

Research on the Whole Rice Industry Chain Model from the Perspective of Rural Revitalization: Taking Qianshan City as an Example

Ziyue Zhang, Yiwei Zhao, Minghui Bu, Wenxiu Ye and Huiheng Zhang*

School of Anhui University of Finance and Economics, Bengbu, 233000, China

*Corresponding Author

Abstract

The report of the 20th National Congress of the Communist Party of China proposes to comprehensively promote rural revitalization, adhere to the priority development of agriculture and rural areas, and accelerate the construction of an agricultural power. Studying the supply chain of agricultural products is one of the ways to achieve rural revitalization, with the aim of providing agricultural products to consumers quickly and safely, while reducing costs in the supply chain and improving economic benefits. Rice, as one of the most important food crops, feeds over half of the population. Research on the rice supply chain has special significance, and rural revitalization policies provide new opportunities for the value-added and transformation upgrading of the entire rice industry chain. This article focuses on the hot issues of the agricultural product industry chain, taking Qianshan City, which has a well-developed industry chain in Anqing City, as an example. Through a questionnaire survey, it deeply studies the basic cognitive status, acceptance willingness, and influencing factors of farmers in the two cities and five counties under the jurisdiction of Anqing City on the entire rice industry chain. It also conducts multi-dimensional exploration and exploration on the existing problems and development strategies of the entire rice industry chain, and deeply analyzes the acceptance bottleneck of new models of the rice industry chain for farmers. On the one hand, it fills the gap in existing research content, and on the other hand, it has important practical significance for achieving the goal of rural revitalization. In response to the basic cognitive status of farmers on the entire rice industry chain, this article uses a cross contingency table to analyze the internal correlation between the respondents' basic information and cognitive status. Based on this, K-means clustering method is used to classify the respondents' relevant cognitive characteristics; In response to the willingness of farmers to accept the entire rice industry chain, the article constructs an evaluation index system for farmers' willingness to accept from four dimensions: acquisition mechanism, technology empowerment, government policies, and contract performance. Principal component analysis is used to comprehensively evaluate the degree of farmers' willingness to accept, and the structural process is used to explore the influence degree and path of their factors; In response to the existing problems and development strategies of the entire rice industry chain, text mining technology is used to explore future development suggestions for the rice industry chain model from the perspective of farmers. The article concludes with relevant conclusions based on the above analysis, and proposes scientific suggestions for the innovative development of the entire rice industry chain from five levels: government, enterprises, cooperatives, village committees, and farmers. The article aims to promote the nationwide application of the entire rice industry chain and assist in rural revitalization.

Keywords

Rural Revitalization; Willingness to Accept.

1. Research Background

1.1. Economic Background

With the slowdown of China's economic growth rate, the downward pressure on the economy of Anhui Province has increased. In 2022, the gross domestic product of Anhui Province was 4295.92 billion yuan, an increase of 8.3% compared to the previous year and an average increase of 6% in both years. The three industries have coordinated growth, with the added value of the primary industry reaching 336.06 billion yuan, an increase of 7.4%; The added value of the secondary industry was 1761.32 billion, an increase of 7.9%, of which the added value of the manufacturing industry was 1308.17 billion, an increase of 8.9%, an increase of 0.6 percentage points compared to the previous year; The added value of the tertiary industry was 219.854 billion, an increase of 8.7%. However, the overall decline compared to 2021 indicates that the development of the national economy still needs to be strengthened.

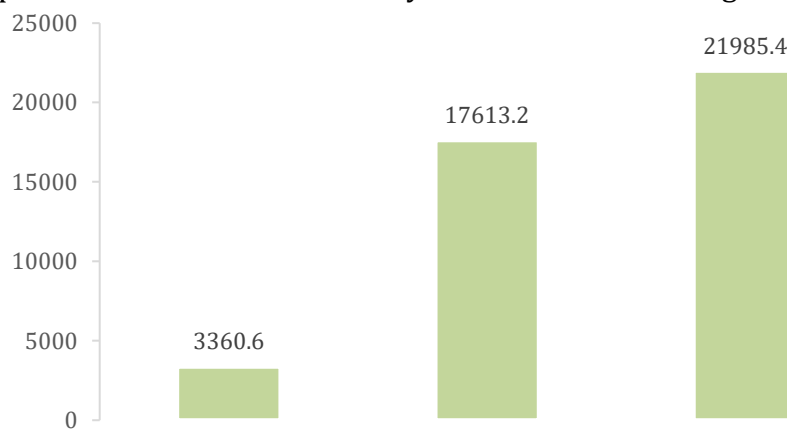


Figure 1. Growth Value of Each Industry

1.2. Political Background

Recently, the Central Committee of the Communist Party of China and the State Council proposed the "Opinions on Doing a Good Job in the Key Work of Comprehensively Promoting Rural Revitalization in 2023", which clearly pointed out the improvement of agricultural infrastructure construction, strengthening the application of agricultural technology and equipment support, etc. The government has also introduced policies directly targeting the rice industry. In April 2022, the General Office of the Ministry of Agriculture and Rural Affairs issued a notice on solidly implementing the promotion and management of mechanized rice planting in the south, encouraging southern rice varieties to accelerate technological progress and improve application levels, in order to promote the vigorous development of rice varieties in southern rice regions.

1.3. Technical Background

The improvement of modern agricultural technology has increasingly become one of the most important driving forces for economic development besides resource factors such as labor. At present, Anhui Province has made corresponding achievements in seed technology, rural high-tech industry development and other fields, especially in the context of "Internet plus", the development of the whole rice industry chain must change the tradition, form the advantages of flexible integration and various communication methods required by the majority of market players. From the perspective of internet penetration rate in urban and rural areas, as of June 2022, the internet penetration rate in urban areas of China was 82.9%, an increase of 1.6 percentage points compared to December 2021; The internet penetration rate in rural areas is 58.8%, an increase of 1.2 percentage points compared to December 2021. In addition, Anhui Province is increasingly attaching importance to the combination of "production, education,

and research", sharing the achievements of universities and research institutes with various entities in the rice industry, innovating the economic model of rice industry production, utilizing information resource advantages, forming strategic alliances based on the multifunctional nature of agriculture, establishing a community of interests, and transforming them into the results truly needed by the market. Meanwhile, in recent years, Anhui Province has cultivated a group of talents with strong technological innovation and transformation capabilities, promoting resource sharing and application between rice seed and product technology research and development institutions and market application organizations, and promoting the transformation and value-added of scientific and technological achievements.

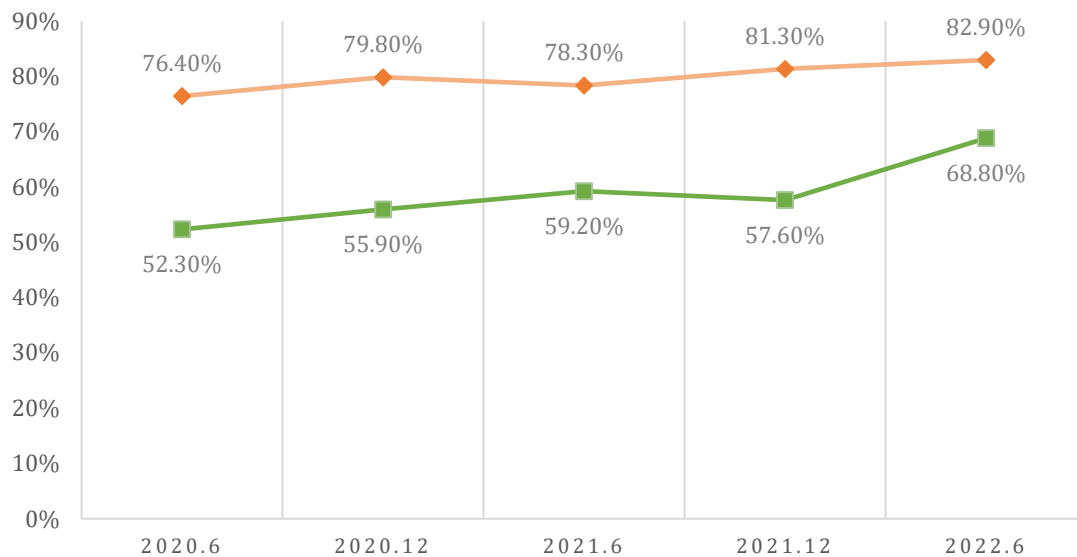


Figure 2. Trend of Internet penetration rate in urban and rural areas of China from 2020 to 2022

1.4. Social Background

In addition, Anhui Province focuses on cultivating a group of strong counties with advantageous characteristic industries such as agricultural product processing and tourism, focusing on key industrial chains such as green ecological resources in the eastern region, advantages in grain and animal husbandry resources and manufacturing in the central region, and advantages in coarse grains and clean energy in the western region. It promotes the radiation of industries from county towns and key townships to rural areas, laying a good social environment for the development of rice entire industrial chain clusters.

2. Research Purpose and Significance

2.1. Obtain the Cognitive Attitude of Farmers and Study the Influencing Factors of Acceptance Willingness

Before conducting on-site research, in order to gain a preliminary understanding of the development of the entire rice industry chain, our team used a feedback structure of questionnaires to understand the market's understanding and supportive attitude towards the entire rice industry chain. Through descriptive statistical analysis of the questionnaire, the respondents' understanding and significance of the "company+cooperative+village committee+farmer" model were analyzed. Based on cluster analysis, the cognitive characteristics of the surveyed farmers were classified to obtain the preliminary development of the industrial chain. On this basis, the comprehensive development evaluation system of the whole rice industry chain is constructed through the principal component analysis to study the

development quality of the whole industry chain model, evaluate the willingness of farmers to accept the whole rice industry chain, and analyze the factor structure and path of participation behavior willingness based on the structural equation, and draw the main factors affecting farmers' willingness to accept.

2.2. Deeply Explore the Implementation of the Entire Rice Industry Chain and Identify Deficiencies

After conducting a comprehensive quality evaluation and impact factor analysis of the development of the rice industry in various regions of Qianshan City, this group conducted a problem oriented field survey to explore some of the existing problems in the development of the entire rice industry chain in Qianshan City. Based on Python text mining, the suggestions proposed by farmers were sorted and screened to further improve the rice industry chain model, Assist the development of rural agricultural production in Qianshan City to become a benchmark for the rural economy.

2.3. Summarize the Development Experience of the Entire Rice Industry Chain, and Assist in its Further Improvement and Model Promotion

The team conducted on-site visits to Hezhuang Village, Meicheng Town, which is the birthplace of the entire rice industry chain in Qianshan City, through methods such as questionnaires and interviews. They also conducted on-site visits to Qianshan Jingde Rice Industry Co., Ltd., which has been cooperating with them for a long time, to deeply explore the production, processing, and sales situation of the rice industry chain development at the specific implementation time. They summarized the development experience of Hezhuang Village's rice industry chain as a demonstration point, This not only provides a model for the economic development of other rural areas in the country, but also explores the further improvement of existing models.

3. Analysis of the Cognitive Characteristics of the Whole Rice Industry Chain of Farmers based on Cluster Analysis

A deep understanding of farmers' understanding of the entire rice industry chain is of great practical significance for promoting local economic development and achieving rural revitalization goals. In order to further analyze the respondents' cognitive characteristics of the entire rice industry chain, we conducted cluster analysis on 217 surveyed farmers and divided them into four groups based on different cognitive characteristics: A, B, C, and D.

3.1. Method and Variable Selection

3.1.1. Concept and Method Selection

K-means clustering is a clustering algorithm based on dividing sample sets. K-means clustering divides a group of samples into k subsets to form k classes, and n samples are divided into k classes. Each sample has the smallest distance from the center of its class, which means that samples in the same class have high similarity, while different classes have significant differences.

Firstly, for the given central values ($m_1, m_2, \dots, m_k$), find the partition C that minimizes the objective function:

$$\min_C \sum_{l=1}^k \sum_{C(i)=l} \|x_i - m_l\|^2$$

After determining the class center, each sample is classified into one class, so that the total distance between the sample and its class center is minimized. Solve the results and assign each sample from its nearest center m_l to the category G_l ;

Secondly, for the given partition C, calculate the centers of each class ($m_1, m_2, \dots, m_k$) to minimize the objective function:

$$\min_{m_1 \dots m_k} \sum_{l=1}^k \sum_{C(i)=l} \|x_i - m_l\|^2;$$

Finally, for each class G_l containing n_l samples, update the mean m_l :

$$m_l = \frac{1}{n_l} \sum_{C(i)=l} x_i, \quad l = 1, 2, \dots, k$$

3.1.2. Variable Selection

Referring to previous literature and local actual conditions, and considering the selection of clustering variables, the following four variables are selected for the analysis of respondents' cognitive characteristics of the entire rice industry chain, as shown in the table below:

Table 1. Variables and Related Issues Explanation Table

dependent variable	
Cognitive level	Do you understand the entire industry chain model of "company+cooperative+village committee+farmers"?
Perception ability	What do you think of the local rice industry chain?
Development level	10. What do you think is the current level of development of the entire rice industry chain?
Willingness to accept	13. Are you willing to try after understanding the entire rice industry chain model?
Promotion awareness	Do you think it is necessary to promote this model in this village?

3.2. Result Analysis: The Cognitive Characteristics of the Four Groups are Significant, and Their Communication Enthusiasm Needs to be Improved

The clustering analysis results obtained from SPSS indicate that there are four types of farmer groups. We need to name and describe the characteristics of these four groups, as detailed in Table 20.

Table 2. Group Classification Characteristics

category	Class A	Class B	Class C	Class D
Cognitive level	four	ten	two	eight
Perception ability	two	six	six	ten
Development level	six	two	six	ten
Willingness to accept	six	ten	two	ten
Promotion awareness	four	one	one	ten

Based on the cognitive classification characteristics of four groups, we conducted the following descriptive analysis:

3.2.1. Class A Farmer Group

The A-type farmer group is not familiar with the full industry chain model of "company+cooperative+village committee+farmer". The local rice industry has no related processing industry and can only directly export agricultural products. This group believes that the impact of the current rice industry chain development is average. After understanding the full rice industry chain model, they still need to see whether others participate before deciding

whether to participate. They also believe that this model can be promoted in the village, But overall, it is not necessary.

3.2.2. Class B Farmer Group

The B-type farmer group is very familiar with the full industry chain model of "company+cooperative+village committee+farmer", but the local rice industry chain only has preliminary extensive processing, which makes the group believe that the current development level of the rice industry chain is very poor. After understanding the full industry chain model of rice, they expressed a willingness to try it, but their willingness to promote it is not strong, and they believe that this village does not need to promote this model.

3.2.3. Class C Farmer Group

The C-type farmer group has never heard of the entire industry chain model of "company+cooperative+village committee+farmer". The local rice industry only has preliminary extensive processing, and the current level of development of the rice industry chain is average. After understanding the entire rice industry chain, they still express their unwillingness to try, and believe that this model does not need to be promoted in the village. This group has a poor attitude and low enthusiasm towards the linkage of the entire rice industry.

3.2.4. Class D Farmer Group

The D-type farmer group is relatively familiar with the rice full industry chain model of "company+cooperative+village committee+farmer", and believes that the current impact of the development of the rice full industry chain is very good. The rice industry in their location has a fine processing industry and a long industry chain. In terms of subjective willingness to accept the new industry chain, this group expresses a great willingness to try and believes that the village in which they are located needs to promote this model. Overall, the D group can be seen as active advocates of new models in the industrial chain, with innovative thinking and the courage to accept and learn new things.

3.2.5. Comprehensive Analysis

A cluster analysis was conducted on 217 questionnaires, and four types of farmer groups, A, B, C, and D, were obtained. The specific proportion of the four groups is shown in Figure 24, with Class A farmers accounting for the most. This indicates that the current cognitive status of farmers on the entire rice industry chain is not optimistic, and most rural areas have significant deficiencies in the rice industry. Only preliminary extensive processing is needed, and they hold a neutral attitude towards attempting the "company+cooperative+village committee+farmer" industry chain, Vulnerable to influence from others; The proportion of farmers in categories B, C, and D is almost equal, with a relatively small proportion compared to category A farmers, indicating that there are relatively few farmers who completely reject or have a very positive and optimistic attitude towards the entire rice industry chain among all respondents. Overall, the mainstream attitude of farmers towards the entire rice industry chain now has a certain understanding, and their ideological consciousness tends to be willing to try. However, in promoting new models of the entire industry chain, their subjective initiative is relatively low.

4. Suggestions

According to the analysis, the current surveyed farmers have a certain cognitive foundation for the rice full industry chain model, but the overall level of cognition needs to be improved. At the same time, the willingness to accept this model is relatively high. Overall, the development prospects of the rice full industry chain model in the local area are good. Based on the above investigation and research on the application and development of the rice full industry chain model in Qianshan City, feasible suggestions are proposed to promote the popularization and

promotion of the rice full industry chain model in this city from three aspects: government, enterprises, cooperatives, and farmers.

4.1. Government

The development of a new model for the entire rice industry needs to be organized and led by the government and jointly monitored by the entire society, mainly through overall planning and optimization of layout; Expand investment and financing channels, strengthen infrastructure construction; Strengthen the monitoring of the entire rice industry chain, promote cooperation and services between departments, and improve top-level design to promote the development of new models.

4.1.1. Expand Investment and Financing Channels, Strengthen Infrastructure Construction

For example, bank loans, agricultural insurance, and stock market financing may all affect the performance of the entire rice industry chain. At the same time, the level of financing also determines the quality of talent cultivation and technological innovation, promoting the value-added of new models from the perspectives of improving operations and reducing losses. Diversified financing channels are the capital guarantee and foundation for ensuring the implementation of the entire rice industry chain. Qianshan City should build a diversified, multi-level, and multi-channel investment system, and increase investment in the infrastructure construction of the entire rice industry chain. Efforts should be made to ensure the stability of the system and the continuity of policies in terms of government intervention, and to clarify the market attributes of the development of the entire industrial chain. On the one hand, it is necessary to establish a long-term and stable financial support system, which is the main source of funds for the operation of the industrial chain, and to link the subsidies directly given to farmers with the protection of arable land fertility. To some extent, it promotes the shift of fiscal policies towards rural areas and provides comprehensive support in technology, funds, policies, and other aspects for the development of agricultural entities. On the other hand, actively explore and strive to expand investment and financing channels, rely on rural collective economic reform, and revitalize the rural collective economy.

4.1.2. Strengthen Monitoring of Core Links

The core link in the entire rice industry chain is led by the government and monitored by society, to formulate compensatory policies for land management, build a risk prevention and transfer system, optimize agricultural resource allocation, improve labor quality, and improve agricultural production performance, among other measures. And relevant departments supervise the quality and safety of rice related products, and effectively practice relevant work to achieve comprehensive supervision and promote effective supervision of rice products. On this basis, targeted measures are taken to monitor the market of rice products to ensure the market liquidity of products. In addition, it is necessary to enhance the government's service function, optimize the new model of market supervision methods, and use internet technology to establish an integrity system, punish illegal and dishonest behavior, and establish a government service standard constraint mechanism to regulate government behavior. On the other hand, building a new type of political and business service relationship - "pro" and "qing", and holding large-scale investment promotion activities, leveraging the role of self media platforms, promoting policies, promoting spirit, and attracting relevant talents and entrepreneurs to invest in potential businesses.

Regulatory authorities cooperate with each other to maximize capital growth, connect various links of the industrial chain, and form a standardized industry regulatory system. Mutual supervision and restraint can promote the healthy operation of the entire rice industry chain market and provide guarantees for the implementation of distribution incentive mechanisms.

4.2. Enterprise

4.2.1. Accelerate Talent Cultivation

The implementation and landing of the entire rice industry chain not only requires industrial optimization, but also talent assistance. Therefore, it is necessary to create a "dual chain integration" model of the "entire rice industry chain" and the "cultivation chain" of new business entities. Fully leverage the practical cultivation role of various business entities in the industry chain for talents, improve the supply of structural labor, and actively create high-quality brands throughout the entire rice industry chain. The cultivation of new business entities is a vast and innovative process, and its results largely reflect the stage of local economic development. The innovation and development of its models need to be combined with local industrial needs and follow the laws of local rice industry development. In the specific cultivation process, it is necessary to combine theory with practice, actively cultivate new talents with independent development capabilities, retain talents through relevant policies, and maximize the effectiveness of cultivating new business entities. At the same time, "dual chain integration" relies on various innovative cultivation models, utilizing local planting advantages to cultivate and develop the rice industry.

4.2.2. Promote Brand Building

Attracting high-quality farmers through high-quality brands, spontaneously maintaining and optimizing their own management, following the development of the times, cultivating competitive enterprises, forming a new pattern of industrial and economic development with complementary advantages and win-win cooperation, and achieving sustainable development of the entire rice industry chain.

4.2.3. Farmers

When the construction and operation costs of the rice industry chain are reduced to an acceptable range, farmers should actively assume corresponding responsibilities, carry out relevant transformation work, eliminate traditional and outdated methods, and contribute their personal efforts to improving the living environment and living standards. Enhance one's own awareness, actively respond to policy calls, follow the leadership of the Party, and play a role in building a harmonious society and creating a happy life.

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