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Comparison of the Three Cooperative Types of Agricultural Technology Popularization Based on the Industrialization of Tomato Industry in Xinjiang Autonomous Region

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Abstract In the process of industrialization of tomato industry in Xinjiang, the cooperative models of rural households and tomato processing enterprises are order type, mediated type and workshop type. The contents, closeness degree and stability of cooperation of them are different. Under different cooperation models, the closeness degree of pillar industry and rural households differs, as well as the speed and effect of the technology promotion. By comparing the situation of technology promotion under the three cooperative models, the results can be obtained. The workshop type can reduce the risks of adopting new technologies of farmers greatly; strengthen the internal motivation of farmers to adopt new technology, so it can attract more farmers. Therefore, the workshop type represents the developmental direction of industrialization of tomato industry in Xinjiang to a certain extent.

Key words Industrialization, Agricultural technology, Promotion, Cooperative model, China

Through more than ten years' development, the processing industry in Xinjiang has formed the industrialized operation and large-scale production. The tomatoes processed in Xinjiang have certain advantages both at home and abroad in terms of quantity, quality and competitiveness. At the same time, the conflicts between the dispersed and random production of rural households and the standardized and commercialized production of pillar industry become increasingly conspicuous, which have restricted the industrialized operation of processing tomato industry to a certain degree. With the development and advancement of agricultural science and technology, the weaknesses of traditional model of planting tomato become apparent and the high cost, low input and low efficiency and some other weak points become the choke point for the industrialized development of tomato industry. Therefore, in the process of industrializing tomato industry, the popularization and application of agricultural science and technology play a principal role in ensuring the large scale production and the base construction of pillar industry, as well as in comprehensively enhancing the quality of processed tomatoes in Xinjiang, the international market competitiveness and modernization of agriculture. The mechanized technology has been applied through the cultivation of tomato: for example, mechanized film, mechanized sow and mechanized furrowing and ridging and mechanized harvest; water saving technology: for example, sprinkler irrigation, drip irrigation under mulch and so on; biological technology: for ex-

ample, biotechnology breeding, biotechnology pest-prevention and so on; besides, the information supervision technology, farm coordinate management and collective management technology still play an important role in the development of the industrialization of tomato. Among the technologies, the effective promotion of agriculture is an important approach for solving the blocks that restrict the development of industrialization of tomato. But there are many different cooperative models in the process of industrialization of tomato in Xinjiang, so the relevant popularization has the value for researching. The paper studies the cooperative models of industrialization of tomato industry in Xinjiang, the popularization situation of the three cooperative models are compared, so as to choose the model that suits the industrialization of tomato industry of Xinjiang best.

1 General situation of the cooperative model of industrialization of tomato industry in Xinjiang

In the process of industrialization of Xinjiang tomato industry, the cooperative models include order-type model, intermediary-type model and workshop-type model (Table 1). The cooperative content, closeness and stability of these models vary from each other^[1]. But all of them take the company or group as leader, the processing and transportation of agricultural products as pillar and unite with rural households organically around the production, processing and marketing of tomatoes. According to the association degree of interest between companies and rural households, the models can be divided into loose type model, semi-loose type model and close type model. The

loose type model refers to the transactions between companies and rural households are competed through market. Through the simple contracts on production and sell, the loose cooperation between companies and rural households is formed to clarify the duties and responsibilities of two parties. It is a simple buy-and-sell relation rather than the market-based organization model run by agricultural industrialization. The semi-loose type model refers to the model that mainly through the intermediary organizations to realize the cooperation between rural households and companies. Generally speaking, the dependency

among companies and intermediary organizations is high, and the relations between rural households and intermediary organizations are close, but the relations among them are unstable and easy to be affected by interests. The close type model is the model that connects rural households and pillar industries by the tie of property and forges economic entity by the way of joint-stock system and the joint stock cooperative system. This kind of cooperation is stable, but at present, this model is rare and their scale is small. Most of them are semi-loose type model.

Table 1 The cooperative types in the process of industrialization of tomato industry in Xinjiang

Cooperative types	Cooperative models	Closeness degree of cooperation	Frequency
Order-type	Company + rural households	Loose type	Higher
Intermediary type	Company + intermediary + rural households	Semi-loose type	High
Workshop type	Company + base + rural households	Close type	Low

2 The comparison of the popularization of agricultural technology under three cooperative types

2.1 The popularization of agricultural technology under the order type Order type—"company + rural households" refers to the cooperation way that the company sign production and sell contract with the rural households and the production, transportation, selling and settlement and some other procedures are completed between the company and rural households. The company signs the purchasing and selling contract with rural households, and then the company leads the rural households to produce the agro-products that are in line with the demands of enterprises and markets. But due to the loose type, rural households' input on technology mainly relies on experience and the comprehensive consideration of the predicted profits. When applying the new technology and new varieties in particular, they are especially cautious and adopt the way of "wait and see". The rural households do not want to have the ability to take the risks bought by the new technology. They lay stress on the input on simple, economical and single-way agricultural technology rather than on the multiple combinations with auxiliary technologies. Rural households are accustomed to applying new varieties, mulching technologies, cultivation techniques and technology of using machine to replace manpower, but they input less on the technologies of soil testing and formulated fertilization, water-saving irrigation, comprehensive prevention of plant diseases and insect pests; and the storage, processing and fresh-keeping of products. The input on the auxiliary equipments that combine the complex technologies is small in particular. The reason is that the small scale rural households lack the capabilities of taking the risks caused by absorbing and adopting the agricultural science and technologies. In the process of adopting new technologies, rural households not only have to face the general natural and market risks, but also have to face the risks caused by adopting new technologies (the risks of buying new technology, using new technology, the risks of increase the input of elements when using new technology and the market risks using new technology)^[2], but the operation scale of rural households is small, the

agricultural profits are low and farmers' willingness and capability of taking the risks are low.

2.2 The popularization of agricultural technology under the intermediary type Under the intermediary type, the tomato-processing enterprises take the intermediary organizations (large plantation family, villages' committee or regimental farm) of local Xinjiang and Xinjiang Crops as the demonstration households. These farmers are rich and have enough money, materials and interests to use new products and new technologies^[3]. At the same time, the enterprises expect that the demonstration households may attract more people in the process of using new products and new technologies. The operation procedures of this model are as follows. Firstly, enterprises provide improved seeds and equipment, as well as relevant services to the demonstration households. Secondly, through the authority and sampling function of the demonstration households to stimulate other farmers to adopt new technologies.

The model is convenient to agricultural enterprises, for using the model, the enterprises do not need to contact with all the farmers but part of them. The enterprises can realize the popularization of technologies through costing fewer efforts. This approach reduces the transaction fees and unnecessary costs and the contingent conflicts in the transaction, at the same time, the demonstration households are willing to deal with enterprises^[4]. However, the following situations are necessary for applying this type; firstly, the demonstration households should have quit a lot of land and the high competence of getting resources, at the same time, the demonstration households should have enough economic power to adopt new technologies and to take the risks. Secondly, the demonstration households should be eager to get new agricultural technologies and be interested in the popularization of technology, so the enterprises do not need to speed time to persuade them. Thirdly, the behaviors and opinions of them have certain authority among the other farmers and they are more risk-taking, besides, they can outguess the value of the new technologies and adopt them. By using new technologies, they can produce more products, or the efficiency of producing the same products is improved, so they can earn more money than before. The other rural households may follow them, and then the tech-

nology can be popularized.

2.3 The popularization of agricultural technology under the workshop type Under the workshop type, rural households and pillar industries are connected by property, the essence of it is the coordination and reorganization of production procedure and production elements of rural households. It can greatly improve the degree of scale-operation, specialization and intensive operation in the sections of production, processing and selling, which lay organization foundation for the modern agricultural science and technology. In order to improve the quality of products, pillar industries actively apply the modern processing technologies and equipment. The specialized production and scale operation of material base of agriculture products create favorable conditions for applying improved varieties, improving cultivation technologies and using agricultural machine. In the workshop type, the pillar industries are not only an important carrier for popularizing the agricultural technology, but also the energetic main body for innovating technology. The pillar industries in the industrialization of agriculture are characterized by large scale operation, abundant capital and intensive technologies. Meanwhile, the pillar industries have to face even bigger market and more fierce competition, so in order to survive; they must pay much attention to the innovation of technologies and seek the new growth point of new technology. Therefore, the pillar industries often cooperate with universities and research institutes; continuously develop new products and introduce into new results. Some pillar industries even have their own research institutes to conduct research. In fact, this kind of industrialization organization has become one of the main bodies of technology innovation and plays a crucial role in the reform of technology. The base of industrialization of tomato industry implements the standardized management throughout the process and the standardized management provides a fair competition opportunity for a new round of adjustment of agricultural structure. The mature area has the advantages of technology, sells channel and brand advantages; and the newly

started area has the advantages of relative good ecological environment, high starting point and the technologies are easy to be promoted and to be accepted by farmers. The standardized work provides possibility for guiding market and the technology is expended to circulation domain, which supply new form and content for popularizing technology. At present, the popularization of new technology still mainly relies on the government and the technical popularization department has not got interests from providing technical services. The standardization implemented on tomato products inevitably promotes the reliance of producers to technology. The traditional way of planting tomatoes will be abandoned gradually in the competition, which takes the quality and interest as the core. In order to effectively open the foreign market, standards of foreign countries should be understood and the export of agricultural products should be organized according to demand of organized production and operation. Therefore, a set of standard of technology and management should be established to normalize farmers' works, strictly control the sections from the seeds to plantation and from processing to selling. The unification of quality and standard of tomatoes and their products should be ensured.

2.4 Synoptic comments In the industrialization process of tomato industry, the capital scale, management level and production scale of pillar industries are different from that of rural households. Generally speaking, pillar enterprises have strong capability on collecting information and absorbing agricultural technologies; they can timely obtain the relevant information of the new results on agricultural technology; they are capable of absorbing the large-scale and comprehensive agricultural technology results, therefore, it facilitates the close combination among relevant research institutions. At the same time, under different cooperate types, the closeness of the connection between pillar industry and rural households is different, and the speed and effect of promotion of them also vary greatly. The technologies applied by the different cooperation models can be seen on Table 2.

Table 2 The technologies applied by three cooperation models

Cooperation types	Water-saving type	Biotechnology	Mechanization technique	Management technique
Order type	Seldom application	Seed selection and pesticide use control	Seldom apply the mechanical seeding and harvest	Decentralized management
Intermediary type	Seldom application	Seed selection and pesticide use control	Seldom apply the mechanical seeding and harvest	Autonomous management
Workshop type	Frequent application	Entire application	Apply mechanical seeding and harvest in large acreage	Centralized management

Comparing with other types, the fundamental advantage of order type is the low operation cost of popularizing technology. Because the technologies are accepted by farmers directly, the unnecessary intermediate sections and transaction fee are reduced. However, the speed of popularizing the new technologies is slow and farmers hesitate to apply the new technologies, so the transformation of agricultural technical results is affected. Besides, the technical standards are hard to handle. By relying on the motivation of demonstration households, the intermediary type has accelerated the popularization of agricultural technology to a certain degree. The weak point of this type is that it serves the demonstration households mainly and the

interests of small rural households are neglected, which may enlarge the gap between the poor and the rich. The workshop type has high requirement on the finance of pillar industries, which should have great financial power and can provide comprehensive technical service during the entire process of production. Besides, the type should accompany with training on farmers, qualification approval and quality monitoring and some other measures.

3 Conclusions and revelations

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capital in city and village invariable, the transfer of rural labor forces into city can still bridge the income gap between city and village, that is to say, the transfer of rural labor forces tends to narrow the income gap. Thirdly, under the situation that the transfer of rural labor forces into city encounters no stumbling-block, due to the great gap of urban-rural stock of capital, the rural income is lower than the urban income.

On the basis of China's current reality, we maintain that the governmental should do two things simultaneously in order to elevate China's rural income level and bridge urban-rural income gap: on one hand, we should promote the transfer of rural labor forces into city vigorously, and change the current state of urban-rural dual labor forces market structure; on the other hand, we should reinforce the input in rural areas, and promote the increase of rural stock of capital so as to further increase farmers' income in the process of the transfer of labor forces.

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has expanded the connotation of the production and operation of tomato; connected each stage and section of producing tomato. The complete organic industrial chain has been formed, and then the coordination of each stage and each section in agricultural system is improved and the coordination fee is reduced. The close connection between pillar industries and rural households has increased the farmers' enthusiasm on applying new technology; overcome the "avoidance" psychology of using technology and become the effective organization. This kind of closely connected industrialized organization provides capital security for applying new technology for one thing, and for another thing, it transfers certain risks to the pillar industries, and then the benefit community of "shared risks and common interests" is formed and the risks faced by rural households are greatly reduced. The farmers transfer from the avoidance type to risk type and to risk seeking type. The risk-seeking type may obtain super profit by applying new technology, so the farmers' inner motivation of applying new technology is improved, thus, more farmers are attracted to use new technology. Therefore, the industrialized

operation of workshop type has not only greatly improved the level of technological advances in agriculture, but also accelerated the progress of other industrial chain including production, selling and some other sections. Thus, the overall strength of agriculture is increased, as well as the overall efficiency of agriculture. Therefore, the workshop type represents the developmental direction of industrialization of tomato industry in Xinjiang to a certain degree.

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