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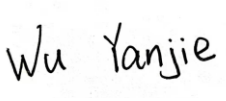


Wu Yanjie

August 15, 2022

ABSTRACT

A STUDY ON THE ROLE OF INNOVATIVE ENTERPRISE-FARMER CONTRACTS IN THE SUSTAINABLE DEVELOPMENT OF AGRICULTURAL INDUSTRIALIZATION - A PERSPECTIVE BASED ON GHM THEROY

WU YANJIE

Agricultural industrialization is the primary channel to promote large-scale agricultural production, intensive processing, and marketing, enhancing agricultural production efficiency. In the long run, promoting agricultural industrialization is conducive to the deep integration of primary, secondary, and tertiary industries. It can improve the comparative efficiency of agriculture and reduce poverty by promoting the employment of agricultural labor and the flow of production factors between urban and rural areas. The model of “leading enterprises+farmers” is a significant agricultural industrialization business model. In China, the development of agricultural industrialization is late and fast, and more problems have emerged in the development. The contractual risks between the two subjects of the “leading enterprises+farmers” model seriously restrict agricultural industrialization development, which requires applying relevant contractual theories and theoretical practices to

innovate the contractual structure to ensure the sustainability of agricultural industrialization. To ensure the sustainable development of agricultural industrialization, it is necessary to apply relevant contract theory and practice to innovate the contract structure.

The leading research of this paper is divided into the following parts: in the first part; we review the theoretical foundations of Agricultural Industrialization Theory and GHY Theory by combing relevant research literature and cases and propose the main problems that limit the stability of contract in agricultural industrialization development; in the second part, we introduce the factors of transaction stability and behavioral factors into the game framework based on social welfare maximization, analyze and solve the equilibrium conditions using GHM theory and derive the main constraints of contractual stability. In the third part, the main constraints on the stability of contractual linkages are analyzed by using an empirical model to analyze the main factors affecting the income increase of farmers, production efficiency, and contractual stability in contractual agriculture through a case study of contractual agriculture innovation under the “leading enterprises+farmers” model of Paisenbai. In the fourth part, we present the study’s main conclusion and propose innovations.

The main findings of this paper include 1. The key to maintaining the stability of the contract of “leading enterprises+farmers” lies in controlling the

transaction costs of the contract from the perspective of organizational structure so that the adaptability and incentives of the contract are compatible with the incompleteness of the contract itself; 2. The social welfare optimization relationship brought about by contractual relationships is only related to the savings in transaction costs and investment in technology management factors between the parties resulting from the specific organizational relationship brought about by the contractual arrangement and is not related to price. However, the price within the contractual relationship is related to the stability of the contract, and the premise of the social welfare function is the survival of the contractual relationship, so the optimization of total social welfare is still related to the price; 3. The contract under the "separation of powers" model is similar to an intra-enterprise contract in terms of form, formulation, and implementation, with framework characteristics, and needs to be gradually enriched and implemented in the implementation process to maintain the stable implementation of the transaction and reasonable distribution of the surplus through tacit understanding and trust; 4. Characteristics play a significant and profound role in the agro-industrialization dimensions of farmers' income increase and production efficiency; in addition, factors such as the improvement of human capital quality also contribute to the quality and efficiency of agro-industrialized production.

Based on theoretical analysis and empirical research, this paper proposes the following recommendations: 1. standardize and rectify the mechanisms of purchase price determination, product grade determination and benefit sharing between leading enterprises and farmers, strengthen the construction of farmers' rights and interests protection organizations, enhance farmers' negotiation status and bargaining power while respecting enterprises' profitability needs, reduce negotiation costs of contractual linkage, enhance farmers' sense of access under contractual linkage, and promote efficient and orderly cooperation of leading enterprises-farmers; 2. pay attention to natural and market risks of agricultural production, provide more policy support and regulation in agricultural risk subsidies and market transaction settlements, build a risk-sharing mechanism for stakeholders, reduce implementation costs in contractual linkages, effectively replace market contracts with contractual linkages between leading enterprises-farmers, and reduce risk exposure of all parties; 3. organize Carry out activities such as agricultural production promotion, adult education, and distance education, and encourage enterprises to implement technical training for farmers in the form of government subsidies to improve the quality of farmers' human capital and cultivate specialized talents in agricultural production.

Keywords: agricultural industrialization; contractual stability; relational contract theory; GHM theory; transaction cost

CONTENTS

CHAPTER 1 Introduction

1.1 Research background and significance

1.1.1 Research background

As the leading form of agricultural industrialization, the “enterprises+farmers” organization is led by a company or group of enterprises, with agricultural products processing, transportation, and marketing enterprises as the leader, focusing on the production and sales of one or more products and the production base and farmers to carry out organic joint and integrated management, forming an economy of “risk-sharing and benefit-sharing”. Faucet enterprises and farmers form a compact integrated production system of trade, industry, and agriculture, whose primary and most common is contractual association. This organization, through the market-leading, leading with farmers, the formation of production, processing, and marketing a dragon, the integration of agriculture and industry, forming a community of interests. The basis for the vigorous development of the “enterprises+farmers” organization is the saving of transaction costs. It overcomes many defects such as small scale, low technical level, high risk, and instability of traditional decentralized farmers. Numerous practical and theoretical studies have shown that “enterprises+farmers” industrialized management organization is

beneficial to solving the contradiction between small production and large market, promoting the adjustment of rural industrial structure, reducing transaction costs, and improving the ability of agriculture to resist natural risks and market risks to achieve sustainable development of agricultural industrialization.

However, the drawbacks of this organization are increasingly exposed in practical operation, mainly in the imperfect interest mechanism and risk mechanism between the company (enterprise) and farmers, which makes it difficult to form an institutional guarantee of “risk sharing and benefit sharing” in the strict sense, resulting in the unstable contractual relationship between the company and farmers in practice. The default rate is generally high. The double default behavior of the company and farmers seriously hinders the development and growth of the “enterprises+farmers” model. For example, as early as 2001, the Economic Reference News reported that in 2000, China’s order agriculture contract fulfillment rate of less than 20%, and about 80% of the orders became paper. According to the survey, among the 16,984 leading enterprises with the contractual relationship, as many as 38% of the leading enterprises canceled their commitment to purchase agricultural products at protected prices. According to a report in China Economic Weekly on April 18, 2005, order agriculture, which has been proven effective by international experience and positioned as a classic model for industrialization and

modernization of Chinese agriculture, has a compliance rate of less than 20% after entering China for more than 10 years.

In addition, it is difficult to measure the attributes of agricultural products, especially the high cost of measuring them one by one at the end of production, which also gives rise to the problem of contract enforcement difficulties. Agriculture is deeply affected by natural uncertainties such as climate, and the production of agricultural products frequently fluctuates, accompanied by the fluctuation of product prices. When the market is good, under the temptation of high spreads, farmers may privately resell agricultural products at high prices. When farmers default, it is difficult for the company to litigate with individual farmers one by one to claim compensation for breach of contract. When the market is terrible, the company has the motive to default by not purchasing agricultural products at the agreed price and quantity. Because many farmers with one company sign the contract, the organizational cost of collective action by decentralized farmers is high. When a single farmer files a lawsuit, other indenture holders may piggyback, making it challenging to motivate farmers to file a lawsuit to claim compensation for breach of contract. In terms of the effectiveness of third-party supervision, due to the biological nature of agricultural production, the production process and its cultivation and feeding management are complex and comprehensive. There are many “observable and unverifiable” or “unobservable and unverifiable” behaviors in

farmers' or companies' production, transaction, and cooperative behavior. The ruling or trial authority is brutal to determining the exemption clause and the liability for breach of contract, which makes it difficult to restrain the breach of contract by the contract subject effectively（Zhong，2018）.

In a nutshell, China's agricultural industrialization is developing late and fast, and there are many problems. The contractual risks between the two subjects of the leading model "enterprises+farmers" seriously restrict the sustainable development of agricultural industrialization. It is necessary to apply the relevant contract theory and innovate the contract based on theoretical practice to ensure the sustainable development of agricultural industrialization.

Agricultural industrialization is the primary channel to promote large-scale agricultural production, intensive processing and marketing, and enhancing agricultural production efficiency. In the long run, promoting agricultural industrialization is conducive to the deep integration of primary, secondary, and tertiary industries. It can improve the comparative efficiency of agriculture and reduce poverty by promoting the employment of agricultural labor and the flow of production factors between urban and rural areas. The "leading enterprises+farmers" model is a significant agricultural industrialization business model. In China, the development of agricultural industrialization is late and fast, and more problems have emerged in the development. The contractual risks between the two subjects of the "leading enterprises+farmers"

model seriously restrict agricultural industrialization development, which requires applying relevant contractual theories and theoretical practices to innovate the contractual structure to ensure the sustainability of agricultural industrialization. To ensure the sustainable development of agricultural industrialization, it is necessary to apply relevant contract theory and practice to innovate the contract structure.

1.1.2 Agricultural industrialization and China's economic development

Agricultural industrialization is of great importance to China's economic development:

Firstly, it is conducive to guiding farmers to the market and overcoming the contradictions between small-scale farming and large markets. Farmers in the process of going to market face the dual risks of nature and the market, small-scale production of farmers, scattered subjects, and weak economic strength; it is difficult to resist the pressure of dual risks. In the form of agro-industrial association, we link the scattered family operation with the centralized market demand, increase the added value of agricultural products by extending the industrial chain, and provide pre-production, production, and post-production services for farmers through various intermediary organizations. These intermediary organizations or leading enterprises build a bridge between

farmers and the market, help farmers shield themselves from natural and market risks as much as possible, improve the operation of farmers' efficiency, and promote agricultural production toward specialized and commercialized operation.

Secondly, it is conducive to improving the comparative efficiency of agriculture and increasing farmers' income. Agriculture, especially food production, is to a considerable extent a weak industry with high social benefits and low economic benefits. Under the law of comparative interests, factors of production such as capital, technology, and talents are bound to flow to non-agricultural industries with high comparative interests, making agriculture in a predicament of the severe shortage of inputs and weak development, which is the difficulty of agricultural development under the conditions of the market economy. Agricultural industrialization improves agricultural specialization and technology and integrates primary, secondary, and tertiary industries into one so agricultural products can realize repeated value-added through large-scale operation and multi-level processing. In particular, through such organizational forms as "leading enterprises+farmers", "professional association+farmers", and "shareholding cooperation", an economic community of interest is formed between enterprises and farmers in which interests are shared, and risks are equally shared. In addition to the income from farming and breeding, farmers can also share part of the profits

from the processing industry and service industry, thus increasing farmers' income and improving the comparative efficiency of agriculture（Sun & Li，2018）.

Thirdly, it is conducive to improving the organization of agricultural production. Agricultural industrialization is built based on agricultural production specialization and scale; with the development of industrialization, specialized production and social services division of labor is becoming more and more apparent, the original scattered, small traditional agricultural production methods have become more and more unsuitable, and the development of the economy so that farmers urgently need to improve the social service system to provide assurance, and the current agricultural production necessary information, technology, materials, processing, marketing, and other social services are lagging. Social services such as information, technology, materials, processing, and marketing necessary for agricultural production are lagging. Therefore, agricultural industrialization, various forms of farmers' cooperative economic organizations, and professional associations have emerged, which are the creation of millions of farmers in the practice of rural reform and organizational innovation in the process of modernization of traditional agriculture.

Fourthly, it is conducive to absorbing more agricultural laborers for employment. Due to a large number of people and a small amount of land,

China has a severe surplus of agricultural labor. It is estimated that there are more than 120 million surplus laborers in agriculture. Because China has a large population and the development of urbanization is seriously lagging, cities are already facing heavy pressure in arranging employment for urban laborers, and the absorption of rural laborers is even more limited, so for a long time in the future, agriculture will still be the central place to absorb surplus agricultural laborers. Therefore, agriculture will remain the principal place to absorb surplus agricultural labor for an extended period. It requires continuous strengthening of the depth and breadth of agricultural development. The continuous development of agricultural industrialization has dramatically broadened the employment path of farmers. Moreover, with the increasing improvement of integrated production organization, production, processing, transportation, storage, and sales, the expansion of production capacity and production field brought by industrialization will absorb more surplus rural labor, which is conducive to the diversion and local transformation of rural labor.

Fifthly, it is conducive to accelerating the transition from traditional agriculture to modern agriculture. On the one hand, the pattern of ultra-small-scale agricultural operations in China is difficult to fundamentally change in the short term, resulting in the high marginal cost of agricultural absorption of new technologies, so that the average farmer, through the adoption of new

technologies, the development of high-yielding high-quality agriculture to achieve increased returns of insufficient incentives; on the other hand, this ultra-small-scale operations due to the fragmentation of land, crop varieties are not uniform layout, but also challenging to promote the use of agricultural machinery and agricultural science and technology. The implementation of industrialization is conducive to solving the contradiction between such small-scale operations and the adoption of science and technology, forming a new system for the promotion and application of scientific and technological achievements, which not only meets the needs of modern production but also will have a positive impact on the transformation of the agricultural growth mode and promote the transition from traditional to modern agriculture （Wang et al., 2014）.

As for the sixth part, it is conducive to promoting the two-way flow of factors of production between urban and rural areas and accelerating the process of urban-rural integration. Trade, industry and agriculture, production, processing, and marketing as one business model is the link between urban and rural areas, which links rural production with urban markets, ensuring both the sale of agricultural products and urban supply, and is a modern way of circulation between urban and rural areas: spatially, it promotes the spread of agricultural products processing industry to rural towns, accelerates the construction of small towns in rural areas, and promotes rural industrialization. The relative

concentration of township enterprises in small towns attracts advanced technology, capital, talents, and equipment from cities and promotes economic integration between urban and rural areas. This economic union can make urban and rural areas complement each other, break the traditional system of urban-rural division, and shorten the process of realizing urban-rural integration.

The seventh part is conducive to using industrialized organizational carriers to attract financial capital to the flow of agricultural industry scattered farmer's business organization model. The inability to undertake the loans of the financial nexus, while the development of the land market is not yet complete, in the form of asset collateral as loan guarantees, the farmers' productive fixed assets collateral capacity is insufficient. The industrialized connection between farmers' operations and company organizations solves this problem in practice. It provides a reliable institutional guarantee for the future development of the rural financial market and financial promotion of the industrialization process of agriculture.

1.1.3 Significance

It is of both theoretical and practical significance to explore the innovation path of the agricultural industrialization model, investigate the theoretical principles in contract farming and examine and study the development status

of China's representative agricultural industrialization model:

1.1.3.1 Theoretical significance

Most of the existing theoretical studies have focused on qualitative analysis rationally. However, there is still a lack of theoretical discussions and empirical tests on how contractual linkages work in agricultural industrialization, and this study is a refinement and supplement. The critical control points for the stable cooperation between the two parties of production subjects are the control of the production and transaction uncertainty of the transaction object-agricultural products; the reshaping of the transaction relationship by using incomplete contract theory under the unequal relationship of the transaction subjects (company and farmer), and the need to reduce transaction costs, enhance the self-enforcement effectiveness of the contract, and weaken the risk of contract enforcement difficulties. Therefore, the theoretical significance of this study is to fill in the gaps and consider this topic precisely.

1.1.3.2 Practical significance

If we take a deeper look at the contractual linkage of leading enterprises+farmers, which inevitably involves the operation mechanism and actual effectiveness of confirmed cases, such as the Jiangsu Ruyi Group model,

Inner Mongolia Sefia model, and Guangdong Wen's model, and if we conduct an in-depth analysis of the newly emerged innovative operation model-the "separation of powers" contractual linkage form exemplified by Paisenbai and summarize its essence and promote its application, it is conducive to the realization of farmers' income, production efficiency, ecological lean, leading income generation and contractual stability; it is also conducive to the sustainable development of agricultural industrialization.

1.2 Research purpose, content and the main innovation

1.2.1 Research purpose

This research paper aims to evaluate and analyze a form of exploration of agricultural industrialization. The specific research objectives are: to use the GHM model, supported by incomplete contract theory, to use the incompleteness of the contract as the starting point of the study, to use the incomplete contract theory to reshape the transaction relationship, the lack of contract enforcement effectiveness, as a way to reduce transaction costs, enhance the effectiveness of contract self-enforcement, weaken the risk of contract enforcement difficulties, and ultimately to achieve the optimal study of property rights or (residual) control. The study aims to achieve the optimal configuration of property rights or (residual) control rights.

1.2.2 Research content

This paper focuses on the impact of contractual risk on the sustainable development of agricultural industrialization and the mechanism of innovative contracts to achieve sustainable development of agricultural industrialization. The latter is the core of the research in this paper. The main research elements of the two issues are developed in the following manners:

1.2.2.1 Impact of contractual risk on the sustainable development of agro-industrialization

The impact of contractual risk on the sustainable development of agricultural industrialization may be reflected in various aspects, such as farmers' income increase, production efficiency, ecological learning, leading income generation, and stability of production relationship. In this part, this paper mainly conducts normative analysis through literature review and review of existing risk theories and speculates on the leading causes, main impact paths, and degree of impact of contractual risk on the sustainable development of agricultural industrialization in combination with existing theories to create theoretical conditions for further research on the mechanism of contractual innovation to achieve sustainable development of agricultural industrialization.

1.2.2.2 Mechanisms of innovation contract to achieve sustainable development of agricultural industrialization

To address this issue, this study focuses on the case of a well-known domestic citrus producer using incomplete contract theory to innovate the contractual linkage model between the enterprise and farmers for empirical analysis, exploring the essential characteristics of its operating model and contract form, refining the three types of contracts through factor analysis, such as transaction costs, trust basis, cooperation efficiency and stability of performance, and using farmers' income and production increase as the explanatory variables, respectively. The empirical analysis was conducted with the explanatory variables of farmers' income increase and production efficiency increase, respectively. The results of the analysis show that in the contractual linkage between leading enterprises and farmers, factors such as trust base and stability of performance of the contracting parties and production incentives of farmers can significantly promote agricultural industrialization; transaction costs of contracts play a significant and profound role in the dimensions of agricultural industrialization such as farmers' income increase and production efficiency, and the effective reduction of negotiation costs and implementation costs can reduce contract risks and significantly contribute to the sustainable development of agricultural industrialization.

In this section, we use an incomplete contract theory model to derive the main

influence paths of contract risk on the sustainable development of agricultural industrialization (mainly the “leading enterprise+farmers’ model) and the main theoretical conditions for reaching sustainable development.

1.2.3 Main innovation

The main innovations of this paper may focus on:

(1) Problem-aware innovation: after China has accomplished the goal of comprehensive poverty eradication, how to reduce poverty further, stimulate the endogenous vitality of agricultural development, and free the primary industry from its previous high dependence on policy tilts and discover its new industrial value are the main issues before the academic and practical circles. This paper targets the potential trend of agricultural industrialization development and focuses on this innovative issue.

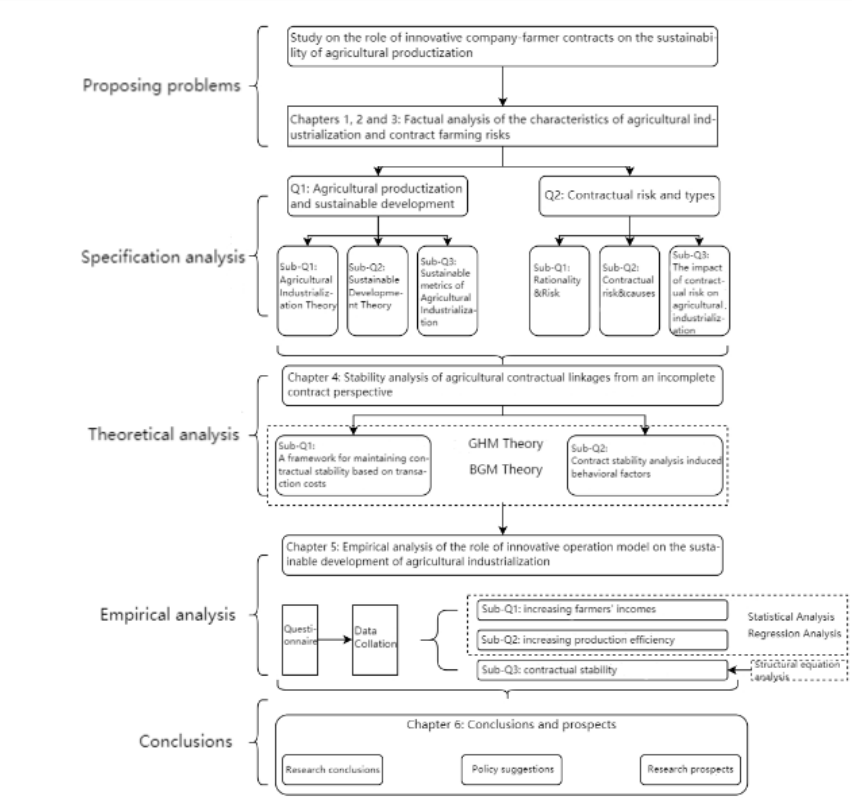
(2) Innovation of research method: most of the domestic and foreign studies on agricultural industrialization have been conducted at the level of institutional analysis, but less combining in-depth theoretical analysis and detailed empirical research, either directly carrying out theoretical analysis but with more assumptions or directly carrying out empirical analysis but without an in-depth discussion of the causal relationship between variables, with the limited guiding significance of the conclusions, and generally weak persuasive power of the conclusions and policy recommendations. This paper attempts to

combine incomplete contract theory, relational contract theory, first-hand data obtained from field research visits, and empirical tests to enrich a more comprehensive research method for a sustainable innovation path of agricultural industrialization.

1.3 Research methodology, technical approach and hypothesis

1.3.1 Technical approach

The technical approach of the research in this paper is shown in the following figure:



1.3.2 Research methodology

This study firstly uses literature analysis to explain the connotation of the concepts of agricultural industrialization, sustainable development, and contractual risk and identifies five dimensions to describe the sustainable development of agricultural industrialization in this paper; secondly, it uses literature analysis and combines with a case study analysis to qualitatively analyze contractual risk, causes and consequences in a thoughtful argument; and then, it uses questionnaire survey and case study to quantitatively analyze the role of innovation (separation of powers) on the sustainable development of agricultural industrialization is quantitatively analyzed using questionnaire and case study methods. Finally, corresponding suggestions are made in the framework of normative research. The specific methods are as follows:

Literature research method: collecting, identifying, and organizing literature on agricultural industrialization, sustainable development, complete contracts, and incomplete contracts, and contractual risks, and by studying the literature to form a scientific understanding of the facts.

Questionnaire method: by designing a questionnaire, we use this kind of controlled measurement to measure the relevant dimensions of the sustainable development of agricultural industrialization under the “separation of powers” contractual linkage and collect more objective scientific data and information.

Case Study Approach: Paisenbai was selected as the research object, and data and information were systematically collected for an in-depth study to explore the impact of its innovative “separation of rights” contract on the company and the farmers on the other side of the contract, and then analyze the effect on the sustainable development of agricultural industrialization. At the same time, some of the critical points in the paper are supported by the presentation of typical cases.

Equilibrium analysis: using theoretical models such as GHM and BGM, we construct a primary value equilibrium mechanism reflecting the “enterprise+farmers” contractual agricultural industrialization model and analyze the main factors influencing the stability of contractual linkage and governance efficiency of this mechanism.

Empirical analysis: the scientificity and validity of the questionnaire design and implementation process were first tested by statistical methods, then the principal component factors of the questionnaire information were extracted by component matrix analysis and compared with the theoretical hypotheses and verified.

1.3.3 Research propositions

Here, we propose the general propositions of this paper.

Firstly, the contract under the “separation of powers” model is similar to an

intra-company contract in form, formulation, and implementation, with a framework character, which is initially a framework that is gradually enriched and implemented during the implementation process, and the rights and obligations contained in the contract are extended to each other. The stable implementation of the transaction and reasonable distribution of the surplus are maintained through tacit agreement and trust.

Secondly, the transaction and production processes are interpenetrated, and the subject matter does not exist independently before the transaction. However, it is combined by the contracting parties in the production process according to their own will and input of complementary asset elements.

Thirdly, the final product comes from the multiple compound transactions between the contracting parties. The leading enterprise does not simply acquire the agricultural products predetermined by the farmers but also regulates, guides, and restricts the behavior of the farmers before, during, and after the production with specific regulations and deep involvement to make it conform to the standardization requirements.

Fourthly, factors such as trust base and stability of contracting parties' performance and farmers' production incentives can significantly promote agricultural industrialization.

Fifthly, the transaction cost characteristics of contracts play a significant and profound role in the dimensions of agricultural industrialization, such as

farmers' income and production efficiency. The effective reduction of negotiation and implementation costs will significantly promote the sustainable development of agricultural industrialization.

Sixthly, the positive effect is partially offset by reducing own information costs after farmers cede their management rights to leading enterprises.

Seventhly, among the essential characteristics of farm households, variables such as age, actual working population, and human capital contribute to the quality and efficiency of agriculturalized production, and the education level slightly contributes to the production efficiency. However, their transaction costs are seriously dissipated and fail to contribute to farm households' income effectively.

CHAPTER 2 Agricultural industrialization and sustainable development

Agricultural industrialization is the leasing, intensification, and marketization of agricultural production (Wang, 2009), which is based on market-oriented, farmer-operated, leading-enterprise-based, integrated operation around economic benefits, integration of all aspects of agricultural production and trade, and conversion of small farm production into socialized production, which is essentially a community of interests voluntarily formed by all actors in agriculture (Niu, 2006). Agricultural industrialization integrates agricultural industry and commerce, production, supply, and marketing, and links agricultural pre-production, production, and post-production into a complete industrial system, achieving profit averaging in all aspects of production.

To make the decentralized production and operation of farmers fit with the intensive standardization requirements of agricultural industrialization, it is necessary to establish a suitable organizational linkage mechanism, the most common of which is the leading enterprise-farmers model. The faucet-enterprise-farmers model connects the scattered and relatively independent small farmers with the big market, allowing the organization of scientific

production and orderly market supply, which can reduce transaction costs, improve economic efficiency and increase farmers' income(Swain， 2016). Yang (1994) was the first to explain the basic meaning of the leading-enterprise-farmers model, defining it as "an entity company as the leader, linking farmers and signing cooperative management contracts". Xu and Liu (1995) defined the model of leading enterprises-farmers as a community of interests with domestic and foreign markets as the guide, economic interests as the link, contractual contracts as the means, and agricultural and sideline products processing and marketing enterprises as the center, uniting a large number of specialized production farmers to carry out production and business activities. Fu(2000) analyzed the production and management model of Guangdong Wen Group's leading enterprises-farmers and concluded that this model enables farmers and enterprises to reduce transaction costs and gain more economic benefits. Later, Du(2002) analyzed the background and differentiation of the model and proposed two ways of understanding it: one is as a specific category, which only refers to the contracted fixed supply and marketing relationship between leading enterprises and farmers. Moreover, the other is a general category, which includes fixed supply and marketing relationships, close association, and loose association.

2.1 Agricultural industrialization theory

Agricultural industrialization is a product of a particular stage of economic and social development, which first originated in the United States in the 1950s and then spread to developed countries in the West and was rapidly applied. China's agricultural industrialization started late due to the institutional barriers and the constraints of economic development level. It has undergone three progressive stages: laying the foundation, forming the prototype, and promoting the application. Regarding the connotation of agricultural industrialization, the theoretical and practical circles in China have different understandings. The definition of Agricultural Industrialization given by the National Committee for the Examination of Scientific and Technological Terms refers to that is market-oriented agriculture, centered on improving comparative efficiency, driven by leading agricultural enterprises, organically combining production, processing, and marketing, and realizing integrated operation（Hoang, 2021）.

Before the outbreak of the industrial revolution, the industry was often defined as the activity of operating certain assets, such as real estate and real estate, which is the industry in the traditional sense（Bellemare & Bloem，2018）. In the modern sense, the industry refers to a kind of material production and non-material production sector with a specific organization, scale, and

structure. The “industrialization” of industrialization reflects a dynamic process. For example, Liu and Chen (2002) believe that since the industry is a collection between the macroeconomic organization and microeconomic organization, the connotation of agricultural industrialization should be defined from the meso level of the industry: agricultural industrialization refers to the development of agricultural industry based on scientific and technological progress and high development of the market economy. Based on scientific and technological progress and the high development of the market economy, the traditional agricultural industry is constantly differentiated and integrated. The pre-production, production, and post-production of agriculture are linked into a complete industrial system, which is organized into a “risk-sharing and benefit-sharing” community of interests and realizes the development process of professional, large-scale, intensive, and market-oriented operation(Li et al., 2016). However, this study agrees with the viewpoint put forward by Justin Yifu Lin that agricultural industrialization, is a new mode of production and management and a new form of industrial organization under the conditions of the market economy to meet the needs of product development, is essentially the specialization of production. Agriculture industrialization is an inevitable trend of economic development. Fan also emphasizes that agriculture as an industry must be able to achieve scale benefits, just like other industries, even if it cannot achieve scale benefits

in the whole process of production, at least in particular links, and form large enterprises for agricultural development, to break the limitations of traditional small agriculture(Liu, 2015).

2.2 Sustainable development theory The original meaning of sustainable development is to make efforts to conserve resources and protect the environment in the pursuit of economic development, to leave room for the development of our future generations, and to achieve the coordinated development of population, economy, society, and resources and environment. However, since sustainable development involves many aspects such as nature, environment, society, economy, science and technology, and politics, the focus of sustainable development theory is not consistent due to the different perspectives that researchers stand. Given the research direction of this paper, this study is mainly based on the theory of sustainable agricultural development and the theory of sustainable enterprise development.

The theory of sustainable agricultural development broadly covers the following aspects: firstly, the sustained development of (high-quality) agricultural products production; secondly, the sustained improvement of

agricultural economic efficiency, including the sustained improvement of financial indicators of agricultural production enterprises and the increasing income of farmers (farm households); thirdly, the sustained use of agricultural resources, including the economical use of resources, the regeneration of resources, the clean use of resources, the recycling of resources, the efficient use of resources, the research and development of alternative resources, *etc*.; fourthly, the sustained improvement of ecological environment; and fifthly, the sustained stability of rural society.

Sustainable development is not only the government's responsibility but also the enterprises' responsibility as micro-economic agents that cannot be shirked. Enterprises have to contribute to the sustainable development of society in terms of technology selection, product development, and pollution control. Because frequent enterprise closures are a massive waste of resources for society, enterprises must first be able to sustain themselves to contribute to sustainable development. However, in reality, not only do a large number of SMEs close down every year, but most of them are also short-lived. on June 14, 2018, at the 10th Lujiazui Finance Forum, central bank governor Yi Gang, while talking about how finance supports SMEs, cited data that "the average life span of SMEs in the United States is about 8 years, the average life span of Japanese SMEs is 12 years, the average life span of SMEs in China is about 3 years." Therefore, the theory of enterprise sustainability mainly studies

refers to the process of pursuing self-survival and perpetual development of enterprises, considering both the achievement of business goals and improving the market position of enterprises, and keeping the enterprises always maintaining continuous profitable growth and capacity improvement in the already leading competitive field and future expansion of business environment to ensure the enterprises' longevity in a considerable period.

One of the essential elements of theory is the saving transaction and organizational costs (Coase，1937). In the broad sense of transaction costs (as defined by Arrow as the operating costs of an economic system), organizational costs are also transaction costs or internal transaction costs. Firms are organizations that save market transaction costs and substitute for market mechanisms but increase in organizational costs and savings in market transaction costs (Bounmasith, 2018). When the savings in market costs exceed the increase in organizational costs, the firm's function ends. Therefore, saving transaction costs is the requirement of what makes a business a business; saving organizational costs is necessary for the survival and development of a business. Saving organizational costs can generally be achieved by optimizing organizational structure, improving management systems, coordinating interpersonal relationships, and building corporate culture. In short, only by saving transaction costs (including organizational costs) can the sustainable development of enterprises have a solid and efficient

physical support force.

The United Nations World Commission on Environment and Development proposed the concept of sustainable development, chaired by Mrs. Gro Harlem Brundtland, Prime Minister of Norway, in 1987. The Commission defined sustainable development as development that meets the needs of the present without jeopardizing the ability of future generations to meet their needs. It is generally believed that the primary connotation of sustainable development theory should include at least the following three aspects: Ecological sustainability. Sustainable development is built on the sustainable use of resources and an excellent ecological environment that protects the integrity of the entire life-support system-the, natural ecosystem-and biological diversity; protects natural resources and ensures the use of renewable resources in a sustainable manner; keeps human development within the carrying capacity of the earth; prevents and controls environmental damage and pollution, and actively manages and restores the damaged and polluted environment. Secondly, economic sustainability. Sustainable development encourages economic growth, which not only attaches importance to growth quantity but also requires improving quality, optimizing allocation, saving resources, reducing consumption, reducing waste, improving efficiency, increasing effectiveness, changing traditional production and consumption patterns, and implementing clean production and civilized consumption. Thirdly, social

sustainability. Sustainable development aims to improve and enhance the quality of human life, meet human needs, and actively promote socially just safe, civilized, and healthy development. To this end, it emphasizes the need to control population growth and improve population quality; to reasonably regulate social distribution relations; to eliminate polarization, unemployment, and inequality; to vigorously develop education, culture, and health, and improve people's scientific and cultural standards and health; to establish a sound social security system and maintain social stability.

Given the scope of the discipline, this study focuses more on the analysis of economic sustainability, with ecological and social sustainability mentioned only in passing.

2.3 Measurement of the degree

Sustainable development of agricultural industrialization means that in the process of developing agricultural production, attention must be paid to the protection of resources and the environment, i.e., while pursuing high production, high quality and high economic benefits of agricultural products, the quantity and quality of agricultural resources must be ensured so that they can be used forever and passed on from generation to generation. As Fan Gang said, agriculture as an industry must receive an average share of profits like other industries so that agricultural investment can be micro-economically

rational and sustainable and can grow continuously in proportion to investment in other industries(Fu et al., 2018).

The indicators of sustainable development of agricultural industrialization have been well written, but this study concludes that the following five indicators can describe sustainable development of agricultural industrialization: farmers' income increase, production efficiency, ecological lean, leading income generation, and stable production relationship.

Farm household income growth, i.e., the growth of farm household operating income(Sharma，2016), considers the change in net income after deducting the cost of seeds, pesticides, fertilizers, *etc.*, from the sale of agricultural products. This study does not consider the labor cost of engaging in crop production, i.e., farmers' income in other labor markets for their labor hours. It is since, first, farmers nominally share their land and labor, but in actual production, they may hire others to sow, plow, and harvest. Second, farmers often lack stable off-farm job opportunities, and simply calculating the product of hours worked and off-farm job pay may seriously distort information on farmers' labor costs. The indicator of production efficiency is mainly reflected in the change in agricultural product yield per acre, which is the final reflection of agricultural production labor rate and technical input. The indicator of ecological learning mainly refers to the economic benefits of the green cycle and ecological environment improvement in the production area.

The indicator of leading income generation mainly refers to the change in operating results and financial status of leading enterprises. The indicator of a stable production relationship refers to the effective fulfillment and stable continuation of contractual linkage, an essential organizational guarantee and institutional basis for industrialized agricultural production. The withdrawal and breach of contract by farmers can be controlled, and the strict compliance of leading enterprises and respect for farmers' interests will effectively maintain industrialized agricultural production.

CHAPTER 3 Contractual risk and types

The organization mode of agricultural industrialization mainly includes “enterprise+farmers”,“company+base+farmers”and“company+cooperative+farmers”(Qi & Li, 2019). This study only analyzes the dominant model of “enterprise+farmers”.

3.1 Rationality of companies and farmers

In his 1925 publication *The Economic Organization of the Peasantry*, Chayanov proposed that the peasant family (farm household) is an independent system different from the capitalist enterprise, with its unique logic and rules of operation. The production of the small peasant family is primarily aimed at satisfying tits family’s consumption needs rather than maximizing profits. The amount of economic activity of farmers is determined by the equilibrium between the degree of satisfaction brought by the marginal product and the degree of hard work of the marginal labor, rather than by the equilibrium between marginal revenue and marginal cost (Chayanov, 1996), while the “formal economics” represented by Schultz believes that, like entrepreneurs, farmers (peasants) are also profit maximizers. The farmers’ behavioral choices are fully consistent with economics. Farmers’ behavioral

choices are entirely consistent with the rational principles of economics (Theodore W. Schultz, 2006). The farmer is ‘first and foremost an entrepreneur, a businessman,’..... who pays close attention to prices in different markets when buying what he can afford, who carefully calculates the value of his labor when producing grain for sale or household consumption, and who is in harmony with the value of the grain he receives. Value of his labor and compares it with the situation when he is employed to work, and then acts based on the calculation and comparison.”

In the present time of economic and social development, when farmers’ needs for survival are fully satisfied, individuals will seek to improve their life forms, expand their production fields, improve their quality of life, improve their social status, and enhance their social status. Developmental rationality is the rationality of behavior with the purpose and motive of achieving individual development. In terms of substantive rationality, development is a conscious choice of the actor and thus meets the requirements of purpose and planning; in terms of formal rationality, on the one hand, development rationality is always accompanied by the social division of labor, socialization of production and commercialization and marketization. In the context of industrialized agricultural development, the exchange of individual resources and social resources through which development is realized can be precisely calculated through monetization.

The companies referred to in this study are mainly Leading Enterprise, i.e. agricultural industrialized leading enterprises, which mainly refer to agricultural enterprises that mainly supply agricultural production materials, process or circulate agricultural products, link with farmers through various interest linkage mechanisms, drive farmers into the market, and make the production, processing and marketing of agricultural products organically combined and mutually promoted. These enterprises generally have a solid economic foundation, broad radiation and strong driving ability. Since they are mainly engaged in the supply of agricultural production materials, processing or circulation of agricultural products in the process of industrialization of agriculture, connecting the market at one end and farmers at the other, playing a leading role in the whole chain of industrialization of agriculture, they are figuratively called leading enterprises. Yang Minghong defines a leading enterprise as an agricultural industrialized management system that relies on the production, processing, and sales of one or several agricultural products, connecting farmers at one end and establishing a “risk-sharing and benefit-sharing” benefit mechanism with farmers at the other end. Domestic and foreign markets, with the integrated functions of driving the production of agricultural products, deep processing, market development, extending the chain, increasing the added value of agricultural products, *etc.*, agricultural products processing or distribution enterprises.

In this study, the leading enterprise behavior goal is to pursue profit maximization, but it is also a social enterprise. In the short-term objective function, the weight of enterprise economic category indicators is higher, and the weight of CSR is lower; in the long-term objective function, the weight of CSR is higher, which is not analyzed in detail due to the research scope of this paper(Michler & Wu，2020).

3.2 Connotation of risk, contract and contractual risk

Different disciplines have interpreted the meaning of risk in a way rich in the discipline's nature. For example, economist Knight defines risk as "uncertainty with some certainty (probabilistic predictive knowledge)". Explicitly analyzing the meaning of the risk, this study argues that risk has multiple layers: Firstly, risk is a category of possibility. Risk is not something that must happen but a future-oriented possibility. Therefore, the risk is not a factual category; it is not an inevitable result of a change in the movement of the relationship between reality and existence. Secondly, the risk is a relational category. Risk is always present in the relationship between a person and a specific object, not in the physical existence. Thirdly, the risk is a historical category, the risk is always relative to human beings, and in different socio-historical stages, the manifestation of risk is different. The form of risk performance in different historical stages reflects, in a certain sense, the state

of social productivity and the level of social development at that time. People's risk awareness concept also reflects, in a certain sense, the state of human survival and development and the level of self-awareness under specific historical conditions. Fourthly, the risk is a value-based category. Not all relational states of existence are risks, but only when they constitute a damaging relational state for human survival and development, so risk contains a value orientation of people. Different value positions may have different understandings of damage, affecting people's risk assessment. Fifthly, the risk is a social category. Risk mainly refers to the social risk associated with practical human activities, which emphasizes the social factors of risk sources, the socializing effects of risk diffusion and the social loss of risk consequences.

According to the Modern Chinese Dictionary, a contract is "a formal instrument of attestation, sale, mortgage, lease, etc., made in accordance with law". 1932 American Bar Association in the Restatement of Contract Law defines a contract as "a promise or series of promises for which the law provides a remedy. Breach of such a promise to give relief, or in some cases, that the performance of such a promise is an obligation". From a legal point of view, a contract is a form of the social agreement in which individuals can create rights, obligations and social status for themselves by freely entering into agreements. The idea of contract arose as early as the ancient Roman

period, and Roman law was the first to outline and reflect the principle of freedom of contract.

The connotation of contractual risk. The sustainable development of agricultural industrialization faces a series of risks, which can be categorized as contractual risks(Qi, 2019). The possible impact on sustainable development of agricultural industrialization due to the negotiation, signing, performance and supervision of contracts is the contractual risk of sustainable development of agricultural industrialization. According to Qiuhui Xu, if the contract is incomplete or the company breaks the contract (i.e., moral hazard), it will cause economic losses to farmers and form contract risk. According to Yang Minghong, contract risk is the risk of non-performance by both parties to a contract for economic benefits. This risk that has never been present in traditional agricultural production and operation. It is a risk that must be faced by both the company and the farmer, and it arises from the uncertainty in the operation of the contract market. In this sense, contract risk is the risk of the contract market.

This study argues that in an agricultural industrialized management organization, enterprises and farmers are interconnected via contracts to achieve effective transactions. The contract becomes a link and channel between the two parties, forming an internal transaction market between enterprises and farmers, i.e., the contract market. Nevertheless, this market is

not stable, and there are many uncertainties, which lead to the violation of the obligations stipulated in the contract to maximize economic benefits among both parties and cause the other party to suffer certain economic losses. The resulting risk is contract risk, which is considered the core risk of sustainable development of agricultural industrialization.

3.3 Types of contractual risk

This study concludes that there are mainly four types of contractual risks between enterprises and farmers.

Initially, adverse selection and morally risky behavior based on information asymmetry may trigger the opportunistic behaviors of human beings, adverse selection is an opportunistic behavior in which the party in possession of information takes advantage of the other party's ignorance for its benefit. In the trade relationship of contractual agriculture between a company and a farmer, adverse selection refers to the situation where an enterprise or a farmer makes use of information asymmetry and conceals or distorts information on purpose before signing a contract to induce the other party to sign a contract that is favorable to its side. To specify, this opportunistic behavior that occurs before signing a contract is chiefly manifested as follows: the company deliberately holds back information about market demand and price of agricultural products and hides information about the enterprise's operation

status as well as operation ability; farmers intentionally conceal their planting and management abilities, quality information about agricultural products, *etc*.

Moral hazard not only refers to the risk that a party involved in a contract in the face of the other party may change its behavior to the detriment of its interests (Vining & Weimer, 1990) but also points to a change in the behavior of one party to the detriment of the other party's interests when the participants at the one side of the transaction are unable to observe the actions of the other party or the cost of observation (monitoring) is too high in the presence of information asymmetry. Moral hazard can be divided into the moral hazard of hidden information and the moral hazard of hidden actions on account of the variability of the hidden content.

The moral hazard of confidential information refers to the fact that information is symmetrical when signing a contract. After contracting, one party may avail itself of the information asymmetry along with advantages to damage the other party and benefit itself by hiding certain information. As exemplified in the case of the "melamine incident" in 2008 the enterprise was unable to monitor the quality of farmers' milk forgery. At that time, Sanlu did not have its milk supply, and it was not as cheap to produce it as to buy it from the farmers. Farmers did not have high-protein pasture for their cows but applied much straw and could not feed concentrate for cost reasons, which is accordingly low in protein compared to the milk produced by feeding alfalfa.

Farmers are motivated by profit to adulterate while the enterprise regularly checks on the protein content of the milk to prevent farmers from that. However, the determination of protein content is calculated by the total amount of nitrogen in the milk, whether it is the organic nitrogen in the animal protein contained in the milk, the organic nitrogen in the melamine, or the inorganic nitrogen in the urea, which will eventually be converted into protein at all. In this way, the adulterated and melamine-laced toxic milk escapes from the detection of the equipment. It is finally gathered in the human body, causing a large number of innocent children to suffer and eventually leading to damage to the entire industry.

The moral hazard of hidden actions refers to the fact that information is symmetrical at the time of contracting. After contracting, the enterprise or farmer may take advantage of the other party's inability to view or confirm specific actions of their party to take actions that violate the provisions of the initial contract but are beneficial to enhance their interests. For instance, one party to the transaction reduces its own factor inputs, violates the contract, or exploits advantages in the system, policy, and contract to take covert actions to maximize its effectiveness. In addition, Wenshuhan Group, as exemplified, was once a star enterprise and a major taxpayer in Yunfu, Guangdong Province, and one of the well-known chicken breeding enterprises in Xinxing County, Guangdong Province, known as "San Wen Yi Gu". In the 1980s, the firm

made use of the farmer-plus-firm business model, and the chicken industry was once booming, which was named one of the top 500 private enterprises in China by the industrial and commercial system in 1996. Additionally, an expert made a unique case study of the enterprise with “Golden Phoenix Flying out of a Col: A Report from Guangdong Wenshuhan Group Co. Ltd.” in 1997. Nonetheless, after Avian influenza in Hong Kong in 1997, the shortage of economy transferred into a relatively surplus economy, the price of chicken was meager for a long time, and the profit of chicken farming became tough. From 2000 on, the relationship between the enterprise and farmers began to be strained, and it was viewed as the target of farmers’ attacks, the enterprise raised feed and fertilizer prices without authorization and even failed to pay back the farmers’ deposits and chicken payments in full. Within the company, the managers and technicians have a strong working mentality, and short-term behaviors such as taking kickbacks, not working hard, and even cheating on artistry and materials, usually occur. Finally, the company suffered severe losses and embarked on a criminal road of illegal fund-raising.

The second is the “ripping off” behavior based on asset-specific investments. Opportunistic behavior is also prevalent in situations that require joint investment by both partners(Ruml & Qaim， 2021). The degree of asset specialization usually depends on the extent to which the asset is “locked” in a particular transaction relationship, i.e., the asset will face high switching or

exit costs to break through the established relationship or institutional rules, which is consistent with what Douglass C. North calls “Path -dependence”. To specify, it is an existence due to the economies of scale, learning effect, coordination effect and adaptive expectations and the existence of factors such as the vested interest constraints, which leads to the self-reinforcement of the institution in the given direction once human beings choose either a system. Once the parties in a transaction have made a specific investment, they will operate in a bilateral relationship(Mao et al., 2019). The degree of specificity of the asset determines the difficulty of the investor’s exit from the transaction process and contractual relationship as well as its dependence on the other party, which indicates that the bargaining position of the investing (contracting) party is weakened at the back of the investment (contracting) is completed. Suppose an ex-post monopoly in a transaction replaces a forehand competition for a specific investment. In that case, this may eventually lead to opportunistic behavior of the other party to take the “quasi-rent” of the asset specificity for itself. Contractual incompleteness can turn this possibility into reality. Accordingly, a specific “quasi-rent” is created that can be appropriated in a contractual relationship with a specific asset investment. Furthermore, suppose either party tries to take advantage of the incompleteness of the contract to appropriate the other party’s “quasi-rent”, In that case, this will result in what is called “ripping off”, an ex-post opportunistic behavior. In a

contractual relationship between an enterprise and a farmer, the issue of "ripping off" inevitably arises. To illustrate, in the dairy industry, dairy farmers can only produce raw milk for sale to dairies or dairy enterprises by contract. The other party may use diversified reasons to purchase the raw milk provided by the farmers at a reduced level or price, so the problem of buyers "ripping off" behavior occurs; dairies or dairy enterprises have made notable investments in processing equipment, and if the farmers do not provide raw milk according to the contract or provide unqualified raw milk when the milk supply is tight, this is the "ripping off" behavior of the seller. The problem of "ripping off" is chiefly due to the "specificity criteria" along with the "incompleteness of the contract"(Mao et al, 2018). Asset specificity investments create a "specificity quasi-rent" with occupiable assets, and specificity investments also reduce the bargaining position of the investor in the ex-post division. Besides, the incompleteness of the contract affects the division of the surplus agreed upon by the parties in advance, the other party will demand more surplus than what was negotiated in advance, and thus arsing the issue of "ripping off".

Thirdly, the "free-rider" behavior is based on collective action. The term "free-rider" originally refers to an economy in which an individual consumes more than his or her fair share of resources or bears less than his fair share of production costs, which is later derived from a collaborative transaction in

which an individual is paid the same amount for some form of “being lazy”. Among a contractual relationship between an enterprise and a farmer, one party is a large, scattered and small farmer. In contrast, the other party is a more significant, more powerful individual agricultural buyer or processor. When the majority of farmers adopt universally “opportunistic behavior”, the firm has to sue a large number of farmers separately. The litigation cost may be much higher than the compensation that may be recovered if legal recourse is taken. Therefore, it is generally a rational choice for the company to give up suing. Likewise, suppose a company commits opportunistic behavior. In that case, it is often too costly for individual farmers to sue the company, and individual farmers are often unable or unwilling to bear the cost and can only choose to hold their breath. Accordingly, individual rationality creates a negative external effect on the collective or cooperative party, making the incentive for the collective interest insufficient, contributing to a weakened motivation for the behavior actor, but offering an incentive for the free-rider to behave opportunistically (Otsuka et al., 2016； Liu et al.， 2020). “Free-rider” behavior is mainly manifested in collective actions that require a high degree of cooperation, such as contractual trading relationships between firms and farmers. Farmers have a strong incentive to sell their agricultural products to the market when the market price is higher than the contract price. When faced with a collective and consistent breach of contract by farmers, the channel

power becomes ineffective, and the enterprise encounters a trade-off between the costs and benefits. The cost refers to the price of going to court along with the protracted litigation process, while the benefits refer to the amount of compensation for individual farmers. As a result, companies often rationally choose to remain “silent” after a farmer defaults on a contract. For example, in 1992, when the market price of burdock in Laiyang, Shandong Province, rose to 1.2 Yuan/kg, much higher than the contract price of 0.4 Yuan/kg, farmers chose to default on their contracts and sell their products to the market. When farmers are on the opposite side of the default consistency, the cost for enterprises to bring individual farmers to court is high, and they can only listen to the default of the farmers. When the market price is lower than the contract price, the company is incentivized to default and abandon the contract and tends to buy at the market price directly, or deliberately press the level and price. After the company defaults, individual farmers who face the company’s actions with small transactions and low amounts will face high litigation costs that are often difficult for individual farmers to bear if they settle by legal means. However, after considering the costs and benefits, individual farmers often do not resort to legal action and can only helplessly choose to “submit to humiliation”.

The fourth point is the short-term behavior based on the number of games (transaction frequency). Short-term behavior tends to occur in one-time

transactions or cooperation frequently (Ma, 2017). Opportunistic behavior is likely when the parties engage in only one-time transactions. Repeated game transactions and contract execution, there are many opportunities to adapt to each other and change strategies. The company or farmer adopts the following dynamic strategy, referring to the other party to constantly adjust their strategies to obtain “win-win” game results, leading to which the company or farmer mainly needs to build its reputation to obtain long-term benefits and in a certain period to achieve cooperative equilibrium, that is, both parties comply with the terms of the contract or transaction; while in the transaction that is about to end or a limited number of benefit swaps, the parties are more likely to take an “a hammer trading” approach, to adopt “striking first prevail” strategy to prevent the ending of “the latter suffered”. In the game of trading between the enterprise and the farmer, it is easy to cause a non-equilibrium game result because of the disparity in the position of the two sides, their negotiation abilities, and unequal information(Salas， 2016). The enterprise and the farmer are prone to mutual distrust and a high-alert mentality and take the behavior of cheating each other. As exemplified in the case happened in 2001 that, the “Yu Yun” incident occurred among Zhejiang vegetable farmers is a typical farmers’ short-term behavior. The “Yu Yun” enterprise and farmers in Yuyao, Zhejiang province and some other places signed a purchase contract for squash, and the two sides agreed that the minimum price of Zha Cai

protection for 0.36 Yuan per kilogram. Specifically, the farmers planted an area of more than 10,000 acres. When the scales opened for purchase, the market price of Zha Cai fell down to a minimum of 0.16 Yuan per kilogram. The same kilogram of Zha Cai, farmers with a contract and farmers without a contract price difference of 0.2 Yuan per kilogram. As the “Yu Yun” enterprise and farmers signed the contract for a year, a considerable part of the contract farmers is driven by the interests of low-priced acquisition of peripheral Zha Cai, to the minimum price of protection sold to enterprises to earn the price difference between inside and outside the contract, there is no contract part of the farmers to pay for the contract, but also with the purchase of low-priced Zha Cai sold to enterprises as well.

3.4 Causes of contractual risk

This study argues three main reasons that why the above risks arise.

Sheng (2007) argues that incomplete contracts make default possible, and opportunistic behavior makes default inevitable. First refers to the incompleteness of the terms of the contract. Modern contract theory initially distinguishes between Complete Contracts and Incomplete Contracts. Referring to Coase, business is composed of a series of contracts. Besides, incomplete contracts are defined as the existence of incomplete factors such as the limited rationality of individuals and the complexity and uncertainty of the

external environment. The parties cannot contract to include in the contract all the future situations that can occur during the transaction and the duties and powers in the corresponding situations thoroughly and precisely. A complete contract is only an ideal state. In line with the GHM model, signing a complete contract is merely considered an ideal state; in reality, the contracts between enterprises and farmers are destined to be incomplete. The complexity and uncertainty of the external environment of agricultural production and operation, the limited rationality, the opportunistic behavior, the unequal contractual status, the negligence and carelessness of enterprises and farmers in the contract signing process, and the high cost of contracts are the main reasons for the incompleteness of contracts. The contract's incompleteness is that the organization is subject to serious default risks.

Secondly, it is the asymmetry of contract subjects. Under the organization of "enterprise+farmers", one side of the transaction is a leading enterprise with strong market management ability, and the other is a large number of scattered farmers with less market information. In the negotiation process of contract signing between leading enterprises and farmers, small farmers with small-scale decentralized operations generally lack organization and market information and are in a relatively weak position. In contrast, leading enterprises are in a relatively strong position with organization, scale, expertise, and information advantages (Santiago & Sykuta, 2016).

Consequently, the two parties are substantially unequal in the transaction. This unequal status is manifested in the enterprise's grasp of market purchase and sale information, the formulation of agricultural contract prices, and the formulation and implementation of contract terms and conditions, *etc.*, which are superior to farmers. They will likely take advantage of farmers' interests via apparently reasonable contract terms, such as deliberately suppressing the grade or price when acquiring agricultural products. Individual farmers are often poorly educated, have little legal awareness, lack funds, and cannot defend their interests through legal means in the face of corporate default. The unequal status of transaction subjects not only makes the contract terms more favorable to the interests of the enterprise and the issue of contractual adhesion but also tends to weaken the binding force of the formal contract. If the default benefit exceeds the cost, it is hard to fulfill the order contract. According to a survey (Sheng, 2007), while farmers' default accounts for 30% of all contract breaches, leading enterprises' default accounts for about 70% of all contract breaches.

The third reason refers to the opportunistic behavior of contract subjects. In the contract execution process of contract farming, the farmers and the enterprise constitute a static game of incomplete information. When the market price is lower than the contracted purchase price, farmers tend to perform; when the market price is higher than the contracted price in advance,

farmers have a solid intention to resell their agricultural products in the market, thus causing farmers' default. Facing farmers' default, enterprises are encountered with the same cost-benefit trade-off of whether to resort to legal action and go to court with farmers. Contrarily, when the market price is higher than the contracted purchase price, leading enterprises tend to perform; while when the market price is lower than the price stipulated in the contract in advance, the company is more inclined to default and break the contract to purchase from the market. When its operation is complex, some enterprises often disregard farmers' interests and even intentionally transfer the risk. Confronting the enterprise default, farmers face the same cost-benefit trade-off of whether to resort to legal action and take the enterprise to court. Accordingly, the traditional contract cannot achieve practical constraints on the opportunistic behavior of transaction subjects under the "enterprise + farmer" organization model.

3.5 Analysis of the impact of contractual risk on the sustainable development of agricultural industrialization

Based on the existing theories and cases, contractual risks affect the sustainable development of agricultural industrialization in the following ways: Initially, the impact on farmers' income increased. Once contractual risk

occurs, the negative impact on farmers' income increase is often the most direct. Take the *Sanlu* milk powder incident in Shijiazhuang as an example; After the incident was publicly exposed, dairy farmers had to dump fresh milk that could not be stored. According to a report by the China News Service that year, from September 14 to September 16, the first results indicate that the province of Hebei lost 5,936 tons of raw milk. In addition to a small amount of 200 Yuan a ton of cheap sale, the average price of a ton of milk was 3,000 Yuan, and the vast majority of dairy farmers were painfully dumped. Experts in the dairy industry analyzed that the daily processing capacity of raw milk of *Sanlu* amounts to more than 5,000 tons, and a large number of dairy farmers who have a milk supply relationship with *Sanlu* were affected by this incident; They said that "the production of raw milk will not stop producing milk because of the plant stoppage. It is an animal instinct. Once it stops producing milk, it may not be able to milk for a long time. So milking, and raw milk production is still going on as well. The marketing of this raw milk determines the fate of the dairy farmers."

The second is the impact on production efficiency. When a contract is not fulfilled, not only does it cause losses to the parties, and the third parties may be disadvantaged and hurt production efficiency. It is not uncommon that the third party here may be the contract guarantor, the local government, or a financial institution. This is because, in a market economy, the two parties to a

contract do not exist in isolation; they are always loosely or tightly connected to other economic agents. Once the contract is abnormally terminated, there is bound to be an impact on one of the links in the market chain so that the entire production and operation chain suffers losses as well. Besides, it also includes the possibility of joint and several liabilities of the guarantor, the complexity of the financial institution to recover the loan as scheduled, and the failure of the government department to set up the task of work, which hurts the whole production and efficiency(Satish，2021).

The third leads to the impact on ecological lean. Suppose the contract between production subjects cannot effectively restrain the pure interest impulse. In that case, there will be such as excessive use of chemical fertilizers, the application of highly toxic pesticides, the abuse of natural hormones and other farmers' "ethical risk" behavior, the harm will indeed be transmitted with the agricultural industry chain, hurting the ecological environment, and in the meantime damage the health of consumers. For instance, in the pig breeding process, the use of excessive veterinary drugs is everyday. Famers often expect to reduce the risk of pig death via using amounts of veterinary drugs. The research results show that one out of every three farmers overuses veterinary drugs to protect the slaughter rate of pigs and get a better sales price. At the same time, the enterprise's purchase contract is often calculated by the slaughter weight, which further intensifies the famers' excessive use of

veterinary drugs and hormones. Similar findings were found for farmers in the plantation sector, where factors such as safeguarding or increasing agricultural yields, hedging agricultural risks and thus ensuring total (excess) delivery of agricultural products to enterprises (leading enterprises) by contracts became the main incentives for farmers to over-dose pesticides. Farmers generally believed that excessive pesticides could reduce the labor and capital costs of agricultural production and their labor time, thus allowing them to increase their off-farm time, obtain more income and maximize home income. As exemplified in fertilizer use, there are often clauses in the contracts between enterprises and farmers on the standard of fertilizer use. Farmers often apply excessive fertilizer to pursue profit, which is not easy to monitor. The cost of monitoring is exceptionally high. China's fertilizer application situation has been not optimistic in recent years. On the one hand, fertilizer brings the effect of yield reduction to agriculture; on the other hand, excessive fertilizer application is becoming increasingly severe, and the fertilizer is of low utilization and causes the severe loss. The fertilizer utilization rate of rice, corn, and wheat, three major food crops in China is only 35.2%; in addition to crop absorption, most of the nutrients grow into the water and soil, resulting in agricultural surface pollution, posing a threat to the health of the majority of residents. The World Bank also reported that nearly 50% of China's groundwater is polluted by agricultural non-point-source pollution. The area of

arable land affected by such pollution has been nearly 20 million hectares.

Fourthly, the impact on the leading income generation. Farmers do not fulfill the sales contract for immediate benefits, thus making the interests of the leading organizations suffer. This is primarily due to the market, where the market price is higher than the contract price, and thus farmers turn to the market in violation of the contract. This results in the reduction of revenues or increased costs for the leading enterprises, which may also squeeze the profits of the enterprises at both ends. A classic case is the “Yu Yun” incident that happened among Zhejiang vegetable farmers; part of the farmers had a contract to buy the surrounding Zha Cai at a low price, to sell to the enterprise to earn the price difference inside and outside the contract at the lowest protection price. Part of the farmers pay for the contract without a contract with the outsourcing of low-priced Zha Cai sold to the enterprise. The final settlement of the 15 million kilograms of Zha Cai purchased by the enterprise more than 30% is the inflow of non-contract Zha Cai from outside, for which the enterprise paid 2 million Yuan more.

The fifth is the impact on the stability of production relations. Primarily, it leads to short-term behavior of the production body, especially farmers. Due to the repeated occurrence of contractual risks and the harm caused to the parties concerned, some farmers lose confidence in long-term expectations and become resistant, thus taking immediate interests as the goal of action,

considering only the benefits of one-time transactions and not the benefits of multiple long-term transactions. Consequently, those who default and renege for immediate interests are incessant and follow the lead of each other and reverse incentives, causing more people to adopt short-term behaviors. Secondly, it brings the deterioration of the integrity environment. In some sense, the modern economy is essentially a contracting economy, and the contracting economy can only grow in the fertile soil of good faith. Suppose the contractual risk of the industrialized operation of the clothing industry is not effectively managed. In that case, people will take short-term behavior due to fear. Meanwhile, the prevailing short-term behavior will deteriorate the regional and even social integrity environment (Xie et al., 2017).

3.6 GHM theory

GMH theory argues that it is impossible to draw up a complete contract due to the limited rationality of people, the incompleteness of information, and the uncertainty of transactional matters, which makes it too costly to clarify all the special powers, and that GHM is inevitable and mainly exist as well. Because of the existence of GHM, ownership cannot be defined in the usual terms of assets as in traditional property rights theory(Grossman & Hart，1986). It is not the foreseeable and enforceable rights in the contract that are essential for allocating resources but rather the residual rights of control that are not

mentioned in the contract for the assets utilities. Accordingly, Hart et al. define ownership as the possession of residual rights of control or the right of decision control after the fact. In the view of Hart et al, it is efficient to allocate residual rights of control to the party whose investment decisions are relatively important when the contract is incomplete. Besides, Grossman, Hart, and Moore et al. further state that residual rights of control derive from material assets' ownership. Thus, residual rights of control naturally accrue to non-human capital. In a contractually incomplete environment, the ownership of physical capital is considered the basis of power, and ownership of physical assets will lead to control over the owner of human capital, so the enterprise is also defined by the non-human capital it owns or controls.

Important concepts under this theoretical framework are: central control of the enterprise non-human capital owners, i.e., shareholders, have the residual rights of control or ownership of the enterprise and, therefore, have the central control of enterprise governance, and shareholders are both the subjects and beneficiaries of enterprise governance as well. Contract incompleteness: The so-called contract incompleteness refers to the degree to which the contract cannot be complete. Hart explains contract incompleteness in three ways: first of all, in a sophisticated and very unpredictable world, it is difficult for people to think too far ahead and plan for every possible situation; secondly, even if individual plans can be made, it is difficult for contracting parties to agree on

them because they have difficulty finding a common language to describe situations and behaviors. Thirdly, even if the parties could plan and negotiate for the future, it would be hard for them to write the plans down in such a way that, in the event of a dispute, an outside authority, such as a court, could clarify what the plans meant and enforce them.

3.7 GHM theory and agricultural industrialization

In reality, the well-functioning production and management models of leading enterprises-farmers have benefited from locally adapted organizational structures and the use of matching contractual linkages, e.g., the Ruyi Group model in Jiangsu (Qian, 2000), the Saifeiya model in Inner Mongolia (Deng and Mi, 2002; Zhou & Deng, 2004), and the Wenshi model in Guangdong (Wan, 2008; Ou, 2010), etc. Via cross-ownership and vertical quasi-integration, the contractual link between the enterprise and the farmer is based on common commodity or contractual factor elements. There is a command and obedience relationship similar to that of an intra-enterprise contract. Farmers give up their management decisions to the leading enterprises, i.e., from the determination of planting plans, product quality, and quantity requirements to the implementation of technical specifications, many details are arranged by the enterprise.

Subsequent studies have focused on contract stability, contract governance,

and contract performance. In terms of contract stability, Zhao and Sun (2004) analyzed the stability of the leading enterprise-farmer model from the perspective of transaction and organizational costs. They concluded that the decentralized management decisions of small-scale farmers lead to higher organizational costs and the emergence of the multiplier effect, which offsets the transaction costs saved by non-market arrangements and reduces the incremental profits increased by the congruent cohesion effect. The stability of this contractual linkage is affected by factors such as the cooperative surplus allocation mechanism between enterprises and farmers and the size of the lead enterprise. Xu (2002) found that the size of liquidated damages in a contract significantly affects contract stability in a game. Ouyang(2004) analyzed famers' bargaining position in contract negotiation and found that organizational fragmentation, information asymmetry, financial and technical disadvantages, and government intervention bias lead to farmers' bargaining disadvantages, which in turn affect contract stability. Changing the monopoly situation of leading enterprises, establishing agricultural economic cooperative organizations, enhancing farmers' bargaining advantages, and improving farmers' organizations.

Regarding contract governance, Xu (2000) analyzed that the unequal status of both enterprises and farmers, the uncertainty of agricultural industry operations, and the opportunistic behavior of both contracting parties lead to

incomplete contracts, which in turn affects the efficiency of contract governance. Deng and Mi (2002) pointed out that the choice of contractual linkage form under the constraints of transaction cost structure and information structure, risk, and knowledge distribution is a dynamic process that constantly adapts to the changing constraints, and the key is whether it fits the given constraints. Huang et al. (2006) conducted an evolutionary game stability analysis on the behavior of contracting parties, and the model depicted that in the long-term cooperative game process, the intervention of third-party forces can ensure the smooth operation of the cooperative game, and the implicit incentive-reputation mechanism can motivate contract execution. Cai et al. (2008) integrated game-theoretic tools and transaction cost analysis framework to construct a contract choice model of leading enterprises-farmers. They advocated promoting both contracting parties to increase investment in dedicated assets to increase the dependence between contracting parties. Furthermore, Xu (2009) considered the leading enterprise-farmer contractual linkage as the kernel of the agri-linkage model, whose efficiency depends on the stability of the contractual relationship and governance efficiency. The win-win situation can be achieved via the shared use right contractual linkage that allows both parties to replace the general general-purpose investment and the human capital-specific suffering with relationship-specific investment.

In terms of contract performance, Li (2003) constructed a neoclassical model to evaluate the costs and benefits of contractual linkages between leading enterprises and farmers in the market state, the vertical integration state, and the commodity contract state and found that only contractual linkages based on the premise of free flow of production factors, the market as a bond, and sufficient competition among enterprises can develop in a healthy and orderly manner. Fan et al. (2003) analyzed the reasons for the high default rate in the contractual linkage model of leading enterprises-farmers; the key lies in the inherent mechanism arrangement of contract farming which fails to truly realize benefit sharing and risk sharing among enterprises and farmers, and proposed that the proper selling mechanism is the best solution to achieve a win-win situation for both companies and farmers. In addition, Jia et al. (2005) innovatively introduced the modeling scheme of system dynamics flow rate basic in-tree to construct a feedback structure model to analyze the root cause of double default behavior of contractual linkage between leading enterprises-farmers. Xu and Ye (2012) argue that relational property rights contracts are intangible property rights formed in long-term relational interactions between two parties to a transaction to create and reasonably allocate greater economic rents and reducing rent dissipation, and their carriers are long-term interactive relationships. A reasonable definition of such relational property rights is the basis for stabilizing the contractual relationship between the enterprise and the

farmers (Ruan, 2019; Han et al., 2018).

Therefore, what effect does agricultural industrialization with innovative operation mode have on farmers' income and agricultural production? It is generally believed that agricultural industrialization as an institutional arrangement can, on the one hand, solve the production factor input issues of farmers, on the other hand, reduce the market and price risks faced by farmers and enable them to share the benefits brought about by the extension of the industrial chain(Hart & Moore，1990). For instance, Goldsmith (1985) and Warning and Key (2002) found that via implementing contract farming, enterprises can provide farmers with capital, technology, new varieties, and product marketing services, which can effectively solve the problems of farmers' production in terms of capital, technology, and information; they can reduce the risk of farmers' direct access to the market, reduce market transaction costs, and change farmers' subsistence production. Moreover, it can also promote employment and improve the status of women and the local economy. A study by Kimenye (1995) also concluded that contract farming helps small farmers increase their income and found that contract farmers have, on average, 37% more production and 80% more net profit than non-contract farmers and that contract farmers have access to more technical advice and market information. Nevertheless, some scholars have also found some adverse effects of contract farming. Reardon et al. (1999) argued that there are

adverse effects of the implementation of contract farming. The main ones are: firstly, due to the relatively high cost of enterprises to enter into orders with small farmers. In many cases, contract farming favors capital-intensive large-scale farmers. It thus can appear to exclude small-scale operating farmers, which may lead to the deterioration of the survival conditions of these farmers and increase the inequality of rural community development(Yuan et al., 2013). Secondly, the unequal economic status of enterprises and farmers may cause the interests of order farmers to be damaged. By participating in contract farming, farmers transfer their production structure from traditional crops to the new cash crops required by the order, forming a dependence on the enterprises and decreasing their negotiating position in the market, or even being in a situation where they are forced to accept lower prices(Hou et al., 2018). In this case, order agriculture has become a “tool” for enterprises, giant enterprises, to exploit the interests of farmers(Vicol et al., 2022). Thirdly, most agricultural products farmers produce via contract farming are cash crops with high market value. Suppose many farmers in a particular region excessively rely on cash crops. In that case, there is a risk of both price increases due to insufficient food supply and price decreases due to excessive supply of cash crops, resulting in economic and livelihood instability of farmers.

3.8 Evaluation of literature

Through the review of the existing literature and theories in Chapter 2 and Chapter 3, we find that most of the research on agricultural industrialization at home and abroad is carried out from the level of institutional analysis, and rarely combines in-depth theoretical analysis with detailed investigation and empirical research. Either theoretical analysis is carried out directly but there are many assumptions, or empirical analysis is carried out directly but the causal relationship between variables is not discussed in depth, and the first-hand data is relatively lacking, The guiding significance of the conclusions is limited, and the research conclusions and policy recommendations are generally weak. On the whole, most of the existing studies focus on the stability of contract linkage and governance efficiency under the framework of institutional economics and game theory, and focus on qualitative analysis. However, how this contract linkage affects the process of agricultural industrialization still lacks theoretical discussion and empirical test. In addition, an in-depth examination of the contract connection between leading enterprises and farmers inevitably involves the operation mechanism and actual results of real cases. For the newly emerging innovative operation mode, the "separation of two rights" contract connection form, which takes Parsons as a typical example, has not received the attention of the academic

community. This paper is intended to help fill the gaps and carefully consider this issue.

CHAPTER 4 Analysis of the stability of agricultural contractual linkages from a GHM perspective

Paisenbai is the first NFC orange juice producer in China. Its localized management model can be summarized as follows: the leading enterprise builds its core orchard, demonstrates and promotes the model and processing and regulates the raw material base, and provides technical management support and part of the funds, while farmers provide land and labor, and the right to use the land contract, ownership of fruit trees and fruit income belongs to farmers, while the planting time, variety, management and operation, harvesting and other specific matters belong to the enterprise, i.e., “separation of two rights” operation mode. Under this contract, leading enterprises and farmers form a community of interest, effectively and precisely organizing agricultural production transactions, solving the problem of intensification and standardization of the Chinese agricultural industry chain while also ensuring

the quality of fruit juice and improving income thus achieving a win-win situation.

Concerning intensification, Paisenbai signs contracts with farmers for contracting, management and acquisition, stipulating that farmers should follow Paisenbai's technical solutions. Besides, Paisenbai guarantees that the yield per acre will increase step by step and the cost of pesticides and fertilizers can be controlled and subsidizes the part that does not meet the standard, and purchases the total amount according to the contract price that is not lower than the market price, reducing the market risk of farmers and allowing them to develop their bases at ease. As far as standardization is concerned, Paisenbai has established a grassroots fruit farmer association, reward and punishment mechanism, and quality traceability system to achieve standardized operation via the power of a base manager, fruit farmer association, and market-oriented operation system.

4.1 Paisenbai's concept of citrus agricultural industrialization

4.1.1 Status of development of Paisenbai citrus industry

Chongqing Paisenbai Orange Juice Co. Ltd., the first enterprise producing NFC (not from concentrate) orange juice in China, is viewed as a national key leading enterprise of agricultural industrialization, a national leading

enterprise of comprehensive agricultural development, a national leading enterprise of poverty alleviation, a leading enterprise of agricultural industrialization in Chongqing. It is one of the implementation units of the "Three Gorges Reservoir Area Citrus Industry Development Project and Chongqing Million Tons Citrus Industrialization Project" implemented by the Third Construction Commission of the State Council. The company is also one of the contractors of National Citrus Engineering and Technology Research Center. Paisenbai has undertaken more than 20 national and Chongqing science and technology research projects from the "Tenth Five-Year Plan" to the "Thirteenth Five-Year Plan", including citrus variety screening, seedling breeding, planting, processing and harmless treatment of waste peel residue, etc. The company has declared and approved hundreds of patents in the whole citrus industry chain. In 2019, it was awarded as a national intellectual property advantage enterprise. It won the second prize of Chongqing Science and Technology Progress Award twice, and won the first prize of Science and Technology Invention Award of China Light Industry Federation in 2021.

In 2002, the State Ministry of Agriculture designated the Three Gorges Reservoir as the only orange juice processing raw material industrial zone among the three major citrus industrial zones in China. The Three Gorges Reservoir area is recognized as the world's top three suitable areas for processing sweet oranges, and Paisenbai has established 220,000 high-

standard orchards in eight districts and counties in Chongqing, including Yubei, Banan, Zhongxian, Changshou, Fuling, Fengdu, Dianjiang and Shizhu, with diversified varieties of early, medium and late ripening and advanced facilities such as water and fertilizer integration. In July 2017, with Paisenbai Citrus Industrial Park as the core, Chongqing Zhongxian “Orange County in Sanxia” Pastoral Complex was approved by the Ministry of Finance and the National Agricultural Development Office as one of the first 18 national pastoral complex pilot projects. “Orange County in Sanxia” is the only national-level pastoral complex in the Three Gorges Reservoir area of Yangtze River and Chongqing and the only national-level pastoral complex with citrus as the core industry in China.

With more than 20 years of focus on citrus industry and dedicated efforts, Paisenbai has built the world’s largest citrus detoxification container seedling base and established a resource institute of 398 suitable citrus varieties to protect biodiversity and explore the commercial value of citrus. Through screening high-quality sweet oranges suitable for global processing in the institute, the company has created 220,000 mu of high-standard orchards of early, medium and late maturity synchronized with international standards and driven more than 100,000 fruit farmers, including more than 30,000 immigrants from the Three Gorges Reservoir area, to become rich steadily. Paisenbai has set up a whole industry chain called “from a seed to a glass of

orange juice".Its NFC orange juice has been awarded the Chinese famous trademark and has been a national banquet drink for 13 consecutive years. The single puree and orange peel are widely exported to Europe and Asia, breaking through the zero export of orange juice in China.

4.1.2 Paisenbai's strategy of integrating the primary, secondary and tertiary industries

Based on its own established and mature primary and secondary industries, and guided by the national rural revitalization strategy and the integrated development of the primary, secondary and tertiary rural industries, Paisenbai·Orange County in Sanxia Pastoral Complex deeply explores the connotation of citrus culture, combines Paisenbai's own modern citrus cultural resources, blends the ancient and the modern, and forms an irreproducible agricultural-tourism compound development model. It has created the green ecological demonstration and experience areas that combine planting and breeding, such as the "China-Three Gorges Citrus Cultural Museum", "Citrus Art Workshop", "Citrus Pig Demonstration Farm" that utilizes antibiotic-free feed and organic fertilizer produced by waste peel residue after juice extraction, "Three-dimensional Vegetable and Fruit Garden", "Four-season Citrus Picking Garden" and other citrus cultural life, , leading the development of agricultural tourism integration along with culture. In 2003, it was awarded

as the agricultural standardization demonstration park by the Ministry of Agriculture, the national agricultural tourism demonstration site by the National Tourism Administration in 2005, the national agricultural science and technology park by the Ministry of Science and Technology in 2016, the first national development park intergrating the primary, secondary and tertiary green food(citrus) industries in 2021, and the enterprise contributing to rural revitalization in 2021.

Paisenbai values the power for poverty alleviation provided by wisdom.. To help the poor first, Paisenbai always takes helping farmers to master the skills to get rich as an important grasp of poverty alleviation, and continues to promote vocational training for farmers. For more than 20 years, in addition to providing free technical services for fruit farmers in the Three Gorges Chongqing Reservoir area, it has also trained more than 60,000 fruit farmers and compiled the “Three Gorges Reservoir Area Citrus Gardening and Young Tree Management Concise Practical Manual”, “Citrus Gardening and Orchard Management Technology Manual” and other materials for free distribution, which enables fruit farmers to standardize the construction of gardens, realize scientific planting and management, and achieve increased production and income. Paisenbai has been designated as the municipal training base for entrepreneurial leaders by the Chongqing Poverty Alleviation and Development Office. Focusing on the three links of “capacity training,

entrepreneurship incubation, and income growth", Paisenbai Vocational Skills Training Center, located in the core area of the national field complex "Orange County in Sanxia", adapts the resources of the primary, secondary and tertiary industries and combines centralized training, on-site teaching and experience sharing to continuously improve the scientific and cultural quality and the level of prosperity of farmers. Through scientific and effective cultivation methods, a group of high-quality professional farmers who can succeed in entrepreneurship and leadership are cultivated.

Paisenbai is declaring the bulk-farm products citrus trading market jointly built by the provincial ministry. Paisenbai will make full use of its leading role in business, gather the advantageous power of Chongqing citrus industry, play its industry-leading juice processing technology, build Chongqing orange juice processing center, and meanwhile help the citrus production areas in the Three Gorges Chongqing Reservoir area to solve the problem of lagging sales of the remaining small fruits and secondary fruits, and help farmers increase their income. Such behaviors will realize the linkage of Chongqing citrus industry blocks, set standards, create a big brand of Three Gorges citrus, and integrate domestic and foreign citrus resources to build a global leading citrus supply chain platform so as to realize rural revitalization.

4.1.3 Paisenbai's agricultural industrialization operation model with "separation of rights" as the core

1. Modern concept of citrus (agriculture)

Similar to the Chinese agriculture, Chinese citrus also depends on the traditional farming model of fighting alone and living off the sky for a long time with problems of single poor variety, uneven management, low quality, short and concentrated ripening period, and unsuitable for the development of processing industry. Accordingly, to develop the citrus industry, it is essential to get out of the shackles of the traditional citrus concept and establish a new concept of modern agriculture. Based on this concept and many other investigations, Paisenbai took two years at the beginning of the project to establish its development goals of modern citrus industry in 28 years. The traditional model of small farming economy with scattered planting and household management of going downhill to get grain and going uphill to get fruit trees" has been transformed into a modern agricultural model with citrus as the main industry. China's first modern citrus orange juice processing raw material exclusive base that integrates scale, intensification and standardization was built under the modern agricultural model of "concentrated patchwork, unified standards, concentrated soil change, unified garden construction, unified management".

2、Operating mode

The advanced concept is the direction, and the operation mode is the driving force. The “separation of rights” is the core component of the Paisenbai citrus strategy: the contractual right to use the land, ownership of fruit trees (seedlings provided by the enterprise and the government for free), and the right to gain fruit income belong to farmers, which not only conform to the consistent policy of ensuring that farmers do not lose their land, but also effectively avoid eating a big pot of rice, fully mobilize the enthusiasm of farmers, and increase the farmers’ income; Site selection, species selection, management rights. care technology, and picking time, etc. are vested in the enterprise and operated according to layout of the modern agricultural concept. As exemplified in the case that at the beginning of the construction of the orchard in 1998, a group of experts from the United States, Thailand and Taiwan was hired to analyze and prove the site of the Paisenbai orchard, test the heavy metal content of the soil of the proposed site, and carefully screen dozens of varieties rich in vitamin C, folic acid, potassium, and different ripening periods of early, middle and late suitable for juicing so as to meet the needs of the product zero additive and production cycle. The “separation of rights” is a successful operation model that has been proven in the 20 years of practice by Paisenbai with references and adjustment to the operational experience of cooperatives in developed countries in Europe and the United

States.

In response to the situation of Chinese agriculture and rural areas, Paisenbai created the Paisenbai Citrus Technology Training Center in 1998, which has trained more than 60,000 farmers for free, with teachers, teaching materials and accommodation provided. At the same time, Paisenbai also created a special technical promotion system. To implement the project, the company built five levels of expertise: the enterprise's General Engineering Office + scientific research units, domestic well-known experts from universities and colleges composed of the first level of expert groups; the enterprise's technical department and promotion center as the second level; the administrators and technicians stationed at each orchard under the enterprise as the third level; more than 60,000 trained and selected orchards of excellence as the fourth level; the local prestige, influential and enthusiastic people selected by each orchard as the fifth level of fruit farmers' association. The five-level technical management system is a reliable guarantee for the smooth operation of the Paisenbai citrus industry.

3、Technology innovation

There is a truth in China called hard work plus smart work. Paisenbai insists on making efforts on the word smart in the practical work of step by step. The so-called smart is the innovation of concept, innovation of technological, and innovation of facilities and equipment. At the beginning of the project,

Paisenbai got rid of the shackles of traditional Chinese citrus customs and took the most advanced concept of large agriculture and modern citrus from developed countries, such as reasonable seed selection, factory nursery, intensive, large-scale, modern, standardized garden construction, scientific management and the introduction of international first-class equipment for deep processing. In China, Paisenbai created six technical systems for citrus processing industry for the first time, which is the watershed between traditional citrus and modern citrus. At the same time, it has undertaken over 20 topics related to citrus industry in the scientific and technological research in the national “Tenth Five-Year Plan”, “Eleventh Five-Year Plan”, “Twelfth Five-Year Plan” and “Thirteenth Five-Year Plan”, and it has built the first national citrus engineering technology center in China’s fruit industry with the Citrus Research Institute of Chinese Academy of Agricultural Sciences.

4.2 Separation contract between two rights in Paisenbai’s "leading enterprise+farmers" model

4.2.1 The main features of the Paisenbai rights separation contract

On the basis of the “separation of rights”, a relatively solid contractual system has been created via the overlay of a number of powerful supporting methods implemented by Paisenbai.

1、Establishing long-term contractual relationships

Paisenbai and the farmers sign the exclusive production and sales agreement, which becomes the basis for the implementation of the contract system.

2、Forming a relatively fair purchase price

Paisenbai takes the domestic market price of the same quality raw material products within a certain period of time as a reference to set a floating raw material purchase price to fully protect the vested interests of the farmers and avoid the risk of non-compliance by the farmers due to price factors.

3、Providing continuous technical services to farmers

Relying on its own excellent technological innovation system and technical promotion system, Paisenbai continues to innovate raw material cultivation and management techniques, provide free technical training and technical services for fruit farmers, continuously strengthen the implementation of corporate standards for fruit farmers to achieve lower management costs, improve yields, achieve stable income, and continuously improve farmers' trust in the enterprise.

4、Implementing joint insurance measures to further strengthen the integrity of performance

(1) Implementing the whole village joint insurance or the whole community joint insurance of cooperatives. If any of these individuals do not follow the standard planting and do private sale, etc., then the support of free technical

services and acquisition will be canceled in the next year. and most farmers will pursue continuous production capacity and income security, and farmers will monitor each other during the contract period.

(2) Implementing the whole vehicle inspection rating when receiving fruit loading. If one of the individuals appears to be substandard, falsification and so on, the whole car purchase price will be floated down in accordance with the provisions, and farmers forms mutual supervision mechanism when loading, which is to avoid price downward adjustment.

The co-insurance measures ensure that the need of the relevant personnel to carry out mutual supervision, which saves the enterprise's management costs and can greatly improve the integrity of performance.

5、Innovating industry chain to provide upward mobility for farmers

Paisenbai keeps building the whole industrial chain of citrus, promoting the integrated development of the primary, secondary and tertiary industries, and innovating the implementation of the agriculture, culture and tourism project and the combination of farming and breeding project. Paisenbai gives priority to select high-quality cooperative farmers with high credibility for training and help them join the project plan. Farmers can not only get income through citrus planting, but also get secondary income through cultural tourism services and forest farming, which further enhances the enthusiasm of farmers to cooperate with enterprises to develop industries and form a more benign

and solid contractual relationship.

4.2.2 Analysis of main advantages of "leading enterprises + farmers" model agricultural contract

After careful analysis of the terms of the "separation of powers" contract in a typical enterprise case, it is found that it has the following essential characteristics:

(1) The contract is similar to an intra-enterprise contract in form, formulation, and execution, with a framework character, which is initially a framework and is gradually enriched and implemented in the process of implementation, and the rights and obligations contained in the contract are extended to each other. The stable implementation of the transaction and reasonable distribution of the surplus are maintained via privity, agreement, and trust.

(2) The transaction process is inter-penetrated with the production process, and the subject matter does not exist independently before the transaction. However, it is combined in the production process by the parties to the contract according to their own will and input of complementary asset elements.

(3) The final product comes from multiple transactions between the two parties of the contract. The leading enterprise does not usually acquire the agricultural products predetermined by the farmer but also regulates, guides,

and restricts the farmer's behavior before, during, and after the production with specific regulations and deep involvement to make it conform to standardized requirements.

This innovative contract can do the following:

Firstly, it replaces market transactions with long-term contracts, saving exogenous transaction costs. Paisenbai uses the long-term contract of "separation of powers" to link multiple subjects and form an organizational structure with consistent interests. The long-term contractual relationship between supply and demand of agricultural products can reduce market search costs, multiple contracts, and bargaining costs. Compared with market transactions, quasi-integrated organizations have the advantage of saving exogenous transaction costs.

Secondly, internal coordination costs between contracting parties are lower than those of business organizations. Each party carries out production and operation activities according to the rights and responsibilities stipulated in the contract, and there is no strict internal section management system; for the reason that each party has independent property rights, the organization has fewer internal principal-agent issues and does not need to form a sophisticated governance structure, so the internal coordination costs are lower.

Thirdly, parties can obtain more considerable residual rights, and the incentive effect within the organization is more substantial. Participating agricultural

subject's alien part of their residual rights in exchange for cooperative surpluses. At the same time, each organizational party remains an independent property right subject and retains most of its residual rights of control. The arrangement of revenue and control rights among the subjects is more symmetrical, providing a more effective incentive for each subject's behavior.

4.3 Key binding elements of contractual stability

In the typical "enterprise+farmers" agricultural contract model, the primary temptation for farmers and enterprises to default is likely to occur when the market price is more volatile (Cai & Ma, 2015). When the market price is higher than the agreed price, farmers have a strong incentive to default; contrarily, enterprises have a solid incentive to default. And because of the limited production value of a single farmer or a few farmers, it is difficult to offset the costs incurred during the period by the subsequent legal or administrative actions taken by either party for breach of contract (Liu, 2015). In this case, Paisenbai and the farmers agreed in the initial contract that the enterprise would buy all the crops produced by the farmers at the market price, which seems to be an attempt to solve this problem. However, due to the poor consistency of the grade of agricultural products, the unit value is meager, but the cost of quality screening is not cheap. Accordingly, assuming that both farmers and enterprises remain rational in the transaction, they only need to

pay the information cost of obtaining the market price IC, the contract cost of negotiating the market transaction CC, and the implementation cost of the potential uncertainty of the market transaction EC, then the dispute between the contracting parties over the quality of the product can be transformed into a dispute over the market price. That is, the unit price of high-grade products must be higher than that of low-grade products, and the higher the unit price is, the higher the farmers' income and the lower the enterprises' income will be during the delivery period when the farmers' and enterprises' initial investment and total production have been determined so that farmers have the impulse to overestimate the product quality. Enterprises have the impulse to underestimate it. Our questionnaire also reflects that it is relatively tricky for farmers to agree with enterprises on citrus grade determination. Assuming that there are more buyers and sellers in the market, the opportunistic behavior of both farmers and enterprises will be difficult to achieve after the external market test. However, both parties will be forced to withdraw from the contractual agricultural industrialization model and return to the conventional "farmer + market" model, which is not a stable contract. It can be found that in the GHM framework, the key to maintaining the "enterprise + farmer" contract model is the internalization of externalities brought about by the quasi-integrated organization created by the contract, which is necessary for the continuation of the organization in price theory: either the price does not

follow the market, but rather shares the risk and the residual income according to the agreed price; or further enhance the exclusivity of the asset, in which case there is no such thing as a fair market price. In the case of Paisenbai, the price model in the contract is exactly in between because the subject matter of the transaction is fixed as citrus, which has specific requirements for growing soil, climate, and technical conditions but is not very harsh; it can be moderately preserved and transported but cannot be transported for a long time and long distance; the demand of the enterprise is excellent and may distort the market price to a small extent in the local area but basically cannot distort the market price in a large area. Therefore, the key to maintaining the stability of the contract still lies in controlling the transaction costs of the contract from the perspective of organizational structure so that the contract's adaptability and incentives are compatible with its incompleteness.

4.4 A framework for maintaining contractual stability based on transaction costs

The processing of primary agricultural products (in this case as citrus) into final products (in this case as juice) will incorporate more excellent added value than fresh fruit, so the value conferred by the production and sales contract between the enterprise and the farmer to the act of agricultural production must be greater than the direct sale, and the key to the stable

existence of the contract between the enterprise and the farmer relationship is that the enterprise will align a portion of the additional revenue brought via contract farming compared to the acquisition of raw materials in the market so that the farmer's return is greater than direct sales of primary agricultural products in the market(Wu，2014). Assuming that there is no information asymmetry between the enterprise and the farmer, both are risk neutral, and F and E represent the farmer and the enterprise respectively, the only thing that the enterprise can concede to the farmer is the savings in transaction costs of the farmer due to the existence of the contractual relationship $\Delta C^F=C^F_C-C^F_M$ (where the random variables C^F_C， C^F_M represent the sum of various transaction costs of the farmer in the case of contract with the enterprise and in the case of direct sale in the market, respectively), incentives for unit production or product quality improvement from relationship-based dedicated investment s where the company provides technical management and other support $K=K_C-K_M$ (K_C， K_M denote the incentive of the farmer in the case of a contract with the enterprise and the incentive in the case of direct market sales, respectively),and the enterprise's transaction cost savings due to the presence of the contractual relationship（$\Delta C^E=C^E_C-C^E_M$，the random variables C^E_C和 C^E_M denote the sum of the various transaction costs of the firm in the contractual case and the direct market purchase case）as a fraction of $\lambda\ \Delta C^E$, in which $\lambda \in (0,1)$. In addition, a special quality primary agricultural product

is sold at an execution price of P_C and a market price of $P_{M.}$ If the contractual relationship collapses, the parties can only return to the market. The equilibrium value of the transaction price is the Nash bargaining solution $P = \frac{(P_C+P_M)}{2}$, P_C, P_M, P are related to K_C and K_M, assuming $(P_C, P_M) \propto \varphi K_C, P \propto \varphi K_M$。

Assuming that $K>0$，and that there is some relationship between s and K. K=K(s) and the function is convex ($K_s' < 0, K_s'' > 0$), this analysis shows that the contractual revenue function of "enterprise + farmer" explained by transaction costs is：

For the farmer：$Y^F= \Delta C^F+ \lambda \Delta C^E+P_C-P_M= \Delta C^F+ \lambda \Delta C^E+ \Phi K(s)$

For the enterprise：$Y^E=(1- \lambda) \Delta C^E-s+P_M-P_C=(1- \lambda) \Delta C^E-s- \phi K(s)$

The necessary condition for the contract to remain stable is that $Y^F, Y^E \geqslant 0$ is workable.

And the socially optimal welfare function is $Y^S=Y^F+Y^E$， i.e.:

$Y^S= \Delta C^F+ \Delta C^E-s$

Based on the above conditions, it can be seen that the optimal social welfare relationship brought about by the contractual relationship is only related to the savings in transaction costs and investments in technology management factors resulting from the specific organizational relationship brought about by the contractual arrangement, independent of the price. The corresponding

contractual arrangement can be considered valuable if $Y^S \geqslant 0$. However, in practice, the price within the contractual relationship is related to the stability of the contract. At the same time, the social welfare function presupposes the existence of the contractual relationship, so the total social welfare optimization is still related to the price.

4.5 Contractual stability analysis introduced behavioral factors

The above model analyzes the basic framework of contract stability in the contractual relationship of "enterprise + farmer" from the perspective of transaction costs but abstracts from the savings in transaction costs for both parties. In the contractual relationship, we propose the hypothesis that the absolute value $G = |P_C - P_M|$ of the difference between the execution price P_C and the psychological market price P_M within the contract is proportional to the savings in transaction costs due to the form of contract organization. This is because, for a rational farmer who believes that the enterprise's purchase price cannot be higher than the market price but is unwilling to sell primary agricultural products below the market price, the most appropriate price for delivery is the market price. The more farmers agree that the purchase price of the enterprise is equal to the market price, the more they trust the enterprise's reputation and effectively reduce the negotiation cost of signing the contract

again. After multiple contracts are signed, farmers tend to trust the company's offer rather than actively search for prices in the market, thus saving market information costs. In contrast, contract farming reduces agricultural production and marketing implementation costs. Conversely, the more farmers believe that the purchase price is lower than the market price, the more they actively search for the market price and terminate the contract farming model, thus increasing the negotiation and implementation costs of subsequent sales. Similarly, rational firms' most favorable solution to maintain contractual stability is to agree that the farmers' advocated selling price is equal to the market price. In the absence of information asymmetry between the enterprise and the farmer about the agricultural production process, the enterprise believes that the farmer cannot claim to sell the product below the market price, but once the enterprise believes that the greater the tendency of the farmer to raise the selling price above the market price (including reducing planting efforts to lower the quality of the product, and implicitly raising the price per unit of a product by misrepresenting the yield at the time of purchase). The higher the transaction costs in the contract, the more stringent and detailed the terms, and conditions of the contract, the higher the negotiation costs, the costs of stricter supervision and management in the production and acquisition process, and the potential negotiation and implementation costs of switching to market acquisition when the contract

cannot be sustained. Based on this assumption, the transaction cost savings of farmers due to contracting $\Delta C^F = \beta^F(P_M - P_C)$, the enterprise as $\Delta C^E = \beta^E(P_C - P_M), \beta^F = \beta^F(x)\ and\ \beta^E = \beta^E(y)$ are the coefficients, respectively, they are not necessarily equal, and the concavity of the function may be determined by the subjective judgment of individual farmers and enterprises. Substituting this hypothesis into the "enterprise + farmer" contract revenue function, it can be respectively concluded that:

$$Y^F = \beta^F(P_M - P_C) + \lambda\beta^E(P_C - P_M) + P_C - P_M$$

$$Y^E = (1-\lambda)\beta^E(P_C - P_M) - s + P_M - P_C$$

i.e.:

$$Y^F = (\beta^F - \lambda\beta^E - 1)(P_M - P_C)$$

$$Y^E = \big((1-\lambda)\beta^E - 1\big)(P_C - P_M) - s$$

The condition for maintaining contract stability is $Y^F, Y^E \geqslant 0$, From the enterprise's point of view, $P_C \geq P_M$ is workable, $s \geq 0$, so it needs to be $(1-\lambda)\beta^E - 1 \geq 0$, i.e. $\beta^E \geq \frac{1}{1-\lambda}$, this means that in order to maintain contract stability, the more significant the proportion of residual income that the enterprise cedes to the farmer due to the savings in transaction costs, the greater the need to tolerate higher than market prices for the purchase price. Similarly, for farmers, $P_M - P_C \geq 0$ is workable, in order to keep the contract

stable, the minimum value $\frac{1}{1-\lambda}$ of β^E is taken， and then the strictest condition for keeping the stability is$(1-\lambda)\beta^F - 1 \geq 0$， and it can be seen that the minimum possible value $\frac{1}{1-\lambda}$ of $\beta^F$is likewise taken.

4.6 Summary

This chapter introduces the main development status and philosophy of Paisenbai, analyzes the main features and advantages of its “separation of rights” model of contractual linkage, and adopts incomplete contract theory to construct a model to derive the conditions for maintaining contractual stability under ideal conditions. It also finds that the decisive parameter for maintaining contractual stability is the ratio λ of cost savings that the enterprise is able to share with farmers as a result of contract farming. Although contract farming brings some cost savings to both the enterprise and the farmer, the key to maintaining contract stability is that the farmer needs to enjoy a portion of the benefits received by the enterprise while enjoying all the benefits received by himself. If λ is zero or even negative, i.e., the enterprise does not give any share to the farmer or takes part of the farmer’s income instead, even both parties can in fact get more benefits than in normal market transactions, the farmer’s interest in contract farming will be greatly reduced(Ferrer-i-Carbonell & Frijters， 2004), resulting in breach or leaving the model by “voting with feet”; but if λ is very close to 1 or even greater than 1, i.e., the enterprise gives

all the extra benefits to the farmer or even subsidizes the farmer, the enterprise's benefits are not as good as in the regular market transaction model and the incentive to maintain the stability of the contract is greatly reduced. In general, because of the asymmetric positions of enterprises and farmers in terms of technology, management, and market factors, the rights and obligations of enterprises and farmers must be asymmetric if the contract is to be stable.

It is found that the contractual provisions of Paisenbai's "separation of rights" model are generally consistent with the results of the theoretical analysis. In addition to the necessary investment in expertise, Paisenbai provides additional services to farmers in terms of professional technical training and popularization of farming concepts that contribute to the improvement of long-term human capital levels and enhances farmers' interest in participating in training through subsidies for lost work and small gifts. Certainly, the analysis also shows that the parameter β is an unpredictable psychological factor that is extremely distributed and may change frequently for both firms and farmers, as mentioned above, different farmers have different perceptions and preferences of the revenue model, so there must be corresponding uncertainty in the contract formation and execution, and default is generally difficult to avoid completely regardless of the share rate λ.

CHAPTER 5 Empirical analysis of the role of innovative operation model on the sustainable development of agricultural industrialization

As the specialization, marketization, and commercialization of social production continue to advance, the problem of connecting farmers to the market, as the main participants and constructors of the micro-ecology of agricultural production, has become more and more prominent. Traditionally, small farmers are engaged in part-time business, and their economic decisions are scattered, the scale of production transactions is small, market information is scarce, and the order of transactions is chaotic, which significantly restricts the improvement of their operation level and the reduction of transaction costs. At the same time, agricultural industrialization provides an opportunity to solve this problem.

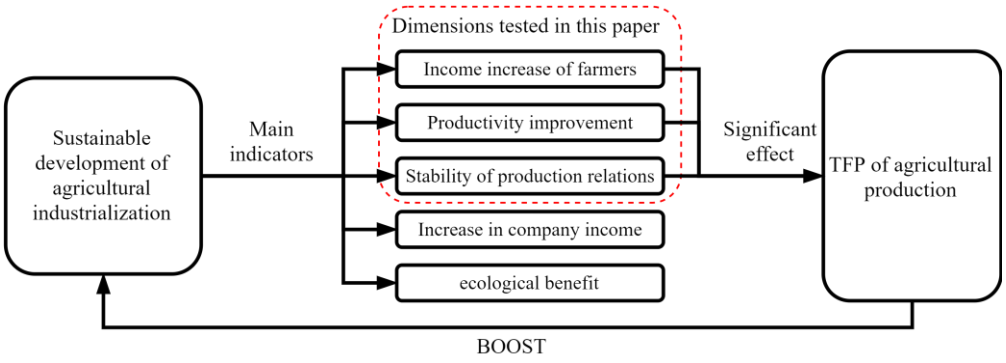
From the institutional economics perspective, industrialized agricultural production and operation reduce transaction costs and promote the diffusion of special effects, increasing the quality and efficiency of agricultural production. It is necessary to establish a suitable organizational linkage mechanism to connect the agricultural subdivision and part-time operation methods with the

requirements of industrialization. Agricultural leading enterprises integrate the agricultural value chain and have the advantage of the section-level organization, so they are tasked with cracking the problem of connecting farmers to the market and promoting the development of agricultural industrialization. Specifically, their organizational forms now mainly cover “farmers + market”, “leading enterprises + farms”, leading enterprises + farms”, and the specific contractual linkage mechanism mainly includes commodity contract, mixed contract, and factor contract. At the micro level of agricultural production, how the transaction costs and other characteristics of the contractual linkage of leading enterprises-farmers affect the sustainable development of agricultural industrialization has not received attention in the established literature. In this paper, we take the “separation of two rights” of the Paisenbai enterprise as the object of analysis, discuss the actual effectiveness and mechanism of the innovative operation development model in the form of a case study, and try to analyze the factoring contract (i.e., the “supermarket contract” defined by Xu Zhongai) of the note type. This paper will also analyze the effect of the “separation of two rights” model on the increase of farmers’ income and agricultural production.

5.1 Research ideas and hypothesis formulation

Research ideas

Through the literature review and theoretical analysis in the early stage, combined with factors such as the availability of the corresponding data, the feasibility of carrying out empirical inspection, and the importance of the impact on the sustainable development of agricultural industrialization, this paper, in the five main evaluation dimensions of the sustainable development of agricultural industrialization (farmers' income increase, production efficiency, ecological lean, leading income generation and stable production relations), The three indicators of increasing farmers' income, increasing production efficiency and stabilizing production relations are mainly analyzed by means of empirical tests. The thinking diagram is as follows:



5.1.1 Hypothesis formulation

Based on the previous empirical analysis and theoretical model analysis, combined with the relevant research literature, this paper puts forward the

following hypotheses in the empirical research section, noting that the empirical part of the hypothesis is not entirely equivalent to the full text of the theoretical and normative analysis of the hypothesis.

Hypothesis 1: “Leading enterprises + Farmer” model brings transaction cost savings, which is helpful to improve the stability of industrialized agriculture contracts and increase agricultural income. The theory of Public Choice (Ostromtrom, 1986) holds that one of the main factors for the stability of public contracts is the savings in transaction costs. In the contract agriculture model of “Enterprise + Farmer”, transaction cost saving may be embodied in three main aspects of contract agriculture:

Dehoog (1986) argues that contracts internalize externalities by changing the organizational structure of production, which turns a lot of negotiations in market competition into contract negotiations, to realize an external internalization. The contract partially transforms the competitive negotiation behavior of the market into cooperative negotiation behavior. In the case of Paisenbai, cooperative negotiation reduced the number of negotiations compared to farmers selling their agricultural products on the market and, to some extent, improved the differences between different farmers’ producing scale, negotiating capacity, and other factors caused by the negotiating disadvantage, and thus increased the income of farmers. The reduction in the number of negotiations and the increase in income caused by the reduction in

bargaining disadvantage also contributed to the farmers' willingness to maintain the contract's stability. Therefore, sub-hypothesis "a" of hypothesis 1 is proposed:

H1a： The reduction of contract negotiation cost benefits the improved contract stability of industrialized agriculture and increased farmers' income. Based on this hypothesis, we design four questions: Purchase Equity (D3) , Sales Spread (D4) , Class Identification (D5), and Profit Sharing (D6) .

The cost of information acquisition in the agricultural product market mainly comes from the price purchase cost and transaction search cost. However, both of them come from the market price mechanism. Rahi and Zigrand (2018) argue that access to information costs have different welfare effects for different subjects and that when market information is primarily price-dependent, the benefits of the system can be more balanced by minimizing noise (reducing the output, purchase, and search behavior of full information, that is, placing more of the information acquisition function in the contract primarily on the enterprise). Yuan et al. (2013) also argued that excessive information transmission reduces the adequate supply of information and that reducing information access costs is beneficial to improving contract stability due to the limitations of farmers' market position and access to information. Therefore, sub-hypothesis b of hypothesis 1 is proposed:

H1b： Reducing the cost of information acquisition is beneficial to improving

the stability of the contract of industrialized agriculture and increasing farmers' income. Based on this hypothesis, we designed two problems: Market Information (D7), and Looking for Buyers (D8).

The characteristics of agricultural products lead to the inevitable existence of risks in the links between producing and selling. Most farmers with poor risk-bearing capacity cannot be risk-neutral, Guo et al. (2007) found that price stability is one of the main incentives for Chinese farmers to choose contract agriculture. In addition to price stability, convenient purchasing time and the total purchase amount may also be conducive to maintaining the stability of the contract between enterprises and farmers. Therefore, sub-hypothesis c of Hypothesis 1 is proposed:

H1c： The reduction of production execution cost is beneficial to improving the stability of industrialized agriculture contracts and promoting the increase of farmers' income. Based on this hypothesis, we design three problems: Timely Selling (D9), Price Stability (D10), and Quick Settlement (D11).

One of the common problems in the "Enterprise + farmer" model is the "Rip-off" problem caused by specific investments. However, some studies have found that specific investment is sometimes used by farmers to "Reverse lock-in", leading to insufficient effective investment (Xinyue Liu and Zhou Li Liu, 2019). In addition to the checks and balances created by the design of contractual mechanisms, a minimum level of mutual trust is also a prerequisite

for cooperation to take place; most farmers generally trust larger enterprises with a higher social reputation when signing contracts (Guo et al., 2007) and then they will work harder. On the other hand, higher cooperation efficiency and farmers' efforts may make enterprises gradually build trust in farmers, reduce the intensity of supervision and management to farmers, and reduce the cost of contract implementation, which then makes the farmers further strengthen their trust foundation to the enterprise. However, other studies have shown that cooperative agriculture is less efficient than non-cooperative agriculture in Russia.

Based on this, we propose assumptions 2a and 2b:

H2a： The trust base of farmers to enterprises is positively correlated with the efficiency of cooperation between agricultural enterprises and the effort degree of farmers. For this hypothesis, we design two questions: Competence Trust (D1) and Integrity Trust (D2). The basis of trust is farmers' comprehensive judgment of enterprises; to avoid being emotionally influenced by the answers to other questions; we placed the questions at the top of the scale.

H2b： The efficiency of cooperation between farmers and enterprises and the degree of effort of farmers help increase farmers' income. According to this hypothesis, we design four problems: Training Efficiency (D14), Production Incentive (D15), Willingness to Expand Production (D16), and Cooperation Efficiency (D18).

One of the main factors that affect the stability of the contract is psychological stability of the contract. Suppose the farmers mentally think that the leading enterprises cannot fully fulfill the contract or do not think that they can fulfill the contract well, assuming that both farmers and enterprises are rational subjects. In that case, the corresponding contracts are difficult to continue, another reason for the low psychological stability of contracts may be that contracts lack flexibility and cannot be adjusted in time when the actual environment changes or an organizational relationship implied in terms of a contract or in the process of its execution that offends the subject (Morrison & Robinson, 1997). Although these psychological factors for the actual implementation of contracts for the stability of the horizontal view are primarily affected by the essential characteristics of the farmers themselves, such as their family status, knowledge, communication skills, personality traits, and risk preferences, from the longitudinal direction of the impact of each farmer, they are the same. Therefore, for these two reasons, the psychological stability of contracts still significantly affects the stability of the actual contract. (Rousseau, 1989). When it comes to measuring the psychological stability of the subject to the degree of contract performance, based on Robinson and Morrison's (2000) questionnaire design, we set up three problems: Enterprise Performance(D12), Farmer Performance (D13), and Cooperative Stability (D17). Based on this, we propose a hypothesis:

H3：The psychological trust foundation helps to promote the contract stability of the enterprise + farmer model.

5.2 Questionnaire design and data collection

5.2.1 Data collection

Agricultural product attributes are difficult to measure, and the cost of the end-of-production case-by-case assessment is prohibitive and not feasible. The quasi-factor contract in this case study intends to preempt the potential measurement difficulties via internalizing the externalities part of the market contract and partially replacing the market contract with a quasi-factor contract. Using replacing an incomplete and difficult-to-execute rough contract with a more elaborate combination of phased operations, the relatively high transaction costs will be dispersed and dissipated throughout the performance process due to the elaborate performance process. The contractual incompleteness will be carefully dismantled, and the default risk is expected to be mitigated.

To quantify the role of “separation of powers” contractual linkage in the sustainable development of agricultural industrialization, this paper developed a research questionnaire for farmers about the opinions of the Chongqing agricultural management department and Paisenbai enterprise and conducted a small-scale pre-study to thoroughly test the reliability and validity of the

questionnaire. Based on the test results, the formulation of some questions and the setting of human capital measurement questions for farmers were revised to make the questionnaire questions have clear and accurate meanings and high consistency. After that, the surveyors were hired to distribute the questionnaires in the business areas of Paisenbai in mid-August 2017. The survey was conducted through door-to-door interviewing and helping farmers complete the questionnaires. Specifically, 1018 questionnaires were collected, and 938 valid questionnaires were obtained, excluding the questionnaires with missing data and high consistency. The questionnaires thoroughly investigated the essential characteristics of local farmers, the mutual trust between farmers and leading enterprises, their performance, and the changes in various types of transaction costs caused by contractual linkages, and then examined the issues of farmers' income increase, production efficiency, contractual linkage stability, and governance efficiency.

Subjective factors influence the results of the questionnaire survey, and the study should ensure the validity of the questionnaire survey as much as possible in multiple aspects such as questionnaire design, preparation, distribution, return, statistics, and analysis, and adjust the questionnaire structure scientifically according to the test results. Initially, in the pre-intermediate stage of the questionnaire, the semantic space of the questionnaire should be limited, and the validity of the questions should be

improved. In the central questions of this paper, such as transaction costs, this paper adopts a neutral investigator interview method via the training of the investigator and allows the investigator to interact and explain to the farmers during the survey in order to achieve the purpose of making the farmers fully comprehend the core of the questions, but avoid the investigator to guide the direction of the farmers to answer the questions through suggestive or leading statements. In addition, the surveyors marked the questionnaires with apparently abnormal or untrue answers during the survey process to provide some subjective basis for removing abnormal questionnaires in the following collection and collation of the answers.

5.2.2Questionnaire design

In the “Contract characteristics” section of the questionnaire, we measure the essential characteristics of the contract linkage between leading enterprises and farmers and give 18 items of the Likert five-point scale, according to the degree of farmers’ agreement to the description of the scale, the scores are 1,2,3,4 and 5, respectively.

Agricultural industrialization is also affected by many factors, including the individual population characteristics of farmers and their economic and social conditions. According to the research practice(Fischer & Wollni，2018), we construct the following variables to control the characteristics of farmers:

1) Gender of the interviewee: a gender is a group of dummy variables; male assignment is 1, female assignment is 0.

2) Age: age may affect their willingness to engage in citrus production.

3) Education: regard education as a set of continuous variables, assigning zero to “uneducated”, 5 to “elementary”, and 8 to “middle school”. Assign “high school”, “junior college, and similar education” to 11, “undergraduate”, and “master and above” to 14. The level of education may affect their willingness to receive training in citrus cultivation techniques, adopt new technologies from leading enterprises, and accept contract terms.

4) Household population and actual working population: the structure of household labor may affect the willingness of farmers to engage in citrus cultivation, based on which we have constructed an indicator of the labor burden rate (household population/actual working population).

5) Self-owned land area: the surveyed farmers are to own land shares in orchards, and there is almost no contract circulation.

6) Government subsidies: including the construction of park work subsidies and subsidies for returning farmland to forestry, expressed in logarithmic form.

7) Quality of human capital: according to the opinion of the Chongqing Agricultural Department and the training materials of Paisenbai, 6 questions related to citrus planting technology were given in Part E of the questionnaire. The correct number of the respondent’s answers will be taken as a score to

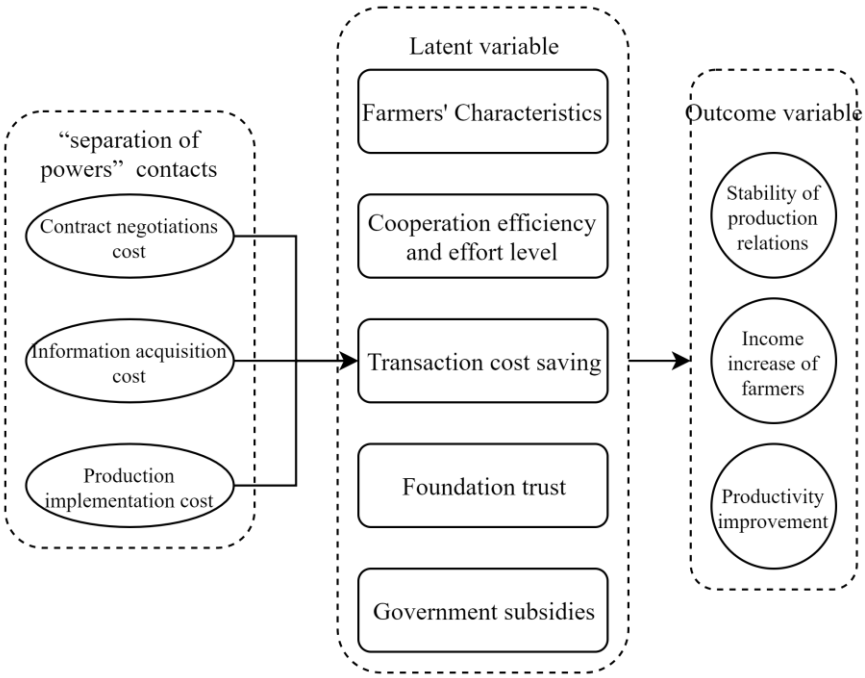
examine the quality of human capital: the farmers' knowledge literacy of citrus cultivation.

In order to examine the influence of each factor in more detail, we construct the square terms of age, education level, private land area, and government subsidies to examine the possible non-linear effect.

Some of the variables are designed as shown in Table 1:

Classification of test items	Latent variable	Test items indicators	Type of indicators	Brief description:
Independent variable	Household characteristics F	AGE	Objective variable	/
		Labor force level		Number of correct answers to the questionnaire
		Farm land area		/
		Educational level		/
	Contract negotiations cost N	N1	Subjective variable	Purchase Equity
		N2		Sales Spread
		N3		Class Identification
		N4		Profit Sharing
	Information acquisition cost I	I1		Market Information
		I2		Looking for Buyers
	Production implementation cost K	K1		Timely selling
		K2		Price Stability
		K3		Quickness of Settlement
	Foundation trust factor T	T1		Competence Trust
		T2		Integrity Trust
	Cooperation efficiency and effort level H	H1		Training Efficiency
		H2		Production Incentive
		H3		Willingness to Expand Production
		H4		Cooperation Efficiency
	Government subsidies array G	G	Objective variable	
Outcome variable	Performance stability factor J (Stability of production relations)	J1	Subjective variable	Enterprise Performance
		J2		Farmer Performance
		J3		Cooperative Stability
	Growth rate of operating income P （Income increase of farmers）	P1	Objective variable	
	Growth rate of land output （Productivity improvement）	P2	Objective variable	

We report the logical relationship between variables in the following figure:



5.3 Descriptive analysis and validity testing of sample

5.3.1Descriptive analysis

The descriptive statistical report on the data of some farmers' household characteristics and contract linkage is shown in Table 2 and Table 3 below. The item data in the "Contract linkage" section are experienced factorial analysis, so its fragmented economic significance has been blurred. The results are for reference only.

Table 2: Partial variable descriptive statistics of partial farmers'

characteristics

	Mean	Standard deviation	Minimum	Maximum
Sex	0.57	0.5	0	1
Age	41.76	5.3	34	54
Education level	6.89	3.75	0	11
Family size	3.61	1.37	1	6
The actual labor force	1.48	0.56	1	3
Labor burden rate	2.79	1.64	1	6
Private land area	4.43	1.77	1.31	7.99
Subsidies array	6.98	0.44	5.85	7.66
Human capital Quality	4.01	1.05	3	6
Growth rate of operating income	2.62	0.13	2.32	2.82
Growth rate of citrus yield per Mu	2.15	0.01	2.13	2.16

Data source: this paper is based on previous research statistics

Table 3: Descriptive statistics of the scale answer variables in the part of "Contract linkage"

	Mean	Mode	Standard deviation
Competence Trust	3.39	4	0.97
Integrity Trust	3.41	3	1.19
Purchase Equity	3.93	4	0.98
Sales Spread	2.28	2	0.65
Class Identification	3.96	4	0.99
Profit Sharing	4.01	5	0.99
Market Information	3.81	4	0.95
Looking for Buyers	4.15	4	0.59
Timely selling	4.3	4	0.64
Price Stability	4.6	5	0.66
Quick Settlement	4.59	5	0.68
Enterprise Performance	4.3	4	0.64
Farmer Performance	4.15	5	0.78
Training Efficiency	3.16	2	1.08
Production Incentive	3.03	2	0.96
Willingness to Expand Production	3.04	2	0.92
Cooperative Stability	4.41	5	0.7
Cooperation Efficiency	3.29	4	1.01

Data source: this paper is based on previous research statistics

From the above table, it is easy to know that the proportion of male farmers is 57%, whose average age is close to 42 years old and average education level is 6.89 years, that is, the level of junior high school, whose average family

population is 3.61, and the actual labor force is 1.48 people. They own 4.4 mu private farmland on average and get an average score of 4 points on the human capital quality test. Between 2006 and 2016, its operating income grew by 2.62 percent and its average per mu citrus yield by 2.15 percent, according to its citrus planting data. The data of the contract link feature item shows that farmers have very positive comments on the fairness of the benefit-sharing mechanism, the information cost of finding buyers, the indicators of the implementation cost, and the stability of the contractor's performance of Paisenbai, however, the evaluation of the purchase price setting and production incentive is not high.

5.3.2 Validity testing of sample

5.3.2.1 Reliability test

We used SPSS 22.0 and AMOS24 to test the reliability of some questionnaire results. In order to refine the information in the questionnaire, factor analysis is used to reduce the dimension of these indicators. After testing with plenty of samples, the KMO measure value of the "Contract characteristics" part is 0.839, above 0.8, and Bartlett's sphere test value is 33197.396, and the significance level is below 0.01, rejecting the original hypothesis; therefore, the test items of the questionnaire have a strong correlation and are suitable to carry out a principal component analysis. The Cronbach's α coefficient of all

the 18 scales was 0.728, which confirmed that the 18 partial variables of the "Contract linkage" had ideal internal consistency. According to the orthogonal rotation factor standardized by Kaiser, we rotate factors and clarify their economic significance. In order to extract item information fully, we refined 6 common factors whose cumulative variance contribution rate is 96.363%, see Table 4.

Table 4: Total variance of interpretation

Components	Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of the variance	Cumulative %	Total	% of the variance	Cumulative %
1	6.335	35.195	35.195	3.952	21.954	21.954
2	3.761	20.892	56.087	3.788	21.046	43.000
3	3.693	20.516	76.603	2.791	15.506	58.505
4	1.827	10.153	86.756	2.786	15.478	73.983
5	1.085	6.026	92.782	2.104	11.686	85.670
6	.645	3.582	96.363	1.925	10.694	96.363

We divided and named the factors as: N: Negotiation Cost Factor, H: Cooperation Efficiency Factor, J: Performance Stability Factor, K: Implementing Cost Factor, T: Trust Base Factor, I: Information Cost Factor according to the variable loads of each factor. The rotation component matrix is shown in table 5(data with loads below 0.50 have been omitted to highlight the economic significance of the factor). After adjustment, the result is the same as the latent variable division form, presupposed when the hypothesis is put forward. This paper's theoretical and empirical analysis is consistent with the actual survey data, and the model matches well; further economic effect

analysis can be carried out.

Table 5: Rotation component matrix

	N	H	J	K	T	I
Competence Trust					.802	
Integrity Trust					.839	
Purchase Equity	.945					
Sales Spread	.782					
Class Identification	.955					
Profit Sharing	.968					
Market Information						.846
Looking for Buyers						.945
Timely selling				.899		
Price Stability				.917		
Quick Settlement				.906		
Enterprise Performance			.950			
Farmer Performance			.891			
Training Efficiency		.984				
Production Incentive		.978				
Willingness to Expand Production		.961				
Cooperative Stability			.817			
Cooperation Efficiency		.960				

5.3.2.2 Validity Analysis

In the test of structural validity, we estimated the average variance extracted (AVE) and the combined reliability (CR) of the variables. The average variance extracted (AVE) measures the size of the variance under a particular

construction relative to the overall within-group variance. The overall combined reliability (CR) is also called structural reliability, measuring the size of the variance under a particular construction relative to the measurement error. The larger the AVE and CR values are, the clearer the division between the different latent variable factors is. Report on the results as shown in Table 6:

Table 6: Results of construct validity analysis

Factors	Specific variables	Factor loading	AVE	CR
T	T1	0.802	0.673563	0.60789
	T2	0.839		
N	N1	0.945	0.8384	0.800463
	N2	0.782		
	N3	0.955		
	N4	0.968		
I	I1	0.846	0.804371	0.646361
	I2	0.945		
K	K1	0.899	0.823309	0.734517
	K2	0.917		
	K3	0.906		
J	J1	0.95	0.787957	0.741187
	J2	0.891		
	J3	0.817		
H	H1	0.96	0.942465	0.826596
	H2	0.984		
	H3	0.978		
	H4	0.961		

It was found that the AVE value of each factor was more significant than 0.5 and the CR value of each factor was greater than 0.6, and the CR value of all factors was greater than 0.7 except for factors T and I (i.e., the trust base factor and the information cost factor). According to the related papers (Bagozzi & Yi, 1988; Gefen et al., 2000), the construct validity of the questionnaire is

good.

In the section of the discriminant validity test, we looked at the relationship matrix between the factor implicit variables shown in Table 7 below:

Table 7: Relation matrix between implicit factor variables（discriminant validity analysis）

	K	T	I	N	H	J
K	0.907					
T	0.618	0.82				
I	0.986	0.737	0.896			
N	0.386	0.967	0.739	0.916		
H	0.635	1.03	0.765	0.996	0.971	
J	1.269	0.74	0.759	0.542	0.764	0.888

It can be seen that some of the factors' discriminant validity, such as K and J, T and H, are of general validity. According to the previous discussion, the two groups of factors have some connotative identity, but the principal diagonal values are all greater than 0.7, and most of them were good. According to the existing literature, we can conduct the following empirical analysis (Fornell & Larcker, 1981).

5.4 Empirical analysis of agricultural industrialization development

We divide Paisenbai's model's impact on agricultural industrialization's sustainable development into five dimensions: increasing farmers' income, increasing production efficiency, ecological efficiency, leading income generation, and contractual stability. Limited to the availability of data, this paper makes an empirical analysis of the two dimensions of farmers' income

increase and production efficiency increase caused by the contract linkage between leading enterprises and farmers, contract stability is analyzed in the path and mediated relationship using structural equation model (SEM) in section 3.2. The other two dimensions are discussed in section 3.3.

The increase in farmers' income refers to the increase in farmers' operating income, which should take the net income of citrus sales after deducting the cost of seeds, pesticides, and fertilizers. We do not consider here the human cost of engaging in crop production, that is, the income that farmers can earn in other labor markets while working. This is because, first, farmers nominally invest in their land and labor, but in practice, they may hire others to sow, cultivate and harvest. Second, farmers often lack stable non-farm jobs; directly calculating the product of working hours and non-farm wages can seriously distort farmers' information on human costs. The production efficiency index is mainly reflected in the change of yield per mu of citrus, which is the final reflection of labor rate and technical input in agricultural production.

We take the compound growth rate of operating income and citrus yield per mu of the farmers interviewed between 2006 and 2016 as the explanatory variables, and the contract basic characteristic variable and the farmer basic characteristic variable as the explanatory variables; then we constructed two OLS models and analyzed the influence of each factor on different dimensions of agricultural industrialization.

5.4.1Increasing farmers' income

In the model of increasing farmers' income, we take the growth rate of farmer's operating income as the explanatory variable and introduce two groups of explanatory variables: basic characteristics of contract linkage and basic information about farmer's household. In the basic model, three transaction costs, performance quality, production efficiency, and trust basis, have explained the 88.2% increase in farmers' operating income. All indexes were significant under a significance of 1%, and the VIF value was lower than 5 with no significant collinearity. This shows that the transaction costs, linkage basis, and contract performance play a vital role in increasing farmers' income. After the basic characteristics of farmers were introduced, the model adjusted goodness of fit reached 95.4%, and the collinearity statistics (tolerance and VIF) included in the explanatory variables indicated that the multicollinearity of the variables was very weak.

Explanatory variable: growth rate of operating income										
	β	tStatistics	Sig.	Tolerance	VIF	β	tStatistics	Sig.	Tolerance	VIF
(Constant)	2.619	1856.168	0			2.172	134.399	0		
Negotiation Cost	0.032	22.467	0	1	1	0.043	23.233	0	0.224	4.464

Cooperation Efficiency	0.01	7.129	0	1	1	0.004	4.706	0	0.949	1.054
Performance Stability	0.03	21.327	0	1	1	0.036	23.869	0	0.351	2.85
Implementing Cost	0.039	27.716	0	1	1	0.03	21.881	0	0.403	2.48
Trust Base	0.095	67.25	0	1	1	0.069	40.873	0	0.273	3.663
Information Cost	-0.038	-27.127	0	1	1	-0.027	-15.904	0	0.279	3.58
Sex						0.063	12.306	0	0.122	8.199
Age						0.006	20.521	0	0.3	3.33
Education level						-0.003	-7.911	0	0.349	2.868
Family size										
The actual labour force						0.034	12.764	0	0.367	2.726
Labor burden rate										
Private land area						0.03	22.889	0	0.404	2.478
Adjusted R^2			0.882					0.954		
Standard deviation			0.043					0.027		
Sig.F			0					0		

The trust base positively affects the increase of farmers' income under the significance of 1%. The operating income of farmers will increase by 9.5% with the increase of the trust base by 1%. Leading enterprises' competence and integrity trust may affect farmers' willingness to participate in contract linkage, their perception of equity in benefit sharing terms, and their recognition of leading enterprises' performance quality, affecting the default motivation and contract stability. A good trust base, an important part of the relationship assets between the leading enterprises and the farmers, will be beneficial to the stable and orderly development of the production trade and facilitate and lubricate the income-increasing process of the farmers and the leading enterprises. The cooperation efficiency has a positive effect on the increase of farmers' income under the significance of 1% , and the operating income of farmers will increase by 1% with 1% increase of cooperation efficiency. The improvement

of field efficiency brought by farmers' technical training and the enhancement of transactional efficiency brought by cooperative synergy can directly act on the production process and promote the growth of farmers' operating income. Performance stability positively contributes to farmers' income increase at 1% significance, and each 1% increase in performance stability rate will increase farmers' operating income by 3%. Whether the contracting parties can cooperate strictly with the established contract terms may affect whether the quality control of agricultural products in the production transaction process can be successfully achieved and whether the contract can be stably continued. A higher quality of performance and contract stability can avoid the internal consumption of institutional costs in production transactions, promote the orderly implementation of the contract, and form the closed loop of contract operation together with the trust base.

Regarding transaction costs, negotiation costs positively act on farmers' income increase at 1% significance, and each percentage increase in negotiation costs will increase farmers' operating income by 3.2 percent. In the actual contractual linkage, there are interest games between leading enterprises and farmers, such as the difference between the purchase price and market price, level recognition criteria, and business profit sharing. Effective convergence of opinions between the two parties will positively influence the contract's follow-up and the contracting parties' willingness to perform,

reduce unnecessary disagreements, and then promote the fair distribution of benefits and the growth of farmers' operating income. Implementation cost positively affects farmers' income increase at 1% significance, and each percentage increase in implementation cost will increase farmers' operating income by 3.9 percent. Farmers often need to mature the citrus and carry out multiple sales during the citrus harvest season. Therefore, the ability of farmers to sell their harvested oranges promptly, obtain a stable price and settle their payments quickly and without delay characterizes the actual trading situation faced by farmers. The lower the cost of implementation, the stronger the incentive for farmers to produce, the more convenient and stable the transaction, and the better the guarantee of their income generation process. It is worth noting that information cost negatively affects farmers' income increase at 1% significance, and each percentage increase in information cost will decrease farmers' operating income by 3.8 percent. One possible explanation is that the leading enterprise, Paisenbai, basically handle citrus market information collection and buyer matching. Under the new contractual linkage model, farmers have a more accurate grasp of market information and agree that Paisenbai is more efficient at buyer matching. Considering that the farmers' evaluation of the fairness of the purchase price (the difference between the purchase price set by the leading enterprise and their own sales price) is relatively low, the average value is only 2.28 points, the farmers lack

the advantage of purchase price bargaining in the case of the precise grasp of the market and will have a more pronounced sense of grasping, thus reducing the motivation and access to production transactions, which to a certain extent hinders the process of increasing farmers' income.

Gender is significant at 1%, i.e., men are generally more advantageous than women in generating income and increasing income, and the average business income of male farmers is 6.3 percent higher than that of women, which may be since men have accumulated more social capital, can fight for more benefits in contract negotiation and contract fulfillment, and have better energy and physical strength in the actual labor process. Age positively promotes farmers' income increase at 1% significance. The coefficient of its quadratic term is not significant after testing, which means a positive linear correlation exists between age and farmers' income increase. Respondents' age is concentrated in 34-54 years old, generally in middle age or prime age, which is unlikely to have a serious lack of energy and physical strength, and as age increases, citrus growing experience is gradually accumulated, and they may also get preferences in contract negotiation. As the age increases, the experience in citrus farming accumulates, and it is also possible to get preferential treatment in contract negotiation, reduce the implementation cost in the transaction, and achieve higher production efficiency. Education level at 1% significance hurts farmers' income; for every level drop in education,

farmers' operating income would rise by 0.3 percent. The interviewed farmers' education level is concentrated in primary and junior high school; farmers with higher education levels often have non-farm occupations and may allocate limited time and energy to citrus farming, thus not as high as farmers with low education levels. The working population positively contributes to farmers' income at 1% significance, and each increase of 1 person in the actual working population will increase the income of farmers' businesses by 3.4 percent. If the actual working population of a farmer's household is larger, there will be more free manpower to invest in citrus cultivation, which can promote citrus production. Upon testing, there is slight multicollinearity between household size and labor burden rate; therefore, it is difficult to provide sufficient independent information. Human capital quality positively promotes farmers' income at 1% significance, and each 1 percentage increase in the amount of human capital will increase farmers' operating income by 3 percent. The higher the quality of human capital, the more precise the farmers can be in the production process of citrus cultivation, and the richer and more effective experience and skills they can accumulate, thus significantly contributing to the farmers' income increase.

5.4.2Increasing production efficiency

The explanatory variables were replaced from the growth of farmers'

operating income to the growth rate of citrus mu production, and two sets of explanatory variables, basic characteristics of contractual linkage and basic information of farmers, were introduced in a stepwise manner to analyze the influence of each factor on production efficiency. In the base model, the indicators of contractual three transaction costs, performance quality, production efficiency, and trust base have explained the increase of 90.2% of the agricultural production efficiency. All indicators are significant at 1%, and their VIF values are below 5, so there is no significant covariance. With the introduction of the basic characteristics of farmers, the Adjusted Goodness of Fit Index of the model reaches 97.3%, and the cointegration statistics (tolerance and VIF) that have been included in the explanatory variables both indicate that the multiple cointegrations of the variables is weak and the model explanation is convincing.

Explained variable: growth rate of yield per mu of citrus										
	β	tStatistics	Sig.	Tolerance	VIF	β	tStatistics	Sig.	Tolerance	VIF
(Constant)	2.148	24202.107	0			2.121	2504.424	0		
Negotiation Cost	0.003	37.521	0	1	1	0.003	33.846	0	0.224	4.464
Cooperation Efficiency	0.001	7.372	0	1	1	0.001	4.958	0	0.949	1.054
Performance Stability	0.002	20.476	0	1	1	0.002	27.409	0	0.351	2.85
Implementing Cost	0.002	27.486	0	1	1	0.002	21.946	0	0.403	2.48
Trust Base	0.007	74.058	0	1	1	0.005	51.981	0	0.273	3.663
Information Cost	-0.002	-22.769	0	1	1	-0.001	-9.198	0	0.279	3.58
Sex						0.006	22.509	0	0.122	8.199
Age						0.001	27.135	0	0.3	3.33
Education level						0.001	17.085	0	0.349	2.868
Family size						0.001	7.385	0	0.367	2.726
The actual labor force						0.002	26.396	0	0.404	2.478
Labor burden rate	0.902					0.973				
Private land area	0.003					0.001				
Adjusted R^2	0					0				

Similar to the results of the analysis of the farm household income increase model, the sign and significance of the transaction cost characteristics, trust base, cooperation efficiency, and performance stability of the contract did not change significantly, and the specific explanations are similar to the previous analysis, we will not repeat here.

Gender, age, actual working population, and quality of human capital positively contribute to production efficiency at 1% significance. However, educational attainment negatively contributes to agricultural production efficiency at 1% significance. A simple columnar and Pearson correlation analysis shows that there is a negative correlation between farmers' educational attainment and several items of their negotiation and

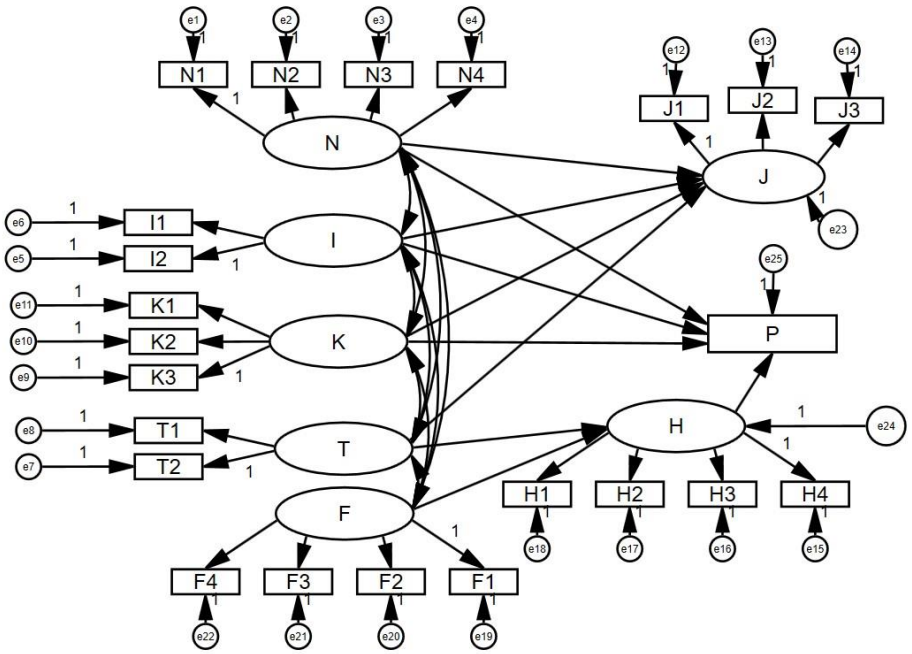
implementation costs; for example, educational attainment correlates with acquisition equity at -0.136 and with benefit sharing equity evaluation at -0.141, both of which are significant a significance level of 5%. It can be concluded that farmers with relatively higher education levels may tend to give more negative judgments on contractual linkages and dissipate more transaction costs in contract negotiation and execution. However, they have a slight advantage in actual citrus growing, the relatively higher transaction costs partially offset this advantage. This observation is corroborated by the Pearson correlation of -0.093 between farmers' education and the contract efficiency indicator, which is significant at a significance level of 5%.

5.4.3Contractual stability

According to the previous analysis, the essential characteristics of farm households' trust base in the leading enterprises may affect the farm household effort and cooperative efficiency variables. In addition, there is another explanation for the effect of contract stability on farmers' income increase, i.e., although the increase in contract stability may statistically benefit farmers' income increase, the income increase may also inversely strengthen the stability of contractual linkages, and there is not necessarily a causal relationship between the two. Both stable contracts and farmers' income increase may be result from transaction cost savings. In order to test the

complex relationship between the factorial variables, we introduce a structural equation model SEM to further examine the degree of influence between the latent variables. Our proposed theoretical model is shown in Figure 1.

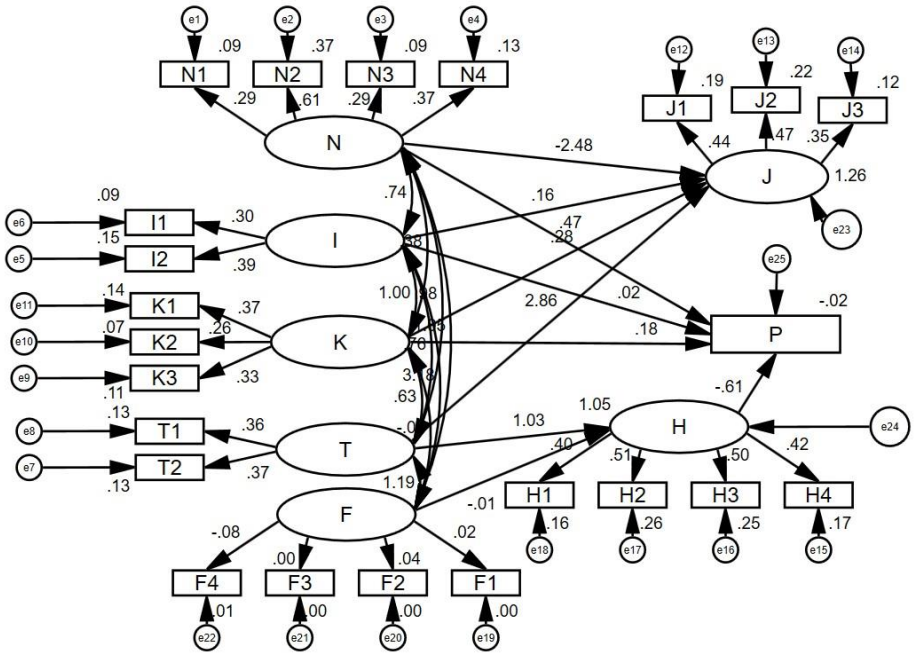
Figure 1: Structural equation theory model



Among them, it is assumed that negotiation cost N, information cost I, and implementation cost K jointly affect both contract stability J and farmers' income increase degree P. Trust base T directly affects the strength of contract stability but does not have an effect on farmers' income increase directly, but rather, T and farmers' traits F together affect cooperation efficiency and farmers' efforts, which in turn indirectly affects farmers' income increase degree. The government subsidy G effect is insignificant and removed in the contract stability test. For the measure of farms' characteristics, we only counted age, education level, human capital level, and cultivated land area,

which have a significant impact on the degree of farm household effort, as primary variables in order to simplify the structural equation model and improve the balance to avoid over-identification. The results of the path analysis of the standardized structural equation model are reported in Figure 2.

Figure 2: structural equation model path analysis results



The structural equation fit index is reported in Table 8:

Table 8: structural equation model fit index

Indicators	The Chinese name of the indicators	Values	Acceptance criteria
chi-square/df	卡方自由度比 (ka fang zi you du bi)	1.954310345	<5
GFI	拟合优度指标 (ni he you du zhi biao)	0.962	>0.9
AGFI	修正拟合优度指标 (xiu zheng ni he you du zhi biao)	0.951	>0.9
RMR	均方根残差 (jun fang gen can zha)	0.053	<0.1
RMSEA	近似均方根误差 (jin si jun fang gen wu cha)	0.032	<0.05
CFI	比较拟合指数 (bi jiao ni he zhi shu)	0.857	>0.9
IFI	增值适配指数 (zeng zhi shi pei zhi shu)	0.867	>0.9

The statistical meanings of the indicators in the table are not repeated. Based on the results of the above goodness-of-fit tests and concerning the model fit goodness criteria recommended by the existing literature (Marsh et al., 1988; Bentler, 1990; MacCallum et al., 1996), it was found that the resulting equations fit well and the model conforms to the actual situation to a higher degree. Observing the results of the path coefficient analysis, it was found that.

1. In terms of the effect of each latent variable on farm household income increase, except for the negative and insignificant coefficient of the effect of information cost on farm household income increase, the savings of the other two costs are significantly beneficial to farm household income increase. This is in the same direction as the findings of the regression analysis in the previous section, and they verify each other, indicating some robustness in the empirical results. This part of the specific analysis has been described in detail in the previous section.

2. The path coefficients of the cooperative efficiency and effort indicators H on farm household income increase, although not significant, are harmful and seem to be inconsistent with intuition; one explanation is that the increase in cooperative efficiency does not only represent a reduction in the intensity of mutual monitoring behavior between farmers and enterprises, but may also stem from the neglect of contract implementation details by both parties to the contract. The reduction in monitoring behavior may also induce a decrease in

farmers' effort. In addition, it should be noted that the cooperative efficiency and effort variables obtained from the questionnaire are derived from farmers' subjective evaluations rather than from objective indicators and that farmers' characteristics are likely to differ significantly in their evaluation of effort, i.e., farmers have different non-differential curves for working hard and leisure (or doing other things), for example, farmers with lower enthusiasm for farming perceive that farming takes more time away from leisure or other activities. In comparison, farmers with higher enthusiasm for farming perceive that they are not working hard enough. Hypothesis H2b was not proved.

3. Farmers' trust base in the enterprise significantly increased the efficiency and effort of cooperation, verifying hypothesis H2a.

4. From the perspective of the factors influencing contract stability, the trust base and implementation cost savings significantly enhance contract stability. Among them, a good trust base has a higher increase in contract stability. In contrast, the savings in implementation costs have a lower impact, indicating that the main influencing factor of contract stability is still the subjective psychological factor in the early stage. When the contract is reached, the two-way choice between farmers and enterprises determines that only farmers who trust the merchants more could enter this contract structure, while those who are more skeptical about the moral level and strength of enterprises or the agricultural industrialization model will tend to break the contract in that

problems in contract implementation will amplify their suspicion and mistrust. In addition, the effects of information cost I and negotiation cost N on contract stability are not significant. The path coefficient of the effect of negotiation cost N on contract stability is harmfulxs and to a greater extent. This paper suggests that this result may be caused by the bias caused by the structure of the questionnaire survey, i.e., although the position of the questionnaire survey in this study is neutral. The results are only used for scientific research, which has been affirmed to farmers, some farmers still misinterpreted the stranger's survey as an act of management oversight of the enterprise. Those farmers who did not want to continue the contract farming model did not want to be entangled with the company and chose the option of satisfaction in terms of negotiation costs that did not correspond to their actual psychological state and then chose to "vote with their feet" and not to renew their contract. The remaining farmers who wanted to maintain a stable contract took the questionnaire results as an act of supervision of the enterprise and expected to further adjust the contract structure in their favor by expressing their dissatisfaction with the negotiation cost part. Overall, hypothesis H3 and hypothesis H1c were verified, while H1a and H1b were not fully verified.

Table 9: some of the significant path coefficients in the model results

Affected factors	The path relationship direction	Impact factor	Path coefficient	SE	CR	P
P	<---	G	0.024	0.01	0.728	**
P	<---	N	0.567	0.291	1.09	**
P	<---	I	-0.045	0.079	-0.293	0.17
P	<---	K	0.231	0.081	1.699	***
P	<---	H	-0.678	0.219	-1.129	0.259
H	<---	T	1.027	0.149	7.656	***
J	<---	N	-2.318	1.82	-1.644	0.150
J	<---	I	0.421	0.725	0.681	0.496
J	<---	K	0.16	0.74	0.295	*
J	<---	T	2.572	1.535	1.565	***

5.4.4 Additional discussion

In the part of empirical analysis, we deeply examine the contract connection between leading enterprises and farmers; that is, in the contract of "separation of two rights", the specific influence of the transaction cost of the contract and the essential characteristics of farmers on the dimensions of income increase and production efficiency increase of farmers in the process of agricultural production. Here are some of the dimensions that were not explored in depth.

1. **Ecological lean:** the green circular economic benefits of production area and ecological environment improvement. Using raw materials to the full, Paisenbai changed the practice of directly burying waste peel residues in the industry, turning them into organic fertilizer and returning it to the field. The organic fertilizer from waste peel residues can earn 1,000 Yuan per ton, and the feed from waste peel residues can earn 1,100-1,200 Yuan per ton. It not

only improves the ecological benefit of orchards and reduces environmental pollution but also realizes the full development of material value and the closed-loop green production cycle.

2. Leading income generation: operating results and economic changes of leading enterprises. From the early days of operation to the present, the operating income of Paisenbai has increased by tens of times, and it has overgrown, thanks to a large amount of technical training investment (up to 100 million RMB) and the construction of standardized and intensive production management mode. These are the supporting measures and systems rooted in the contract mode of “separation of two rights”.

5.5 Summary

Through hypothesis formulation, data collection, and empirical analysis, this chapter tests three important factors that influence the development of agricultural industrialization: farmers’ income increase, production efficiency, and production relationship stability (i.e., contract stability). The test results partially verified the prior hypotheses, and the results are presented as follows:

Hypothesis	Sub-hypothesis	Description	Whether to support the hypothesis

H1	H1a	Reducing contract negotiation costs is positively associated with farmer's income increase and contract stability.	Yes
	H1b	Reducing information access costs are positively associated with farmer's income increase and contract stability.	No
	H1c	Reducing production execution costs are negatively associated with farmer's income increase and contract stability.	Yes
H2	H2a	Credit base is positively associated to cooperation efficiency and effort.	Yes
	H2b	Cooperation efficiency and effort are positively associated with farmer's income increase.	No
H3	H3	Credit basis is positively associated with contract stability.	No

CHAPTER 6 Key findings and further research prospects

6.1 Key findings

In this paper, by collecting questionnaires and using the methods of regression analysis and structural equation analysis, we explore the influencing factors of contract stability in contract agriculture of “Leading enterprises + farmers”. Combined with the previous theoretical analysis, it is found that the reduction of production implementation costs brought by contract agriculture is conducive to improving the stability of the contract and to increasing farmers’ income. However, it is also found that although the improvement of contract stability and the increase of farmers’ income are both the results of contract agriculture under the contract of separation of two authorities, there is no apparent causal relationship between the two; in fact, there is no sufficient evidence to conclude that contract stability is an intermediate variable of income increase, that is, contract stability does not necessarily lead to income increase, and conversely, it cannot be inferred that income increase must be conducive to the improvement of contract stability in the opposite direction, which is not entirely consistent with previous theoretical models. In the theoretical model, we assume that the subject of the contract has economic

rationality, which is a strong assumption. This phenomenon may be attributed to the heterogeneity of farmers' agricultural production motivation; that is, the reality and psychological needs of different farmers' heterogeneity make the direction of the causal relationship between income increase and contract stability ambiguous, or there is no causal relationship at all. For example: for some farmers, the goal is not to increase income continuously but the demand for stable income from the stable sale of agricultural products because of the different trade-offs between income and risk. They might even accept low but relatively stable income of contract agriculture; for another part of the farmers do not care whether the contract is stable, even under the constraints of the contract, they still constantly look for the potential to obtain a higher yield of the market opportunities, when such opportunities appear, they would ready to default at all times. However, the two types of farmers may show similar actual behavior. Restricted by the form of the questionnaire, it is difficult to express the risk preference attributes in the questionnaire, and it is difficult to evaluate directly. This also explains that empirical research does not show the mediating and final effects.

From this result, we can find that contract agriculture brings positive welfare effect as a whole, but it is also restricted by many factors, mainly reflected in the following aspects: first, the refinement of contract also leads to the separation of the real purpose of contract-making, that is, as long as a specific

link of contract conforms to the individualized needs of heterogeneous subjects, it may lead to the conclusion of a contract, however, the various contracts in the whole process of production and sale do not have the necessary logical relationship; secondly, in the existing contract mode of separation of two powers of Paisenbai, the basic level fruit farmers association, reward and punishment mechanism, quality traceability system and other means of performance guarantee are pretty standard in the practice of many places at home and abroad, although externalities are internalized to some extent, they are still a loose means of performance control, and cannot completely solve the problems of moral hazard like high cost of contract implementation or blackmail through the design of the system or rip-off problem; thirdly, the existing contract agricultural model still has the problem of inconsistency between the quantity target and the quality target in the system. According to the analysis of the previous model, theoretically speaking, the market situation faced by enterprises is constantly changing, the relationship between marginal revenue and marginal cost is also constantly changing, and enterprises have the motivation to constantly adjust their production activities to reach the optimal production scale, if the quantity of primary agricultural products contracted by farmers makes enterprises deviate from the optimal production scale, it will harm the economic interests of enterprises and make the agricultural contract model unsustainable.

6.2 Suggestions for sustainable development approaches of agricultural industrialization

Given the existing problems, combining the theoretical analysis conclusion of chapter 3 and the empirical analysis conclusion of this chapter, the paper puts forward the following suggestions on the path of agricultural industrialization based on the mode of “leading enterprise + farmer household”:

First, although the shape of the indifference curve of the risk and income trade-off is heterogeneous for farmers, we should pay attention to the scale of capital and market position relative to enterprises. The same economic interests for farmers must have greater marginal utility flexibility; no farmer neglecting economic interests. The reason why farmers have different behaviors of production and sale and different attitudes to agricultural contracts in contract agriculture production is that their degree of risk preference is different due to their personality; in fact, the most important reasons are: (1) the limitation of the ability to evaluate the relationship between risk and revenue due to the restriction of market experience and human capital level; (2) the relative lack of mobility of farmers and their families; not only the agricultural production but the family life reflect a relatively weak risk resistance, and their ability to grasp the market opportunities timely is also weak. Because of the above reasons, some farmers

naturally think that they may be in a weak position in contract agriculture. It is necessary to take advantage of the small transaction amount of individual farmers' scattered contracts, which leads to the relatively high cost of protecting rights of enterprises which establish their own in the contractual relationship in a more equal or even more powerful position through active breach of contract and other means. In the future development of contract agriculture, in addition to improving routine judgment through better training for farmers, we can also reduce the default rate and enhance the stability of contracts using margin or agricultural development fund. For example, when signing an agricultural contract, farmers need to pay a small amount of "equity capital" to enter into a special contractual agricultural development fund, like good performance can continue to withdraw a small amount of "dividends", and default will be converted into a margin but can not be returned. This not only strengthens the farmers' sense of belonging to the leading enterprises and their sense of participation in the operation of the enterprises but also encourages the implementation of the contract. On the other hand, the general income of individual farmers is limited; therefore, a small number of liquidated damages can form a strong binding force.

Secondly, in terms of the means of performance control, it is necessary to ensure as much as possible the economic equivalence between enterprises and farmers and effectively restrict the subjects of contract agriculture in terms of

regime; the structure of the contract should fully promote the formation of commercial credit and public order and good customs so that the rights embodied in the contract can be expressed more completely. For example, based on the existing fruit farmers' associations, we will increase the administrative villages or natural villages to form producing collectives or producing groups and introduce a credit publicity system; the performance and credit status of producing collectives or groups will have an overall impact on the group's ability to negotiate subsequent technical counseling and product acquisitions. Although most farmers have a weak concept of modern business credit, they generally have simple moral concepts, for example, an individual breach of contract will harm the collective interests, so it is easy to form strong performance constraints. In addition, the head of the production team also has more ability to constrain the performance of enterprises, to some extent; it could eliminate individual farmers' worries about their weak position in the contract concerns. Finally, the learning effect in producing collectives and producing groups can enhance the producing enthusiasm of farmers, restrain the vicious competition behavior among farmers in production, and improve the output and product quality in general, which will further contribute to increasing farmers' incomes.

Third, besides the sporadic default risk of the farmers, enterprises due to production strategy adjustment and internal management problems also exist

in the risk of default. In addition, because of the characteristics of agricultural development, it is difficult to adjust the types of crops planted in a short period of time. It will be exposed to market and natural disaster risks for a long period. Due to many practical limitations, it is difficult for farmers to hedge the corresponding risks through futures trading, buying insurance and other methods. Therefore, the overall ability of risk resistance is poor; if the enterprise defaults or the market fluctuation transmitted by the enterprise is too violent, or a natural disaster happens, it will not only hurt its economic interests but also affect the social stability in the countryside. China is a big agricultural country, but the income level of the peasant group is relatively low. The three agricultural issues are the critical concern of China in reducing poverty and achieving balanced development, both in terms of policy and development needs. In contract agriculture, the interests of farmers should be protected. This paper assumes that the leading enterprises in contract agriculture are entirely for-profit enterprises. However, many large-scale agricultural product processing enterprises have the effect of helping farmers to reduce poverty in their business scope. By accepting tax concessions from the government, land transfer fees or rent relief, financing facilities, subsidies or direct participation of state-owned capital, the enterprises make their management behavior be implied at an expression of all levels of government policy objectives. This paper suggests that, in addition to the existing subsidy-

based policy support measures, grass-roots government departments such as agricultural management should also pay attention to the guidance of farmers' production behavior, and provide timely help for the farms to maintain their legitimate rights when the interests of farmers may be injured.

6.3 Summary and other policy recommendations

Based on the case study of "separation of two rights", this paper discusses the essential characteristics of the innovative operation mode and contract form; through factor analysis, the paper refines factors of three types transaction cost, trust base, cooperation efficiency, performance stability and so on, and makes an empirical analysis with income increase and production efficiency as the explanatory variables. The results show that in the contract linkage between leading enterprises and farmers, factors such as trust base, stable performance, and farmers' incentives can significantly promote agricultural industrialization; the transaction cost characteristics of contract play a significant and profound role in the agricultural industrialization dimension, for example, the increase of farmers' income and production efficiency, and the effective reduction of negotiation cost and implementation cost will significantly promote the sustainable development of agricultural industrialization, however, after the transfer of management rights to the leading enterprises from the farmers, the reduction of their information costs, on the contrary, offset some of the

positive effects. Among the essential characteristics of farmer households, the variables of age, actual labor force and human capital quality contribute to the improvement of quality and efficiency of agricultural production. However, the education level slightly contributes to production efficiency, the transaction costs are seriously dissipated, which failed to effectively promote the increase of farmers' income.

This paper puts forward some policy suggestions for the innovation of agricultural contract linkage and the promotion of agricultural industrialization.

（1）Standardize the mechanisms for determining purchase prices, determining product grades and sharing benefits between leading enterprises and farmers, and strengthening organizations' construction to protect farmers' rights and interests. While respecting the profit needs of enterprises, we should also enhance farmers' bargaining position and bargaining power, reduce the cost of contract linkage, enhance farmers' sense of gain under contract linkage, and promote efficient and orderly cooperation between leading enterprises and farmers.

（2）Pay attention to the natural and market risks of agricultural production, give more policy support and regulation in the risk subsidy of agricultural products and the settlement of market transactions, and construct a risk-sharing mechanism among stakeholders. We could also reduce the execution costs in the contract linkage between leading enterprises and farmers, which

could effectively replace the market contract to reduce the risk exposure of all parties.

（3）Organize activities such as agricultural production publicity, adult education, distance education, *etc.* , and encourage enterprises to carry out farmers' technical training through government subsidies and other forms. Improve the quality of farmers' human capital and train specialized personnel in agricultural production.

6.4 Research prospects

At the micro-level of agricultural production, how the transaction costs of leading enterprises-farmers contract link affect the sustainable development of agricultural industrialization has not been paid enough attention to in the existing literature. We take the innovative operation mode of "separation of two rights" of Paisenbai as the object of analysis and discuss the actual effect and mechanism of the mode of the innovative operation and development in the form of single case analysis, trying to give a preliminary answer to the question. However, limited to the complexity of the problem itself and the availability of empirical data, there are still some deficiencies. Possible follow-up research directions include:

（1）From the angle of complementary assets and certain assets input of both sides of the contract, the paper describes the lock-in of interests and the

stability of the contract in the contract of “separation of two rights” more precisely; by analyzing certain clauses of the contract, a new index is extracted to characterize the residual control and other features in the contract. Many leading enterprises-farmer contract linkage models can be regarded as the internal contract elements of embedded enterprises or commodity contracts, and soft factors such as relational capital will have a subtle and profound impact on the formulation and implementation of contracts; it is necessary to take into account in the follow-up study to better distinguish agricultural contracts from ordinary commodity contracts and factor contracts.

（2）The positive effects of income, health, and so on are often underestimated if there are no personality variables in the empirical analysis data set (Carbonnel & Fritjers, 2004); Therefore, the evaluation of various aspects of the contract in our questionnaire may not be able to correct the bias caused by farmers’ factors, and we expect to correct the follow-up study.

（3）This paper divides agricultural industrialization into five dimensions and makes an empirical analysis of the two most important dimensions of increasing farmers’ income and increasing production efficiency, but the description of the other dimensions requires more detailed data; in the follow-up research, we need to carry out the empirical test of ecological lean, leading income generation and contract stability through the nuanced analysis of contract and the construction of new indicators.

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