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# Review of Researches on Agricultural Industry Chain at Home and Abroad

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**Abstract** Management of agricultural industry chain is the main form of modern agricultural industrialization. Integration and optimization of agricultural chain have great significance in deepening the reform in the countryside, quickening the development of agricultural modernization and establishing new system of agricultural management. Based on the theory sources and contents of agricultural chain as well as the current researches at home and abroad, this paper hackles and concludes information technology, logistics management and food safety and quality in foreign agricultural chain as well as the organization model, operation mechanism, integration and optimization, promotion and extension, financing and risk prevention, influencing factors as well as performance evaluation in domestic agricultural chain and offers relevant review in order to provide further reference for future researches.

**Key words** Agricultural industry chain, Integration and optimization, Promotion and extension, Influencing factors, Risk prevention

## 1 Introduction

Agriculture is an ancient and traditional industry and the construction of agricultural industry chain, which stems from industrial economics, has great significance in view of the special national conditions in modern China. Natural attributes of agriculture determines the natural weakness of traditional agriculture. However, the establishment of agricultural industry chain will create an integrated management system based on agricultural production, which will no longer be isolated. This is conducive to raising the organization degree of agricultural industry and value-increasing ability of agricultural products, adapting to the requirements of scalization, specialization and marketization of agricultural production and fundamentally twisting the scattered, extensive and disadvantaged agricultural production in order to stabilize national economy in China. Therefore, "the twelfth five-year plan" indicated to quicken the development of modern agriculture, promote agricultural industrial management, support the processing and circulation of agricultural products as well as promote the specialization, standardization, scalization and intensification of agricultural production management. *Decision on Overall Reform of Several Major Issues by the Central Committee of the CPC* issued by the Third Plenary Session of the Eighteenth Central Committee of CPC pointed out to promote the innovation of agricultural management method, involve farmers in agricultural industrial management with contracted management right as share and actively develop various

modes of scale management. As the main feature of modern agriculture, researches on the cultivation, development and governance of agricultural industry chain require to be improved.

## 2 Theory sources and content of agricultural industry chain

**2.1 Theory sources of industry chain** Theory sources of industry chain could be traced back to labor division theory that the maximum increase in productivity and improvement in techniques, proficiency and judgement comes from labor division, which was put forward by Adam Smith, the originator of the economics. Based on Adam Smith, Young described labor division with three concepts. The first concept was professional level of each individual, which increased with the narrowing of scope of everyone's activity. The second one was the length of indirect production chain (production detour), which was related to the vertical division in the upstream and downstream sectors. The last one was variety of specialty, which was related to horizontal division in sectors at the same level<sup>[1]</sup>. Hirschman discussed industry chain relations and the relevant concepts with the "correlation effect" theory in *Economic Development Strategies*. He classified industry chain relations into "forward linkages" and "backward linkages" and proved the theory of "effective investment sequence"<sup>[2]</sup>. Michael Porter first mentioned value chain theory in his book *Competitive Advantages* and believed that value chain in the company consisted of basic and auxiliary value-adding activities. Basic value-adding activities involve each section of production and management, such as internal logistics (including material purchase, product development, product processing and finished product delivery), production operation, external logistics (material and equipment supply), marketing and after-sale service. Auxiliary value-adding activities include infrastructure construction, management of human resources, technology development and purchase management. Porter believed that value activities were generally connect-

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ed with different specific methods for different enterprises and became the sources of competitive advantages. Besides, Porter also stressed the importance of investigating the position of enterprises in the industry. He described the larger industry value chain which involved a specific enterprise value chain with value system and thought that garnering and maintaining competitive advantages depend not only on the understanding of enterprise value chain but also the understanding of how to adapt to a value system for a company. Value flows among enterprises form the value of the whole supply chain and the vertical connection of value chain, which is called industry value chain<sup>[3]</sup>.

**2.2 Content of agricultural industry chain** As mentioned before, industry chain originates from the 1950s in America, but few academic researches adopt the concept of "industry chain" although many documents have used the terms like "value chain", "supply chain", "production chain" and "logistics chain". However, the concept of "industry chain" was put forward by domestic scholars in the research on agricultural industry chain<sup>[2]</sup>. Based on the conception of industry chain, foreign scholars proposed "vertical coordination" of the development of agricultural industry and believe that agricultural industry chain is a series of procedures involving production of raw materials, processing, storage, transportation and sale (Mighell, 1963)<sup>[4]</sup>. Domestic scholar Fu Guohua (1996) believes that agricultural industry chain is a chain-like rotating process which is based on the market, promotes rational allocation of important production factors like capitals, land and labor force and involves production, processing, transportation and selling of some certain "competitive products" in plantation and aquaculture, transportation, processing and selling industry<sup>[5]</sup>. Wang Kai and some others (2002) have further classified the conception of agricultural industry chain and hold that agricultural industry chain is a combination of agricultural value chain, information chain, logistics chain and organization chain as well as an organic integration of supply of agricultural production means, production and processing, storage and selling of agro-products<sup>[6]</sup>. Some other scholars think that agricultural industry chain is the specific application of industry in agriculture involving production, processing, transportation and selling and is also an organic integration of value chain, information chain, logistics chain and organization chain covering each sector, organization and related company before, during and after agricultural production (Cui Chunxiao, 2013)<sup>[7]</sup>. Based on the scholars' opinions, it can be concluded that agricultural industry chain is a complicated chain-like system of the organic integration from production to final consumption of agro-products, aiming at promoting the development of agricultural modernization.

### 3 Current researches on agricultural industry chain at abroad

Foreign scholars' researches on agricultural industry chain have lasted for nearly 60 years and are mainly based on related theories of supply chain of industrial manufacturing. Since the matching

service systems in modern agriculture in some developed countries like America, Japan, Canada and the Netherlands are relatively perfect, foreign scholars' researches on agricultural industry chain in recent years mainly focus on the value chain and supply chain of agricultural products, covering information technology, logistics management as well as food security and quality.

**3.1 Information technology** Foreign researches on information technology in agricultural industry chain mainly concentrate on the effect of information technology on industry chain and supply chain as well as bottleneck problems. Latin Fois (2000) pointed out that the current agricultural information management technology is over specific, inflexible and with small application scope, therefore rational transformation is required with the joint efforts from government and agricultural enterprises<sup>[8]</sup>. Taking coffee industry as an example, Norbert Niederhauser (2008) proved that the Internet – based information technology can achieve the management differentiation of supply chain in order to increase the value of agro-products during the selling<sup>[9]</sup>. Jabir Ali and Sushil Kumar (2011) used Indian tobacco companies as the example and adopted empirical analysis to prove that information and communication technology (ICT) can increase the decision-making ability of Indian farmers and thus is beneficial for agricultural supply chain to exert the advantages<sup>[10]</sup>.

**3.2 Logistics management** Foreign scholars mainly focus on the effect of logistics management of a specific kind of agro-product supply chain on the performance of agricultural industry chain, the mode of logistics management and establishment of traceable system. Decio Zylbersztajn (1998) conducted wide and intensive researches on the supply chain of agricultural products like fruits, vegetables and beef respectively and believed that logistics management in a company was crucial to the performance of agricultural industry chain and improvement of core competitiveness<sup>[11]</sup>. P. – Y. Le Gal and J. Le Masson (2009) have established the logistics management of sugarcane supply chain, which can effectively analyze the complex supply chain within a certain range and thus provide effective market information for related organizations and individuals<sup>[12]</sup>. Techane Bosona and Girma Gebresenbet (2013) have discussed the importance of logistics management in food and agricultural supply chain and believed that the establishment of traceable logistics system of food and agricultural supply chain required further understanding of related economy, law, technology and social problems<sup>[13]</sup>.

**3.3 Food security and quality** In researches on food security and quality of agricultural industry chain, scholars mainly focus on the influencing factors of food security of fresh agro-products in specific fields and areas. For example, Jaxsens (2010) has studied food security problems of fresh agro-products because of climate change with simulation model and risk assessment tool<sup>[14]</sup>. Katleen Baert (2011) has studied food chain in Belgium and believed that the safety of food chain was affected by local society, economy, politics and environment<sup>[15]</sup>.

Apart from the above mentioned, foreign scholars have also

studied the supply chain management and sustainable development of agricultural products like pineapple as well as dairy products and put forward some suggestions for optimizing the supply chain of agricultural products.

#### 4 Current researches on agricultural industry chain in China

In view of the development process of agricultural industry chain in developed countries like Japan, the Netherlands, America and Canada, extension, integration and optimization of agricultural industry chain are essential in promoting the industrial competitiveness in agriculture. At present, there are still problems in agriculture in China, such as inadequate infrastructure, irrational organization structure and intensive operation with small scale, which results in difficulties in extension and integration as well as irrational operation mechanism of agricultural industry chain. Therefore, domestic scholars have conducted many researches on the organization mode, operation mechanism, extension and promotion, optimization and integration, financing and risk prevention, influencing factors and performance evaluation of agricultural industry chain and the conclusion are as follows.

**4.1 Diversity in organization modes of agricultural industry chain and imperfect operation mechanism** Rational and effective organization modes and operation mechanism are beneficial to the resource allocation and exerting the maximum effectiveness of agricultural industry chain, therefore research on the organization modes and operation mechanism of agricultural industry chain has been the main content in studying agricultural industry chain. Domestic scholars generally believe that organization modes of agricultural industry chain in China are diversified, which is jointly determined by factors like the market competition, operation mechanism with the organization, transaction scale, goods property, asset specificity, degree of production controllability, regulation structure and governmental behaviors (Luo Biliang, 2004)<sup>[16]</sup>. Tang Bulong (2009) studied poplar industry chain from three aspects, namely goods property, asset specificity and uncertainty as well as market structure, and concluded that there were three modes of market transaction, operation form and vertical integration in poplar industry chain<sup>[17]</sup>. From the perspective of participants, Wang Yafei (2011) believed that organization modes of agricultural industry chain included "market transaction", "integration", "enterprises + farmers", "enterprises + agricultural bases + farmers", "enterprises + associations + farmers", "scientific institutes + farmers" and "enterprises + intermediary organizations + farmers"<sup>[18]</sup>. However, some other scholars think that the specific selection of organization modes of agro-product industry chain should take the external factors into consideration and there is no absolute optimal organization mode. Xiao Xiaohong (2012) studied the operation mechanism and believed that the healthy steady operation and function realization depended on the joint effect of dynamic development mechanism, organization mechanism, interest coordination mechanism as well as

risk control mechanism and also pointed out that interest coordination mechanism of agricultural industry chain in China was not perfect<sup>[19]</sup>.

**4.2 Enough vertical extension and horizontal promotion while inadequate integration and optimization of agricultural industry chain** Extension of agricultural industry chain is the main approach for developing modern agriculture and establishing the mechanism of "industry promoting agriculture and the city driving the countryside". This kind of extension follows the motion law and technical route of regional economy. Rational integration and optimization of agricultural industry chain are required during the extension in order to integrate agriculture, industry and commerce, farmers, workers and businessmen as well as the countryside, suburban and cities into a community of economic benefits and market risks so that all the participants can share the social and economic benefits from labor division and cooperation (Li Jieyi, 2009)<sup>[20]</sup>. In recent years, based on the actual conditions in China, domestic scholars mainly propose vertical extension and horizontal promotion of agricultural industry chain and emphasize both increasing product value in each section and integration as well as optimization from the micro-perspective of region and inter-region. Gong Qinlin (2004) believed that establishment of agricultural industry chain involved the connection within the region and extension between regions and the extension meant to cover the upstream and downstream sections as much as possible<sup>[21]</sup>. In view of the short and narrow agricultural industry chain in China, some scholars suggest that horizontal promotion of agricultural industry is required to fully exert the potential of each node. Then, related researches have mainly focused on the influencing factors of extension of agricultural industry chain. For example, Chen Hongwei and some others (2009) believed that extension of agricultural industry chain was restricted by information, market requirements, transaction fees, low operation management and imperfect interest coordination mechanism and also put forward that development of leading enterprises and perfection of agricultural organization modes should be emphasized<sup>[23]</sup>. Zhao Xufu (2006) thought that apart from the integration of logistics, information flow, value flow and management subjects, regional and interregional integration of agricultural industry chain was also required from the micro-perspective of spatial and temporal distribution<sup>[23]</sup>. Based on the analysis of advantages and disadvantages of current integration modes of agricultural industry chain in China, some other scholars proposed that farmers cooperative organizations should be the leading integration mode based on household contracting management, thus the industry chain of household management can cover those non-agricultural sections before and after the production of agro-products so that farmers can share the benefits and improve their status in market competition (Cheng Dening, 2012)<sup>[24]</sup>.

**4.3 Financing of agricultural industry chain from financial institutions while lack of research on risk elusion** Financing of agricultural industry chain, which is based on financing of supply chain and value chain, means that one or several financial institutions offer financial service for different subjects of agricultural industry chain, taking the trust of the whole chain as that of each subject (Cheng Yongquan, 2013)<sup>[25]</sup>. Based on the investigation

on financing of agricultural industry chain conducted by financial institutions in Chongqing city, Man Mingjun (2011) divided into financing modes of agricultural industry chain into industrial park-oriented financing, government-oriented financing and leading enterprises-oriented financing<sup>[26]</sup>. These different financing modes share common specialties. Firstly, general demand of financing of agricultural industry chain is large. Secondly, financing of agricultural industry chain emphasizes self – fulfilling of repaying source and sealing of capital expenditure. Thirdly, financing demand of each subject in agricultural industry chain is diversified. Lastly, evaluation criteria of financing of agricultural industry chain are chain-like (Huang Yue, 2013)<sup>[27]</sup>. Risk of agricultural industry chain means the possibility of subjects suffering loss and operation deviation since any section can be affected by internal or external uncertain factors during the operation. Based on the deep research on agricultural industry chain, scholars have concluded the main risks as natural disaster risk, market risk, contract risk, operation risk as well as technical risk and also proposed relevant risk prevention measures according to the specialty of different risks. For example, based on the recognition of these risk factors, Li Bin (2011), taking Wuling Mountain ethnic area as the example, established the risk evaluation index system by using fuzzing analytic hierarchy process, which involved market risk, natural risk, contract risk and efficiency risk as well as 26 evaluating index. The result showed that natural risk had the highest possibility and required high attention<sup>[28]</sup>.

**4.4 Relatively more qualitative researches on the influencing factors and quantitative researches on performance evaluation of agricultural industry chain** The germination, development and maturation of agricultural industry chain are affected by market demand, technology, capital, talents and information as well as management, therefore analysis on the effect of these factors is significant in the cultivation of agricultural industry chain (Xiao Xiaohong, 2013)<sup>[29]</sup>. Starting from the general agricultural products and some specific agro-product, designing the evaluation index system of operation performance of agricultural industry chain is becoming increasingly popular among domestic scholars. Analytical hierarchy process and fuzzy comprehensive evaluation are selected with structural equation for verification. Taking vegetable industry chain in Nanjing as an example, Dai Huayong (2006) established performance analytical hierarchy model and evaluation matrix to comprehensively assess the external performance (including flexible management, cooperation, response of customers and consumers as well as environmental ability) and internal performance (including management cost, capital turnover and return)<sup>[30]</sup>. Based on the features and development law of forestry industry, Yang Jiameng (2011) proposed four-dimensional model of forestry industry chain consisting of length, width, correlation degree as well as thickness and established measurement index system and comprehensive measure process to assess the performance of forestry industry chain. With forestry industry chain in Jiangsu province as an example, the analysis showed that the value of length was high while other values were relatively low<sup>[31]</sup>.

## 5 Conclusion

The writers concluded related current researches on agricultural

industry chain at home and abroad, which provided excellent reference for perfecting theories of agricultural industry chain. However, there are still problems requiring further study, especially in domestic researches.

Firstly, domestic researches lack consideration in information technology of the operation mechanism of agricultural industry chain. Currently, information technology products related to agricultural industry chain are mainly developed and designed for some individual sections, lacking unified planning standards and with repetitive construction and information isolation. Therefore, establishment of information technology application system of the whole agricultural industry chain requires further attention. How to integrate scientific technology and information into industrialized production, processing, selling and consumption is to be explored to promote the connection of agricultural production and operation as well as improve the management. Secondly, scholars' researches on the extension and promotion of agricultural industry chain generally exclude regional advantages. Extension and promotion of agricultural industry chain inevitably involve the relation and coordination with other regions while there is no research on the spatial distribution and features of agricultural industry chain combining regional economy. Thirdly, researches on the financing and risk prevention of agricultural industry chain are mainly from the perspective of banks as well as small and medium-sized enterprises, excluding agricultural cooperatives and farmers. There is no research on effective credit risk management and development suitability of financial products, causing contradiction between demand and supply of agricultural credit. Researches on how to avoid risks in each section of agricultural industry chain are over general. Lastly, domestic scholars' researches on the influencing factors of agricultural industry chain are mainly qualitative analysis from market demand, technology, capital, talents, information and management, lacking quantitative analysis. Besides, performance evaluation of agricultural industry chain is still subjective to some extent. Current documents involve less about the research on relational governance among each subject of agricultural industry chain. Compared with other industry chains, agricultural industry chain possesses obvious specialties and relation between each subject is extremely unbalanced. Farmers, being the source of agricultural industry chain, own the lowest power, share the least benefits and possess the weakest anti – risk ability. The imbalance of agricultural industry chain determines its vulnerability. Defining the subject of governance, establishing effective governance mechanism to protect each stakeholder, especially those farmers, setting up rational and effective risk sharing mechanism and specifying governmental responsibility in governance system require further exploration.

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importance to strategic management and process management. Although agri-scientific research institutions are not like enterprises pursuing cost control, there are still difficulties and obstacles in application of the ABC approach. However, as long as they deeply understand quintessence of this advanced cost accounting and management theory, integrate it into the existing cost method, and learn, promote and make improvement by levels and steps, it is expected that the ABC approach will have a huge development space in agri-scientific research field.

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