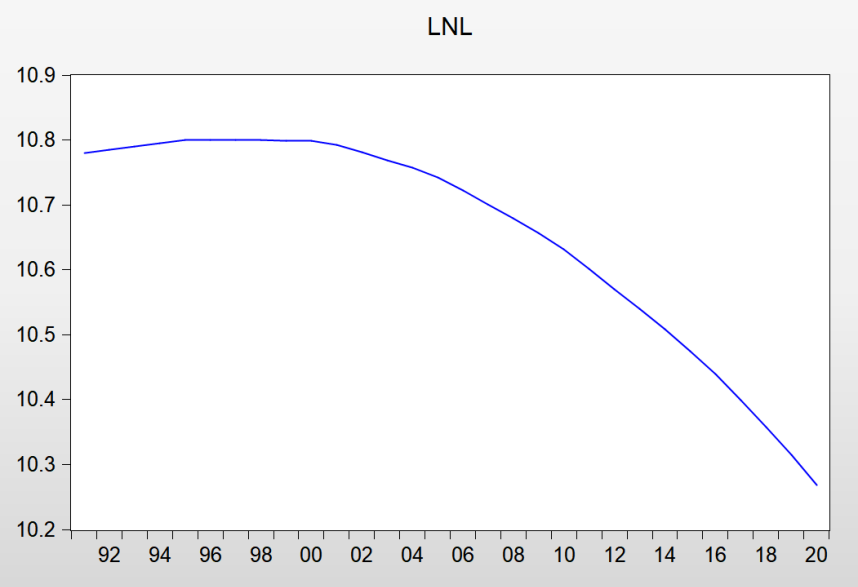

Figure 3 Graph of LNL

(4) LNF

LNF is the logarithm of national fiscal expenditure on agriculture. We can see the key graph and summary statistics below. It can be seen from the distribution diagram that the skewness of LNF is -0.19, which is left skewed. The kurtosis is 1.62, which is a low kurtosis. From the value of Jarque-Bare is much greater than 0, it can also be judged that LNF does not conform to the normal distribution. It can be seen from the line chart that LNF is a process of rising fluctuations.

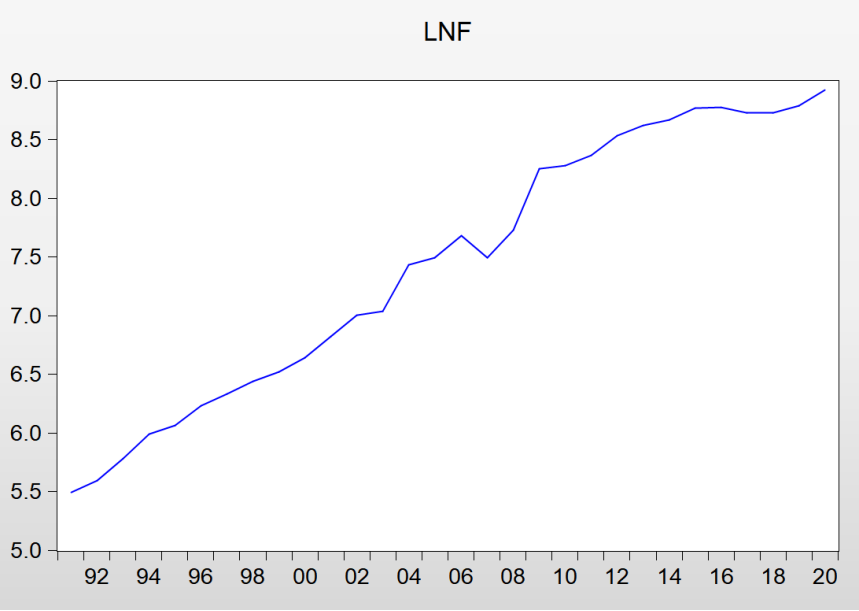

Figure 4 Graph of LNF

(5) EDU

EDU is the logarithm of the educational attainment of an agricultural laborer. We can see the key graph and summary statistics below. It can be seen from the distribution chart that the skewness of EDU is -1.15, which is obviously left skewed. The kurtosis is 3.33, close to the kurtosis of the normal distribution. From the value of Jarque-Bare is much greater than 0, and the p-value is significant, it can also be judged that EDU does not conform to the normal distribution. It can be seen from the line chart that EDU is a process of rising fluctuations.

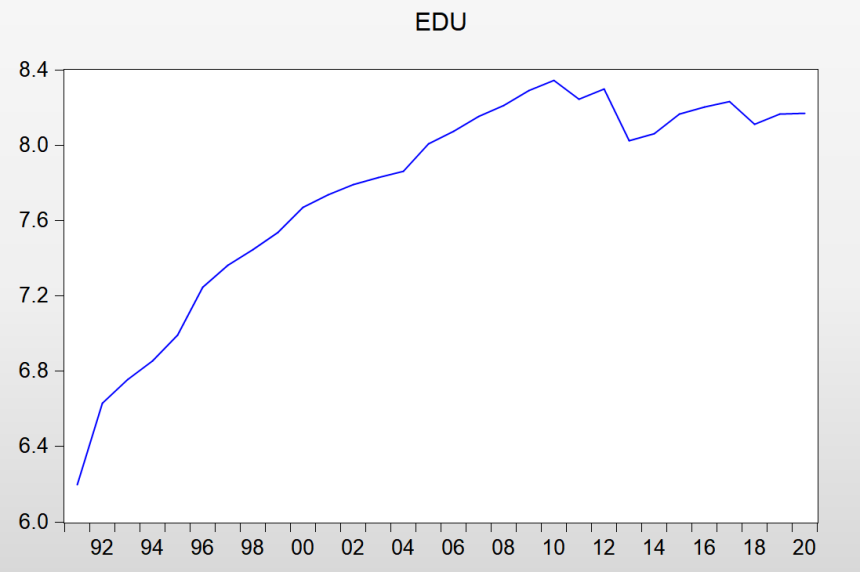

Figure 5 Graph of EDU

Stationarity Test. For time series data, the data first needs to be tested for stationarity. For stationary time series data, a regression can be performed directly. In contrast, for non-stationary time series data, the data needs to be processed to eliminate its time trend before continuing the empirical analysis. Usually, the data is differentially processed to make it stable. The cointegration analysis is carried out for the variables with the same order of single integration to study their long-term equilibrium relationship. Therefore, the first step in the empirical analysis is to carry out the unit root test. If the data does not have a unit root, we consider the data to be stationary. Otherwise, we consider the original series to be non-stationary.

The stationarity test must be carried out from case 1 to case 3. If the null hypothesis is rejected, that is, the sequence is stationary, the stationarity test can be stopped. If the null hypothesis cannot be rejected in all three cases, the sequence is not stationary, and further difference processing is required.

For non-stationary variables, the first-order difference processing is performed first, and then the ADF test is continued. If the first-order difference is still non-stationary, the second-order difference is performed, and so on, until the variable is stable. The test results are shown in the following table:

Table 2 Stationary test

Variable	T statistics	Critical value			Conclusion
		1%	5%	10%	
LNY	-3.589	-4.356	-3.595	-3.233	Unstable
DLNY	-3.919	-4.394	-3.612	-3.243	Stable
LNT	0.363	-4.310	-3.574	-3.222	Unstable
DLNT	-4.603	-4.324	-3.581	-3.225	Stable
LNL	0.478	-4.339	-3.588	-3.229	Unstable
DLNL	-3.888	-4.339	-3.588	-3.229	Stable
LNF	-1.346	-4.309	-3.574	-3.222	Unstable
DLNF	-5.931	-4.324	-3.581	-3.225	Stable
LND	-2.665	-4.310	-3.574	-3.222	Unstable
DLND	-6.675	-4.324	-3.581	-3.225	Stable
EDU	-2.665	-4.310	-3.574	-3.222	Unstable
DE	-6.675	-4.310	-3.574	-3.222	Stable

Note: LN is the logarithm. D is the first-order difference, and taking the first-order difference sequence for the natural logarithm will get the rate of change, which still retains the economic meaning.

The ADF test results show that the original sequence data of the total agricultural output value Y, the educational level of agricultural labor force (Edu), the fiscal expenditure (Fin), the total power of agricultural machinery (Tech), and the number of rural labor forces (Lab) did not reject the original sequence data at the 5% significance level, that is, they all accept the hypothesis with one unit root, so the original sequence data are non-stationary data. At the significance level of 5%, the first-order difference values of all variables reject the null hypothesis of unit root. Therefore, the first-order difference values

of all variables are stationary data and first-order unintegrated, which meets the conditions for the next co-integration test and the establishment of VAR or VEC model.

The logarithmic difference of gross agricultural output is the growth rate: $DLNY = LnY_t - LnY_{t-1}$

The logarithmic difference of the total power of agricultural machinery is the growth rate: $DLNT = LnT_t - LnT_{t-1}$

The logarithmic difference of fiscal expenditure on agriculture is the growth rate: $DLNF = LnF_t - LnF_{t-1}$

The logarithmic difference of the rural labor force is the growth rate: $DLNL = LnL_t - LnL_{t-1}$

The logarithmic difference of the educational attainment of the agricultural labor force is the variation: $DE = LnE_t - LnE_{t-1}$

Cointegration Test. After the above data processing, the non-stationary time series has been transformed into stationary time series. Since most of the time series data are non-stationary, to eliminate the trend components in the data, the form of difference is often used. Theoretically, first-order difference can be carried out first to observe whether it is stable; if not, second-order difference can be carried out until it is stable. However, it should be noted that after multiple differences, the data is no longer of economic significance, and the conclusions obtained from this model are not convincing. In order to solve the above problems, Engle and Grange established the cointegration theory and its method in 1987 to deal with non-stationary time series data. That is, some economic variables, even if they are non-stationary, their linear combination may be stationary. This stationary sequence combination, called the cointegration equation, expresses a

long-term stable equilibrium relationship among various economic variables. We must be aware of is:

(1) As a description of the relationship between non-stationary variables, the cointegration vector is not unique.

(2) For k variables, there are at most k-1 cointegration vectors.

(3) The cointegrated variables must have a common trend component.

Currently, there are two main cointegration test methods: the test based on regression coefficients, such as the Johansen cointegration test, and the test based on regression residuals, such as the DF, ADF test, and CRDW test. Although various test methods are still in use, it is generally believed that the Johansen cointegration test is more accurate than other test methods. This paper also uses the Johansen test method to perform the cointegration test.

The above analysis shows that the variables are first-order single integral and have the same trend component, so the preconditions for the cointegration test are met, and the cointegration test results are shown in the following figure.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.720441	91.20490	69.81889	0.0004
At most 1 *	0.657227	55.51775	47.85613	0.0081
At most 2	0.466616	25.53848	29.79707	0.1431
At most 3	0.223149	7.940123	15.49471	0.4718
At most 4	0.030591	0.869918	3.841466	0.3510

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 6 Cointegration Test (Trace)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.720441	35.68716	33.87687	0.0301
At most 1 *	0.657227	29.97927	27.58434	0.0242
At most 2	0.466616	17.59836	21.13162	0.1456
At most 3	0.223149	7.070205	14.26460	0.4809
At most 4	0.030591	0.869918	3.841466	0.3510

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 7 Cointegration Rank Test (Maximum Eigenvalue)

From Figures 3 and 4, at the 5% significance level, the results of the trace test and the maximum eigenvalue test both show that there are two cointegration relationships.

VEC Error Correction Model. In the previous analysis, we know two cointegration relationships exist between the five variables, so we construct a VEC model. The first step is determining the optimal lag order. The determination of the optimal lag order is essential for the establishment of the model. If the lag order is too large, on the one hand, the sample size will be reduced. On the other hand, it will lead to too many variables in the model and too many parameters to be estimated, and too little lag in order will lead to missing information. The information criterion is mainly used to determine the proper lag order, including SC, AIC, and the likelihood ratio test (LR). The optimal lag order corresponding to different information criteria may be different. Generally, a few judgments are subject to the principle of majority.

Lag	LogL	LR	FPE	AIC	SC	HQ
1	260.4144	NA	9.63e-15*	-18.10880*	-16.89909*	-17.76045*
2	274.1879	16.95205	2.75e-14	-17.24523	-14.82581	-16.54852
3	304.4390	25.59703	3.34e-14	-17.64915	-14.02003	-16.60409

Figure 8 Optimal Lag Order

Through the comparison of different methods, this paper finally determines that the lag order is 1, and the obtained VEC model estimates are as follows:

Cointegrating Eq:	CointEq1	CointEq2
DE(-1)	1.000000	0.000000
DLNF(-1)	0.000000	1.000000
DLNL(-1)	-4.897063	0.681866
	(1.06079)	(1.16180)
	[-4.61642]	[0.58690]
DLNT(-1)	0.985936	-1.866491
	(0.47781)	(0.52331)
	[2.06344]	[-3.56670]
DLNY(-1)	-0.406824	-0.252217
	(0.17886)	(0.19589)
	[-2.27456]	[-1.28754]
C	-0.149394	0.001066

Error Correction:	D(DE)	D(DLNF)	D(DLNL)	D(DLNT)	D(DLNY)
CointEq1	-1.095674	0.211170	-6.34E-05	-0.170499	0.544721
	(0.29405)	(0.46992)	(0.00737)	(0.15061)	(0.24370)
	[-3.72618]	[0.44938]	[-0.00860]	[-1.13205]	[2.23517]
CointEq2	-0.272479	-1.307738	-0.011111	0.113339	0.225217
	(0.21913)	(0.35020)	(0.00549)	(0.11224)	(0.18162)
	[-1.24343]	[-3.73426]	[-2.02278]	[1.00979]	[1.24006]
D(DE(-1))	0.035005	-0.153375	-0.007465	0.010564	-0.397976
	(0.18443)	(0.29474)	(0.00462)	(0.09447)	(0.15286)
	[0.18980]	[-0.52037]	[-1.61473]	[0.11183]	[-2.60360]
D(DLNF(-1))	0.223280	0.072445	0.005166	-0.086252	-0.152517
	(0.14262)	(0.22792)	(0.00358)	(0.07305)	(0.11820)
	[1.56554]	[0.31785]	[1.44493]	[-1.18071]	[-1.29028]
D(DLNL(-1))	1.782171	22.87467	-0.026780	3.582682	9.907142
	(9.15375)	(14.6286)	(0.22945)	(4.68855)	(7.58657)
	[0.19469]	[1.56369]	[-0.11671]	[0.76413]	[1.30588]
D(DLNT(-1))	-0.100770	-0.848133	-0.001733	-0.175942	0.165157
	(0.47835)	(0.76446)	(0.01199)	(0.24501)	(0.39646)
	[-0.21066]	[-1.10945]	[-0.14449]	[-0.71809]	[0.41658]
D(DLNY(-1))	-0.376834	-0.272550	-0.004525	-0.057046	-0.082125
	(0.25365)	(0.40537)	(0.00636)	(0.12992)	(0.21023)
	[-1.48562]	[-0.67235]	[-0.71168]	[-0.43908]	[-0.39065]
C	-0.000746	0.036017	-0.002106	0.005471	0.008495
	(0.02259)	(0.03610)	(0.00057)	(0.01157)	(0.01872)
	[-0.03303]	[0.99756]	[-3.71925]	[0.47282]	[0.45370]

Figure 9 VEC model regression result

Impulse response function. In practical application, because VEC model is a non-theoretical model, the analysis model usually does not focus on the analysis of how the change of one variable will cause the change of another variable. Instead, it analyzes the impact on the whole system when an error term changes, or the system is affected by impact. This is the impulse response function. Since this paper mainly studies the impact of finance, technology, education, and labor force on the development of the agricultural economy, it mainly considers the impact on the total agricultural output value when the error term of each variable is disturbed.

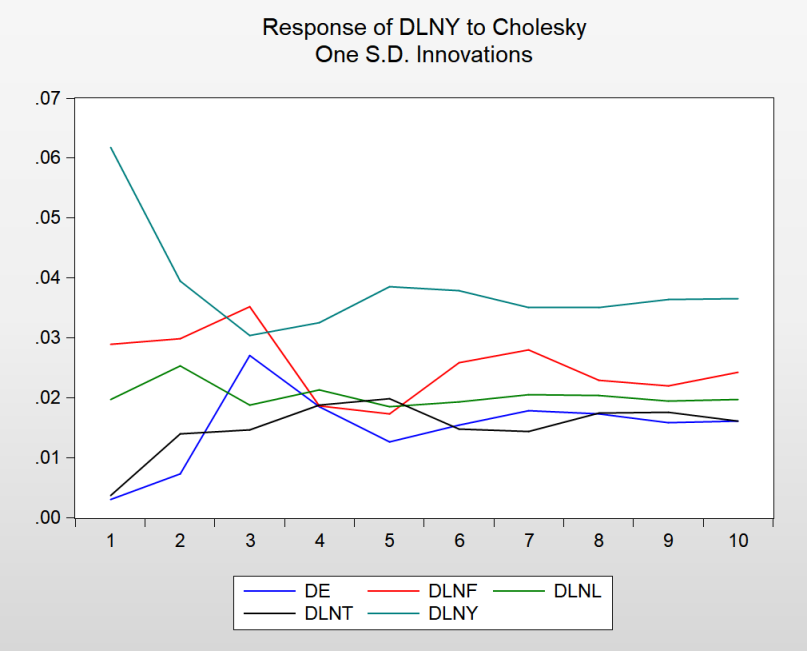

Figure 10 DLNY Impulse Response Function Summary Chart

From Figure 10, we can see that the five variables positively impact the total agricultural output value. When a standard deviation of itself impacts the total agricultural output value, the impact reaches the maximum in the first period. It begins to stabilize after the fifth period, indicating that the agricultural output value has a prominent positive role in promoting itself. Moreover, it was most affected at the beginning. When the fiscal

expenditure on agriculture is impacted by one standard deviation, the impact on the total agricultural output value reaches the maximum in the third period. The impact on the total agricultural output value exceeds its impact on itself and remains relatively relative from the sixth period onwards smooth. After giving a standard deviation shock to the rural labor force, the impact on the total agricultural output value reaches the maximum value in the second period and remains relatively stable. After the impact of one standard deviation on the total power of agricultural production machinery, the impact on the total agricultural output value is close to zero at first. It then gradually increases, reaching a peak in the fifth period and leveling off. When the education level of the agricultural labor force is impacted by one standard deviation, it has the most significant impact on the agricultural output value in the third period. Then it remains relatively stable after the seventh period. Overall, the impact of fiscal expenditure on agriculture, the education level of the agricultural labor force, the rural labor force population, and the total power of agricultural production machinery all stabilized after the eighth period.

Variance Decomposition. Variance decomposition describes the degree of explanation by other independent variables when the dependent variable changes. This paper only considers the degree of explanation by other independent variables when the total agricultural output is the dependent variable. The result is shown below:

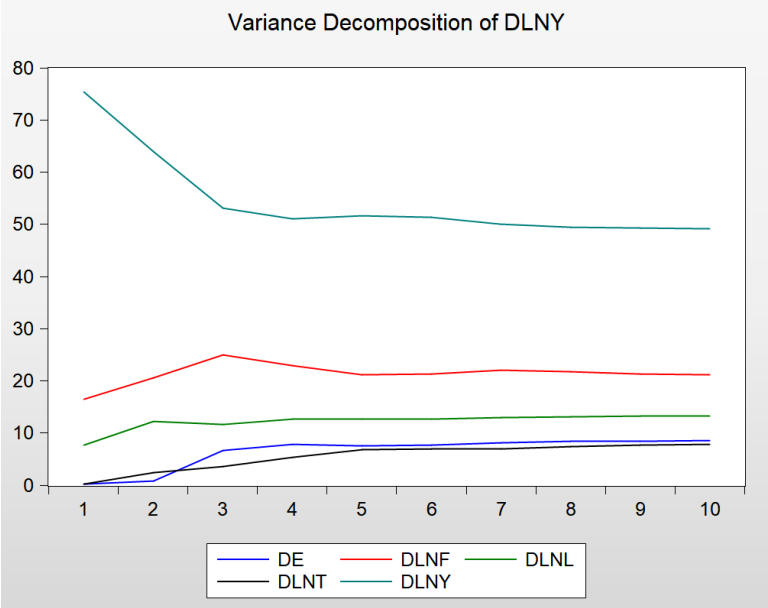

Figure 11 Variance Decomposition of DLNY

Figure 11 shows the variance decomposition of the total agricultural output value. From the figure, we can see that the variance decomposition of the total agricultural output value is mainly caused by itself at the beginning, followed by the fiscal expenditure on agriculture and the number of labors. Then the total agricultural output shows a gradual decline, while the level of explanation of the variance decomposition of the total agricultural output by the fiscal expenditure on agriculture, the rural labor force, the education level of the agricultural labor force, and the total power of agricultural production machinery has gradually increased. After the tenth period, the impact of the total agricultural output value on itself will remain at about 49%, the impact of fiscal expenditure on agriculture will remain at 22%, and the impact of the rural labor force will remain at 13%. Momentum's influence is very close to staying at the 8% level. In the long run, the total agricultural output value is mainly affected by the fiscal expenditure on agriculture and the labor force.

Empirical Conclusion Analysis

This paper mainly conducts an empirical test on the promotion of agricultural growth by technology, finance, education, and labor. First, the stability test and cointegration test of each variable are carried out, and the impulse response function and variance decomposition are carried out by establishing a VEC model. Finally, the following results were obtained: technology, the growth rate of the total power of agricultural production machinery, will promote agricultural economic growth, but its promotion effect is small, about 8%. In the process of agricultural growth, the driving impact of the total power of agricultural production machinery accounts for about 8%, which is relatively weak compared with other variables. It accepts hypothesis 1: the total power of agricultural production mechanization, the degree of mechanization, can significantly promote agricultural economic growth. It may be related to the national conditions of China's agricultural economy. First, the various terrains of China's land are staggered, scattered, and uneven, and large-scale farmland cannot be formed. Second, agricultural production conditions are relatively poor. Planting is less standardized and more affected by seasonality and weather. In addition, farmers are primarily based on the household contract responsibility system. Suppose the degree of mechanization is too high. In that case, the farmers will invest too much in the degree of machinery, the maintenance cost and operation costs will be high, and the input and output will not correspond to reduce farmers' income.

Education, the education level of the rural labor force also promotes agriculture, which also accepts hypothesis 3 to a certain extent: education can promote agricultural economic growth, but its influence is close to that of technology is also about 8%. The

overall influence degree is small. Compared with the fiscal expenditure on agriculture and the rural labor force, the educational level of the rural labor force has a limited role in promoting China's agricultural economic growth. For the current agricultural economy, the continuous improvement of the educational level will enable the agricultural labor force to master more efficient planting methods, increase the total output per unit area, and bring about long-term and stable growth of the agricultural economy. A significant reason for this result may be that the explanatory variable in this paper is academic education. Generally, agricultural production pays more attention to practicality and should pay more attention to professional training in agricultural production skills, so the impact of academic education is limited. In the follow-up research, the rural labor force's vocational training can be considered an explanatory variable to analyze its impact on the agricultural economy further.

There is a long-term positive relationship between the labor force, that is the growth rate of the rural labor force population and the development of the agricultural economy. The impact is relatively strong, at about 12%. It shows that the greater the growth rate of the rural labor force, the greater the agricultural output value growth rate. This regression conclusion accepts hypothesis 4: the increase in the rural labor force will significantly promote the growth of the agricultural economy. Agricultural labor is the basis for the existence and development of the entire agriculture, the national economy, and society. Because of the constraints of the congenital and production conditions of China's agriculture, agricultural labor still plays a vital role in agricultural development. However, from the perspective of the overall rural labor force population, it shows a downward trend

year by year. The loss of China's rural labor force population will also have a restrictive impact on the development of China's agricultural economy.

Finance, that is, the fiscal expenditure related to agriculture in this paper will promote agricultural economic growth to a considerable extent. It accepts the second hypothesis of this paper: financial support will significantly promote the development of the agricultural economy, which is a long-term impact, accounting for 21% of the impact. Compared with the above three factors, the impact is the highest. It is also in line with common sense. Agricultural production is more dependent on the climatic conditions of the current year, and the initial investment in agricultural production in the new year is based on the previous year's income. Without good agricultural support policies and national encouragement, agricultural development is relatively unstable, so financial support is more important for agricultural development. For details, we can refer to the introduction of the three rural policies in 2004, and agricultural development has rapidly improved.

CHAPTER IV

THE SUCCESSFUL CASE OF CHINA'S AGRICULTURAL ECONOMY

Examples of U.S. farms

At the end of the 20th century, Anji County was once one of the impoverished counties in Zhejiang Province. After more than 20 years of development, Anji has become a wealthy Zhejiang Province's top-ranked county. The change is to rely on Anji's land resources, natural resources, and other aspects of investment in technology, finance, education, and labor to jointly help this beautiful mountain village move towards the big stage of China's economy.

Anji is located in the northwest of Zhejiang Province. It is a famous bamboo town in China. The county has a forest area of 135,300 square hectares, of which the bamboo forest area is 67,300 hectares, and the Moso bamboo forest accounts for 58,400 hectares. Rich forest resources, especially bamboo resources, provide basic conditions for the development of understory economy in Anji County. With the advantages of bamboo forests and natural landscapes, Anji develops high financial value-added industries such as tourism, the tea industry, and the bamboo industry. In 2020, the county's total output value of leisure agriculture and rural tourism will reach 4.66 billion yuan, the number of tourists will be 10.56 million, and the revenue will reach 2.148 billion yuan.

Technological Innovation: First of all, relying on the resource advantages and industrial base of Anji, bamboo products, white tea, healthy Chinese medicine and other industries have gradually developed into dominant industries. It could realize standardized production and regional transformation. Second, the government encourages enterprises and universities to develop key technologies jointly. They promote the docking and transformation of advanced and original technologies by building public service platforms

such as bamboo, white tea and Chinese medicinal materials industry research and development institutions, academician expert workstations, and technology trading institutions. Through technology development, Anji's white tea has realized precise input, remote service, and real-time production process monitoring, greatly improving production and efficiency, and the technology coverage rate has reached 90%. According to the "full price utilization, cross-border development" concept to promote the in-depth processing of tea, with science and technology to achieve the promotion of industrial value chain. First, enterprises need to be equipped with fast detector which is used for self-inspection of organic phosphorus, chrysanthemum, and heavy metals in dried and fresh tea. At the same time, it will conduct sampling together with relevant departments to ensure product safety. Second, enterprises implement the ID card system for tea gardens in the management of tea gardens. The first "six-in-one" intelligent management system can uniformly code more than 390 member units, print anti-counterfeiting marks, and implement traceability management from production to sales through the implementation of the "Anji White Tea Gold Traceable Card" system of Internet of Things + finance. In 2019, the public brand value of "Anji White Tea" reached 4.092 billion yuan, and it has been among the top ten national tea general brands for decade.

Financial Support: In the past ten years, the county's financial sector has invested 16.9 billion yuan in agriculture. After implementing the "Beautiful Village Loan", the County Rural Commercial Bank has lent a total of 3.65 billion yuan, supporting the construction of beautiful countryside in 164 villages. Through low-interest loans, the County Rural Commercial Bank gave more than 56 million yuan of profits to agriculture. Especially starting in 2018, the county government and the county rural commercial bank

allocated 100 million yuan to set up a special development fund for rural revitalization in Anji County, which was specifically responsible for the county agriculture and rural bureau. The bank provides project loans of 3 million to 5 million yuan to underdeveloped villages every year (by the end of 2023, it will be used interest-free for five years, and the county rural commercial bank will bear the interest) for development. In addition, the government set up a 100 million yuan "loan for rural villages" (low-interest loans, interest-free use in project villages for five years, and the interest is borne by the county finance) to implement targeted assistance programs for economically weak villages. Currently, the project has helped 40 villages provide 100 million yuan of interest-free loans, promoting the "secondary" development of the rural economy.

Talent and Education: The first measure is to strengthen the talent guarantee. By implementing the talent reserve training plan, the government has strengthened cooperation with colleges and universities to carry out special training for agricultural practitioners jointly. Secondly, the government can organize public lectures for successful agricultural people or actively hold industry skill competitions to enhance practitioners' sense of belonging and honor. Finally, the government must allow the development of the rural economy to agriculture. In all kinds of public recruitment, through establishing tourism professional personnel positions, to absorb more talents.

Examples of U.S. farms:

Escalante Farm covers an area of 22,000 acres and is located in the northeast of Utah, adjacent to Colorado. It is one of the most famous farms in Utah and one of the oldest farms in the state. In 1776, the Spaniard Escalante passed by here and recorded the farm on the map of the western United States. After that, the farm has been named after

Escalante. The Green River embraces Escalante on three sides, and the famous Dinosaur National Monument is on the other side of the river. The farm is 15 miles from Vernal, Utah, and it takes only 15 minutes to get to the nearest airport, and there are daily flights to Denver or Salt Lake City.

The fertile soil of Escalante Farm presents different intoxicating scenery throughout the year, providing a beautiful source of inspiration for artists and students. There are precious natural resources such as mountains, rivers, forests, and wetlands on the farm; there are a large number of wild animals such as black-tailed deer, red deer, antelope, and turkey. There are tens of thousands of birds such as wild ducks, wild geese, and sandhill cranes. There are 17 large sprinkler circles and more than 3,000 acres of alfalfa planting area on the farm.

The farm's pasture-producing area consists of 2,145 acres of irrigated farmland and 1,000 acres of river flood plains. Forage grass is harvested from four crops yearly, with an average annual yield of 6-7 tons per acre. The quality of the forage grass produced by Escalante Farm is very good. The moderate crude protein of the forage grass is over 22%, the RFV generally reaches 170, and the highest RFV can reach 240. These high-quality pastures are mainly supplied to large-scale dairy farms and special training horse farms.

The farm is also equipped with complete living and working facilities. There are six villas, one for the rest of the farmers, one for office, and the other four houses ranging from 1,000 to 2,000 square feet. The entire farm can accommodate 30 people for lodging and rest. There are relaxing rooms, maintenance workshops, garages, sheds, grass sheds, warehouses, scales, livestock pens, fences, and other facilities.

The Escalante farm has complete water conservancy facilities. The Green River provides sufficient water security for the alfalfa plantation on the farm. Through 12 miles of underground pipelines, three water stations and 12 high-horsepower water pumps, Green River sends water to 142 water towers in 17 sprinkler rings, continuously sending water to the fields.

From the perspective of financial policy support, the initial purchase of the farm cost 7.8 million US dollars, plus the renovation and addition of equipment, and the total cost was close to 10 million US dollars. At the time, the Bank of America also valued the farm at $10 million. Therefore, the farmer can use the farm as collateral to borrow 6.5 million from the bank and put the 6.5 million into agricultural production or reinvest. If they invest 6.5 million in agricultural production, farmers can update advanced equipment and build a modern farm. If they choose to reinvest, farmers can buy new farms for reproduction. No matter which option they choose, it can reduce the farmer's financial pressure and operating pressure. In the United States, farmers usually use banks' mature assessment systems and monetary financing methods, such as refinancing, to diversify capital risks for farm operations. At the same time, farmers use funds for reinvestment and reproduction, which can promote the entire agricultural development and agricultural modernization.

From a technical point of view, all mechanized operations are realized in the Escalante farm, and only four employees are required to complete all the work of the entire farm, from planting to harvesting. The farm is fully covered by WIFI, and many high-definition network cameras and wireless security positioning devices are distributed to realize electronic harvesting and sprinkler irrigation.

It can be seen from the modern farms in the United States that the development of agriculture must be inseparable from financial support. At the same time, technology and talents are equally important. Although only four people are required to manage 22,000 acres of land, the quality requirements for talent are very high. In addition, the farm's advanced machinery and visible technology have an obvious role in promoting agricultural development.

In summary, according to the analysis of these two cases, it is consistent with our regression results. Financial support has the greatest impact on the development of the agricultural economy, followed by technology, which also plays a very positive role in the development of the agricultural economy. The effect on the population is relatively general, but the impact of education, the quality of employees on agricultural economic development, will be higher.

CHAPTER V

CONCLUSION AND SUGGESTION

In any economy, the development of agriculture depends on the interaction of four elements: technology, finance, education, and labor. In 1988, some scholars in Japan also put forward the 'Theory of Agricultural Development Stages'. It divides agricultural development into three stages: the development stage of improving the quality of agricultural products, the stage of increasing farmers' income, and the stage of optimizing the agricultural industry structure. The main goal of the three stages of agricultural development is to solve the problems of food security, poverty, and agricultural structure in different stages of economic development. They pay great attention to the allocation of agricultural resources and the input of production factors in the stages of agricultural development. Agricultural development results from coordinating finance, labor, technology, and education. Due to labor scarcity and insufficient financial support, the introduction of effective agricultural support policies and the rational allocation of agricultural resources is essential for agricultural development. According to the regression results above, financial support for agriculture and the rural labor population has the most substantial influence. Therefore, the policy recommendations can be divided into four parts:

1. The rapid and stable development of agriculture is inseparable from financial solid and financial support

For farmers, financial agriculture-related funds are a kind of low-cost funds and even more than that. Agricultural production is a relatively long-term process, and the cycle of profit conversion is relatively long, so farmers need more financial support than urban residents. From the model results, we can see a long-term equilibrium positive relationship

between fiscal expenditure on agriculture and the gross output value of agricultural production. Its role in promoting agriculture is also relatively prominent.

In recent years, the country's fiscal expenditure on agriculture has also increased year by year. These financial supports can directly from the impact of the agricultural economy on social demand and purchasing power, which can effectively improve the environment for agricultural economic growth and provide a powerful force for promoting agricultural economic growth. Fiscal agriculture-related support builds a favorable environment for economic development. Under the promising situation of agricultural development, it can attract farmers to participate in the development of agricultural production, vigorously invest in agricultural planting and production, increase the amount of agricultural and human capital, expand the cultivated area of crops, improve the industrial structure, and then improve the efficiency of agricultural economic growth.

2. Pay attention to the loss of the agricultural labor force and promote the better development of the agricultural economy

In recent years, due to the widening gap between urban and rural areas, the problem of "hollowing out" in rural areas has become severe. More and more rural people have lost their lives to cities. From the regression results, the change rate of the agricultural labor force substantially impacts the development of the agricultural economy. Therefore, the problem of the loss of the agricultural labor force still deserves attention.

On the one hand, the transfer of agricultural labor is unavoidable, and we can rely on organizational system innovation to improve agricultural productivity. First, increase the construction and support of new agricultural business entities such as family farms, farmers' professional cooperatives, and agricultural socialization service organizations, and

improve the degree of agricultural organization. At the same time, through the "company + cooperative + farmer" model, establish an agricultural industrialization consortium to promote the organic connection between small farmers and modern agriculture. Second, make full use of the reform of the "separation of three rights" in rural land and the reform of the collective property rights system. Based on voluntary and paid farmers, speed up the transfer of land management rights, moderately expand the scale of operation, and strengthen unified management.

On the other hand, in the face of our current problems, such as the "aging" of the agricultural labor force, we should open farmers' income channels and attract migrant workers to return to their hometowns for employment. First, we must fully tap the potential of increasing agricultural income, focus on the use of various agricultural resources, expand the various functions of agriculture, and do an excellent job in planning and constructing the regional layout of agricultural products. Secondly, they can encourage good areas to develop the production of economic crops such as cotton and sugar, strengthen the construction of production bases for export products such as horticulture, aquaculture, and cocoon silk, support "one village, one product", and develop characteristic agriculture, leisure agriculture and rural tourism. It could promote the intensive processing of agricultural products and increase the added value of products at multiple levels. Third, they can promote land-saving, water-saving, plant-saving, fertilizer-saving, chemical-saving, energy-saving, and other technologies to reduce agricultural production costs. Fourth, expanding the space for non-agricultural employment is necessary to increase income, improve the secondary and tertiary industries in rural areas, and increase farmers' income through multiple channels. It is necessary to focus on increasing farmers' income

in the primary distribution and redistribution, guide the price of agricultural products to maintain a reasonable level, promote the steady and orderly increase of wages of migrant workers, and strive to allow farmers to get more income from the price of agricultural products and labor remuneration. Finally, they can improve the quality of township enterprises, actively develop household industries, enhance the vitality of county economic development, promote the transfer of employment of farmers, and support migrant workers returning to their hometowns to start businesses.

3. Identifying the direction of technological progress can better help the development of the agricultural economy

Agricultural mechanization has become the main body of the transformation and innovation of agricultural scientific and technological achievements, especially in today's structural decline in the number and quality of agricultural labor. Promoting and using good seeds and suitable methods must take agricultural machinery as the carrier and combine with light simplification and large scale, standardized and intensive mode of modern agricultural production. From the regression results, a single mechanization development has a minimal role in promoting agricultural economic development. Therefore, combining agricultural mechanization and informatization is an inevitable choice for rural development in the future. It is more effective than pure mechanization for sustainable agricultural development. China is a late-developing country. In recent years, informatization has developed rapidly. Under the new technological and economic conditions, agricultural mechanization is driven by informatization, and agricultural informatization is promoted in developing agricultural mechanization—the leap-forward development of productivity. Use information technology to transform traditional

agricultural production methods, machinery manufacturing, and distribution industries, comprehensively improve the technical content of agricultural products and machinery products and improve the overall competitiveness of agriculture. The development path of new agricultural mechanization should be driven by agricultural informatization, technological progress and innovation. Relying on technological progress and input in agricultural mechanization, they should promote the accumulation of knowledge and the improvement of workers' quality, and constantly raise agricultural labor productivity and economic benefits, to enhance the international competitiveness of agriculture.

4. The development of modern agriculture depends on a new type of farmers who are literate, knowledgeable and skilled in management

Farmers are the main force of the agricultural economy. After the reform and opening, the overall education level of farmers has been improved to a certain extent, but the quality of farmers needs to be higher. Therefore, it is necessary to strengthen the cultivation of new-type farmers to adapt them to modern agricultural economic development needs, form a complete agricultural industry chain, and strengthen the solution of surplus labor in rural areas. The government should vigorously support the professional training of the rural labor force. They can vigorously popularize water-saving irrigation technology, popularize advanced fertilization technologies such as diagnostic fertilization and precision fertilization, carry out pilot projects for the promotion of no-till cultivation technology, and accelerate the popularization of crop precision and semi-precision seeding technology. What’s more, they can actively promote intensive, efficient, and ecological livestock and poultry aquaculture technology to reduce feed and energy consumption. Otherwise, they can organize implementing of the new rural practical talent

training project, focusing on training experts in planting and breeding, scientific and technological leaders, rural brokers, professional cooperative organizations and other talents.

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