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# A Study of the Mechanism for Distribution of Benefits Based on Vertical Coordination in Agriculture

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**Abstract** Currently, the mechanism for distribution of benefits based on vertical coordination in the area of agricultural products can be divided into some types such as market price regulation, contract agreement, and dividend distribution according to trading volume or shares, and internal profit of enterprise. There are differences in operating characteristics, advantages and adaptation between different mechanisms. And contract agreement can be subdivided into guaranteed price, market protection price, market protection price + preferential services, and market protection price + secondary rebates. Taking the citrus processing industry in Zhongxian County for example, it is recommended to learn from the Taiwan experience to strengthen the linking between citrus cooperatives, and develop the order mode as well as the "market protection price + preferential services" mechanism for distribution of benefits.

**Key words** Vertical coordination, Area of agricultural products, Distribution of benefits, Case study

## 1 Introduction

Vertical coordination in the area of agricultural products mainly refers to the economic and technical cooperation between farmers and agro-processing enterprises on variety selection, planting size, quality and safety in production, processing and marketing of agricultural products from "from farm to dining table" [1-4]. According to recent development, I divide the vertical coordination in the area of agricultural products into five types: traditional market-based transaction; order mode on the basis of farmers' organizations; company-led cooperative mode; joint stock cooperative mode; vertical integration mode. As for different vertical coordination types, there are different mechanisms for distribution of benefits. This paper attempts to perform a theoretical analysis of current mechanism for distribution of benefits based on vertical coordination in the area of agricultural products, and explore the choice and innovation of mechanism for distribution of benefits based on vertical coordination in the area of agricultural products in specific regions through case study, which has certain practical significance for deepening the academic research in this area and guiding agricultural and rural practices.

## 2 Analysis of mechanism for distribution of benefits based on vertical coordination in the area of agricultural products

Currently, the mechanisms for distribution of benefits based on vertical coordination in the area of agricultural products mainly include market price regulation, contract agreement, dividend distribution according to trading volume or shares and internal profit

of enterprise, as shown in Table 1. Market price regulation means that both farmers and enterprises are the recipients of agricultural market price and the interest relation is wholly regulated by the "invisible hand" – market, and it is applicable to the coordination mechanism according to demand and price changes. Contract agreement means that farmers and enterprises sign a legally binding production or sales contract before agricultural production, and the two sides agree on the purchase price, preferential services or rebates, and it is applicable to the coordination mechanism of order mode. Dividend distribution according to trading volume or shares means that the farmers and enterprises distribute the earnings and dividends of a combination according to the transaction volume, capital contribution or share, and it is applicable to the vertical coordination of company-led cooperative mode and joint stock cooperative mode. Internal profit of enterprise means that the value-added profit at agricultural production and processing stages are all owned by processing enterprises, and farmers only get land rent and remuneration, but the rent and remuneration levels are regulated by market, and it is applicable to vertical integration mode. Market price regulation, dividend distribution according to trading volume or shares, internal profit of enterprise and other mechanisms for distribution of benefits have fixed mode of operation. The contract agreement mechanism is complex, and affected by fluctuations in market prices, contract terms and other factors, it is prone to opportunistic behavior, so this article focuses on the contract agreement type. This article is in agreement with the view of Guo Hongdong that the mechanism for distribution of benefits regarding contract agreement is divided into guaranteed price, market protection price, market protection price + preferential services, and market protection price + secondary rebates<sup>[5]</sup>.

**2.1 Guaranteed price** Agricultural processing enterprises and farmers sign the contract to purchase agricultural products according to guaranteed price, and the benchmark of guaranteed price is "production cost + average profit". The guaranteed price con-

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tract ensures the sales channels and interests for farmers, and the enterprise has also a stable source of raw materials required. However, whether the contracting parties can honor an agreement is greatly affected by market price fluctuations, because guaranteed price is usually unchanged in the life of the contract, while the market prices fluctuate with changes in supply and demand at any time. When the market price is far below the guaranteed price, enterprises may default and conduct low-cost procurement; conversely, when the market price is much higher than the guaranteed price, farmers may also default and sell the produce on market, and enterprises can only purchase at high price on the market.

**2.2 Market protection price** Different from guaranteed price, market protection price is approved and established by agricultural processing enterprises and farmers in accordance with certain standards as the minimum base price of the acquisition. The contract provides that when the market price is higher than the protec-

tion price, the acquisition is based on the market price, but when the market price is lower than the protection price, the acquisition is based on the protection price. This mechanism for distribution of benefits has a strong protective effect on the interests of farmers, and the market risk is fully borne by the enterprise, which requires the enterprise to have great strength to bear the risk due to market volatility. To ensure that the market protection price is really implemented, it needs a corresponding risk fund system, which can control the market risk arising from price fluctuations to a minimum, and make up for the losses to a certain extent. Although many enterprises have realized the importance of risk mechanism, the risk-sharing mechanism in the current macro environment has not yet been established, and there are few powerful enterprises which can fully bear and resolve the risks, so the development of this mode is restricted.

**Table 1 Types of mechanism for distribution of benefits based on vertical coordination in the area of agricultural products**

Coordination mode	Mechanism for distribution of benefits	Applicability
Traditional market trading in line with market conditions	Market price regulation	Abounding in traditional agricultural areas
Order mode based on farmer organization	Contract agreement (including guaranteed price, market protection price, market protection price + preferential services, market protection price + secondary rebates)	The agricultural product areas with specialized production, full-fledged cooperative and strong enterprises
Enterprise-led cooperative mode	Dividends distribution based on transaction volume + secondary rebates	Strong processing specificity, low level of organization of farmers, competitive agricultural products of enterprises
Joint stock cooperative mode	Dividend distribution according to shares	In face of many institutional and legal barriers
Vertical coordination mode	The profit is owned by enterprises, and farmers obtain land rent and remuneration	High capital investment and standardization requirements, and dedicated agricultural product areas

**2.3 Market price protection + preferential services** The combination of market protection price and preferential services has made the agricultural processing enterprises provide preferential seed, technology and information services in addition to signing protection price purchase contract with farmers. Economic responsibilities of both parties are clear, and the economic ties are close. They are mutually responsible for each other, and keep stable cooperative relations in a period of time. By carrying out services to compensate for interest losses of farmers, enterprises can purchase raw materials of required quality and quantity. Farmers get the financial, material and technical benefits offered by enterprises in vertical coordination, reducing the cost of agricultural production and the corresponding risks. This mode makes the cooperative relations between farmers and enterprises stable and long.

**2.4 Market protection price + secondary rebates** Agricultural product processing enterprises sign market protection price contract with farmers in advance to determine the sales volume, quality, price and rebate of agricultural products. After the agricultural products are mature, they are purchased by enterprises at protective prices, and in year-end settlement, the enterprises take a portion of value-added benefits in processing and circulation to farmers who participate in cooperation according to the quantity and quality of the agricultural products delivered by farmers. This

mode changes the position of farmers simply providing raw materials, and enables them to share part of the profits in processing and circulation, thereby fully mobilizing farmers' enthusiasm for production, so that enterprises and farmers establish a long stable and close cooperative relationship. However, the operating pressure and risk increase for enterprises, and the rebate operation is difficult, with complicated procedures.

### 3 Choice and innovation of mechanism for distribution of benefits based on vertical coordination in the area of agricultural products: a case study of citrus industry in Zhongxian County

**3.1 Current situation and problems regarding vertical coordination of citrus industry in Zhongxian County** The upper and middle reaches of the Yangtze River are one of five major citrus producing areas determined by *Regional Distribution and Plan for National Competitive Agricultural Product* (2008-2015) issued by the Ministry of Agriculture. Now it is forming Asia's largest citrus juice processing base and only fresh cold citrus juice production base. Zhongxian's citrus juice processing enterprises mainly include Paisenbai Citrus Juice Co., Ltd. of Chongqing Three Gorges Construction Group and Edgar M. Bronfman Citrus Co., Ltd., which are two most important processing enterprises in major citrus producing areas in the upper and middle reaches of the Yangtze

River. Pisenbai has annual processing capacity of 100000 t, and peel fertilizer plant with production capacity of 5000 t is also officially put into operation. Edgar M. Bronfman Citrus Co., Ltd. has annual processing capacity of 40000 t condensed juice. The two processing enterprises have formed fresh fruit commercialization, condensed juice and fresh cold citrus juice processing and production lines, with a total processing capacity of 180000 t. Pisenbai fresh cold citrus juice has received the "international standard acceptance certificate", and become China's first citrus product up to the highest international technical standards. Currently, the major problem in the mechanism for distribution of benefits based on vertical coordination between citrus farmers and citrus juice processing enterprises in Zhongxian County is that citrus farmers can not share the value-added benefits of processing, with poor collaborative performance. The mechanism for distribution of benefits for citrus farmers and citrus juice processing enterprises is still mainly based on market price regulation, lacking the protective measures for citrus farmers. In recent years, due to increasing citrus planting and processing scale and establishment of new orangery, the citrus purchase price also remains low, with the market price of about 1 yuan/kg or less, and the contract rent also falls from 10 – 12 yuan to 8 – 10 yuan per fruit tree. Thus, citrus farmers can only obtain short-term market gains and production profits at the planting stage in the long run, and they can not share the value-added benefits of processing, leading to poor collaboration performance of citrus industry chain in Zhongxian County.

### 3.2 Choice and innovation of mechanism for distribution of benefits and vertical coordination mode

**3.2.1** Outstanding advantages of citrus cooperative on the basis of collaboration. The citrus processing industry in Zhongxian County relies on the cooperatives to develop vertical coordination, not only having the basic conditions proposed by the UN FAO, but also having the outstanding advantages. First, cooperative has more professional management of orangery. It typically consists of the citrus farmers in the village or from several nearby villages, and they have the common business content and industrial interests, so they can make a long-term plan to develop citrus industry and carry out professional management of orchard. Second, the citrus cooperative re-optimizes the factors especially the labor force, to some extent alleviating the labor shortage pressure brought about by the current aging of rural population. Third, citrus cooperative's maintenance of orchards is in line with the citrus farmers' collective action logic, and conducive to improving the level of management and protection of orchards. Finally, cooperatives improve the transaction efficiency of citrus industry chain, and avoid high transaction costs. If we learn from the experience of Taiwan's rural associations to strengthen the collaboration between cooperatives, we can further improve the market bargaining power of cooperatives to get external benefits<sup>[6]</sup>. At the same time, it can improve credit and fulfillment of purchase and sale contract, so as to avoid the contract fulfillment plight faced by the past order farming. It is reported that Taiwan has more than 10 ru-

ral citrus production associations, and one of the main duties is to coordinate the marketing strategies to ensure citrus farmers' income growth<sup>[7]</sup>.

**3.2.2** Farmer cooperative as the main organizational form of farmers' access to market and basis of collaborative development. As of 2014, there were 1.289 million cooperatives legally registered in China, 0.12 million various levels of demonstration cooperatives, and 92.27 million farmers who join the cooperatives (accounting for 35.5% of total farmers)<sup>[8]</sup>. The cooperative has been widely distributed in various areas of agriculture such as farming, animal husbandry, fishery and forestry. Farmers are increasingly dependent on the organizing power of cooperatives to obtain agricultural materials, strengthen field management, harvesting and unified marketing, and get government financial support. Cooperative is becoming the carrier for the agricultural production to communicate and collaborate with the upstream and downstream industries. At present, there have been more than 50 citrus cooperatives in Zhongxian County, and over 50000 citrus farmers have joined the cooperatives, so abandoning the organizational form of cooperatives is not in line with the actual basis of current vertical coordination in the area of agricultural products.

**3.2.3** Order mode superior to other modes. Traditional market-based transaction mode has poor collaboration efficiency. The enterprise-led cooperative mode, joint stock cooperative mode and vertical coordination mode all have a contract relationship with the citrus juice processing enterprises. In the context of coexistence of current citrus surplus and shortage and low demand on processing specificity, enterprises lack the economic power to build and manage compact vertical coordination relationships. Even if the future supply and demand contradictions change, it would be uneconomical to plant citrus for citrus juice processing companies because there are great technology and management differences between planting and processing of citrus, while the order mode based on specialization not only saves the transaction costs in collaboration, but also reduces production costs. There are considerable advantages in establishing "market protection price + preferential services" mechanism for distribution of benefits to the citrus processing industry chain in Zhongxian County. Firstly, the citrus planting has high technical requirements, and is especially vulnerable to climate change and pests. The citrus juice processing enterprises have professionals, and planting and disease prevention and control techniques. Using the technology diffusion characteristics, the processing enterprises providing technical support to citrus farmers can not only bring enormous social benefits and reputation, but also save human resources and funding. Secondly, there are great fluctuations in the market price of citrus, and since the information-based construction in rural areas is lagging behind, citrus farmers bear a huge market risk of planting citrus. The citrus juice processing enterprises have a large scale and a strong ability to bear risk, search and process information. If the both sides sign market protection price contract, it will greatly reduce

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30 years in Xinjiang, while the corn for seed has short history of using mulching films, leading to residue of mulching films in cotton field much more than residue of mulching films in corn for seed. Besides, cotton and corn have developed root system and higher over-ground parts which increase the difficulty of recycling of mulching films, while potato and other vegetables have relatively simple root system and short over-ground parts which are favorable for recycling of mulching films.

From Fig. 5 – B, we know that the density of residue of mulching films in 0 – 20 cm soil layer of sunflower field is smaller than 20 – 30 cm soil layer, while other crops have higher density of residue of mulching films in 0 – 20 cm soil layer than 20 – 30 cm soil layer. The major reason for spatial distribution difference of residue of mulching films is different physiological characteristics of different crops. In sum, there are significant differences in distribution of residue of mulching films between different crop fields. Combining density of residue of mulching films and crop planting area, the residue of mulching films in cotton field is most prominent.

## 4 Conclusions

(i) The mulching films are still in large volume in the whole Xinjiang, and there are great differences in use and recycling of mulching films among all counties and cities. Planting area and planting structure jointly influence use of mulching films, and the use of mulching films is significantly correlated with recovery of mulching films, but not correlated with recovery rate of mulching films. It is recommended to start from key counties and cities to control the problem of residue of mulching films, especially in Shawan County and Shache County which have large volume of use but low recycling rate of mulching films.

(ii) There are significant differences in distribution of residue of mulching films, highest in North Xinjiang and South Xinjiang, followed by East Xinjiang, and the lowest in West Xinjiang. Changji, Bortala, Bayingolin, Aksu, and Kashgar prefec-

tures have large planting area, mainly cotton and processed tomato, and the use of mulching films has a long history. In addition to shortage of water resources, the use of mulching films is still in large volume and accumulation of residue of mulching films is also very high. In comparison, Yili and Aletaiide prefectures have abundant water resources, the use of mulching films is little, and accumulation of residue of mulching films is also very little.

(iii) There are significant differences in distribution of residue of mulching films between different crop fields. Xinjiang is the major area of cotton production in China, the problem of residue of mulching films in cotton field is very prominent. Therefore, it is urgent to solve the problem of residue of mulching films in cotton field.

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