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Recommendations for Analysis and Optimization of Vegetable Circulation Mode in Hebei Province

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Abstract This paper analyzed current situations of vegetable production and circulation in Hebei Province and summarized 3 major modes of vegetable circulation in Hebei Province, namely, traditional circulation mode, production-marketing docking mode, and e-commerce channel based circulation mode. Through comprehensive analysis of advantages and disadvantages of different circulation modes, it came up with pertinent recommendations for optimizing the vegetable circulation system in Hebei Province: reducing circulation links at the operating level to reduce circulation costs; bring into full play government supervision functions at institutional guarantee level to cut down expenses in circulation links.

Key words Vegetable, Circulation mode, E-commerce, Optimization

1 Current situations of vegetable production and circulation in Hebei Province

1.1 Current situations of vegetable production in Hebei Province

Hebei Province is a large province of vegetable production and vegetable industry is always an advantageous industry of Hebei Province. Vegetable planting area, total vegetable yield, and output value of Hebei Province in 2010–2013 were listed in Table 1. From the vegetable yield, total vegetable yield of Hebei Province in 2010–2013 was 70.736 million, 73.843 million, 76.951 million, and 79.0212 million tons separately, ranking the second place in 31 provinces of China^[1–3], accounting for 10.9% of total vegetable yield of China, with gradual increase of planting area, total yield, and per unit area yield. As to the output value, the percentage of vegetable output value to total agricultural output value in Hebei Province takes on increasing trend. In 2013, vegetable output value of Hebei Province reached 153.5 billion yuan, accounting for 44.19% of total agricultural output value; on the basis of the location quotient method, its location quotient is higher than 1, in other words, Hebei Province has regional comparative advantages; apart from satisfying local demands, it also can export to other areas, thus Hebei Province is a real "vegetable garden"^[4].

1.2 Current situations of vegetable circulation in Hebei Province

In recent years, circulation of agricultural products has received close attention of government. *Government Work Report* (2012) of the State Council clearly specified that it is required to continue to control food price rising, invigorate circulation, reduce cost, raise the circulation efficiency, reduce the middle cost, and really benefit producers and consumers^[5]. The *Gov-*

ernment Work Report of 2013 proposed that there is pressure of price rise of agricultural products, keeping stability of overall price level is an essential target of macro regulation; besides, it proposed invigorating circulation, reducing logistic costs and keeping basic stability of overall price level^[6]. In recent years, China has issued a series of policy documents, such as the *State Council Circular on Further Promoting the Vegetable Production to Ensure Market Supply and Prices Basically Stable*, to suppress rise of vegetable price^[7].

"Vegetable garden" project realizes increase of yield, but it can not guarantee the increase of income from sales of agricultural products. In 2012, production price of agricultural products in Hebei Province rose about 0.6%, fresh vegetable price rose 17.1% compared with the same period of last year, influencing food price rose 1.66%. and CPI rose 0.52%, the degree of influence was up to 20.1%, showing the fresh vegetable price rise is the major driver of price rise^[8]. Without considering price rise of agricultural means of production (8.2%), optimizing vegetable circulation channel and reducing circulation expenses are important factors and approaches for further stabilizing vegetable price and increasing circulation efficiency.

Since 1992, the vegetable circulation system has become loose and it has realized free market circulation. Before 2000, wholesale market takes the dominant position in vegetable market circulation; from 2000, it has gradually entered the stage of coexistence of multiple circulation entities, to adapt to demands of urban residents for vegetable basket products^[9]. In the whole country, the concentration degree of vegetable production areas is increasingly high and the nationwide large market and large circulation pattern gradually takes shape. In Hebei Province, there are new circulation modes such as traditional circulation mode with wholesale market as main entity, production-marketing docking mode with supermarket as the core, and e-commerce channel based new circulation mode, and the first two modes are major ones^[10].

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Table 1 Vegetable planting area, total vegetable yield, and output value of Hebei Province in 2010 – 2013

Year	Planting area 10 ³ hm ²	Total yield 10 ³ t	Yield per unit area kg/hm ²	Absolute number of total output value//10 ⁸ yuan	Percentage to agricultural output value//%
2010	1 138.57	7 073.60	62 127	1 013.42	41.03
2011	1 157.86	7 384.30	63 775	1 126.67	40.60
2012	1 203.00	7 695.13	63 966	1 333.87	43.09
2013	1 220.36	7 902.12	64 753	1 535.00	44.19

2 Major vegetable circulation modes of Hebei Province

2.1 Traditional circulation mode In traditional mode, vegetable circulation mode includes three stages: vegetable purchasing, vegetable wholesale, and vegetable retailing. The main characteristic is many circulation links, raising price in these links directly brings about rise of vegetable price.

Table 2 Expenses of circulation links in traditional circulation mode

No.	Circulation links		Items of expenses
1	Production	Planting cost	
2	Purchasing	Picking expenses, packaging expenses, fresh keeping expenses, transportation cost, and handling expenses	
3	Wholesale	Transportation cost, transaction commission, labor cost, transaction management expenses, and stand cost	
4	Retail	Transportation cost, stand cost, sanitation, water and electricity charges, and losses	

2.1.2 Circulation channel mode. The traditional vegetable circulation channel mode of Hebei Province is "farmer + wholesale market + retail terminal + consumer". According to difference of links, the retail link is mainly small retailers, including following 6 modes^[11]: (i) "farmer + small retailer and pedlar"; (ii) "farmer + wholesaler in production area + small retailer + consumer"; (iii) "farmer + wholesaler in sales area + small retailer + consumer"; (iv) "farmer + wholesaler in production area + wholesaler in sales area + small retailer + consumer"; (v) "farmer + cooperative, broker, and agent + wholesaler in sales area + small retailer and pedlar + consumer"; (vi) "farmer + cooperative, broker, and agent + wholesaler in production area + small retailer and pedlar + consumer".

2.2 The production-marketing docking mode with supermarket as the core As a new retailing form, after entering the circulation field of agricultural products, supermarket has effectively promoted agricultural and rural economic development and has gradually become a consumption trend. From this, it forms the production-marketing docking mode with supermarket as the core, including farming-supermarket docking, and farming-community docking, etc. Among these, farming-supermarket docking is widely applied in foreign countries. In this docking mode, supermarkets and specialized cooperatives sell agricultural products in accordance with purchasing contract and establish direct purchasing bases of agricultural products, farmers and bases directly supply agricultural products to supermarkets.

In farming-supermarket docking mode, production bases of fresh agricultural products and farmers' specialized cooperatives directly connect with supermarkets, which avoids the wholesale

2.1.1 Expenses of circulation links. In traditional circulation mode, expenses of circulation links are listed in Table 2. From Table 2, we can see that expenses of wholesale link mainly include transportation cost, transaction commission, labor cost, transaction management expenses, and stand cost; expenses of retail link mainly include transportation cost, stand cost, sanitation and water and electricity charges, and losses.

link, reduces losses in vegetable circulation, improves quality of vegetable in retailing terminal, and reduces middle links and expenses^[12]. Consumers with higher income are sensitive to vegetable quality and purchasing environment, they generally choose clean and comfortable supermarkets to buy vegetable^[13], thus, the farming-supermarket docking mode can effectively the problem of optimization of vegetable logistics, and realize win-win of producers, sellers, and consumers^[14].

2.3 E-commerce channel based new circulation mode Internet development brings about huge changes of agriculture, e-commerce gradually enters the circulation field, penetrates into the entire industrial chain of agricultural products, provides a new circulation mode, and plays a significant role in boosting market competitiveness of agricultural products and promoting market circulation. The e-commerce with fine products and organic vegetable as main part is gradually developing, including online shopping and telephone ordering, mainly using cold-chain logistics, and oriented towards high end consumers. Such new vegetable circulation mode is safe and convenient and products are of high quality and high grade. However, the cost of cold-chain logistics for fresh vegetable is one time higher than ordinary logistics, and commodity wastage rate is up to 10% – 30%. High cost of cold-chain delivery reduces profit, and supply of green agricultural products is limited. Single target leads to slow development of this circulation mode. Nevertheless, total volume of retail sales of fresh products is about 2500 billion yuan, while the online transaction amount is only 1%, which is expected to reach 10%, and e-commerce of fresh products has market prospect of 250 billion yuan, showing huge potential^[15].

3 Strength and weakness analysis of different circulation modes

The traditional vegetable circulation mode with wholesale market as the core plays the role of main channel at current stage. It has functions of rapid and powerful concentration and separation, effectively matching demands and supply, and connecting production and sales areas. Farmer market with pedlars as major part is still the first choice for consumers of different income and consumption level, having obvious strength in customer groups.

However, from the perspective of vegetable logistics chain, wholesale market divides it into production area and sales area. Wholesale market becomes a breaking point of vegetable logistics chain, making production area and sales area isolated. There are following problems. First, many entities participate in the circulation process. From field to dining table, vegetable needs purchase, transportation, wholesale, and retail process, the cost is gradually enlarged at three or up to 5–6 circulation links, the total circulation cost is high and the cost shifted to consumers is high, so it is difficult to reduce retail price. Second, it can not guarantee vegetable circulation safety. In traditional circulation mode, many links do not adopt cold-chain transportation and have no strict quality inspection system, especially the retail link after entering the farmers market.

Compared with traditional circulation mode, production-marketing docking avoids all levels of wholesalers, reduces middle links and losses, and reduces circulation cost. Using farming-supermarket docking mode, it is able to direct purchase from rural cooperatives and agricultural production bases, find out and grasp purchasing source. In the process of production-marketing docking, there gradually evolves agricultural enterprises with large-scale planting management. In vegetable production, processing, transportation, and sales, it has established strict control standards, so the circulation safety has more guarantee. At the same time, vegetable sold in supermarket is mainly clean, fresh high quality vegetable without spot of plant diseases, and pesticide residue and harmful heavy metal residue also conform to national standards and satisfy demands of specific customer groups.

From actual operation, there is certain gap between farming-supermarket docking and effect of theoretical analysis. There are following problems: (i) low production organization level. In production source, the present agricultural production is mainly small peasant decentralized management, traditional planting mode and supermarket standardized operation have obstacle of docking. In recent years, planting cost of labor and pesticide gradually rises, while the standard for vegetable accessing to supermarket is high, but the benefit is low, many small farmers select sales to wholesale market or farmers market. (ii) Low level of organization. Cooperatives are joint economic entities voluntarily organized by farmers, directly responsible for supermarket, and need undertaking functions of circulation entities and information hub. However, according to present situations, the organization level of cooperatives still fail to match and dock increasingly improving supermarket ter-

minal. (iii) It lacks support of stable and high efficient logistics system. Transportation generally still needs to be undertaken by farmers or agricultural cooperatives, the cold-chain logistics system is not perfect and increases operating risk of production and marketing docking. On the whole, if production and circulation can not generate scale benefit, the income of production and marketing docking will not be guaranteed or even lower than the income in traditional circulation mode^[16].

4 Policy recommendations for optimizing vegetable circulation system of Hebei Province

At present, the vegetable operating pattern of coexistence of several economic sectors, many types of circulation channels and multiple management styles greatly invigorates vegetable circulation field and increases vegetable circulation efficiency. Even there is level difference in circulation efficiency of different circulation modes, the overall efficiency can be improved. Therefore, the optimization of vegetable circulation system in Hebei Province can be started from confirming functions and efficiency of different modes, and it is recommended to study the vegetable circulation mode from two levels (operation and system guarantee) and two approaches (reducing links and cutting down costs)^[17].

4.1 Directly and indirectly reducing circulation links and cutting down circulation costs at operation level

4.1.1 Making scientific planning of industrial distribution to reduce costs and losses. Through making a unified planning for vegetable industry in Hebei Province, it is recommended to shorten circulation links and reduce transportation cost. Firstly, Hebei Province should make effort to increase urban vegetable self-sufficiency within the province. For example, it urban areas can buy vegetable directly from suburban vegetable production areas. Besides, Hebei Province can bring into play advantages around Beijing and Tianjin, and establish fixed vegetable supply bases in surrounding areas to realize directed marketing and reduce middle links.

4.1.2 Increasing the proportion of direct sales of vegetable, to promote production and marketing docking. Direct sales of vegetable is the most efficient mode for reducing circulation links. It is required to energetically develop "farming supermarket", "farming community", and "farming standard" docking modes. In vegetable production source, it is required to establish new agricultural operation system, combine with land circulation, and develop order production with large specialized farmers and family farms. In sales link, it is recommended to promote three direct sales modes: farm field to community buildings, farm to standard vegetable market, and field to supermarket. As a definite market entity, supermarket can effectively monitor production and sales and supply high quality vegetable. This is an inevitable development trend of vegetable retailing terminal. In addition, supermarket is mainly operating in the province and has in-depth understanding of production characteristics of agricultural products, has advantage in purchase channel, and can effectively reduce transaction costs

in information, monitoring, and implementation. Therefore, Hebei Province should mainly develop farming supermarket docking, promote proficient use of production and marketing docking, and increase proportion of vegetable sales in supermarket^[18].

4.1.3 Upgrading and transforming wholesale market and coordinating production docking. It is required to stick to demand oriented and explore the direct production and marketing docking mode with wholesale market as the core. At present, most vegetable wholesale markets in Hebei Province are simple in functions, mainly provide places and simple services, lack inspection, packaging, fresh keeping, and delivery functions, only have transaction and settlement functions. It is recommended to study and explore transformation and upgrade mode of wholesale markets, regulate operation order, promote transformation of wholesale markets from primary markets to middle and high grade markets, bring into play functions of information center, organization and production, and coordination docking, and promote wholesale market and surrounding vegetable production and supply bases and retailers to establish stable docking relation, to promote integrated industrial chain and reduce circulation costs^[9].

4.1.4 Cultivating e-commerce channel and promoting sales of fine vegetable products. Vigorous development of e-commerce provides new technical means and development opportunity for vegetable circulation. Sales of vegetable with the aid of e-commerce channel has strong information interaction, few sales links, and excellent product promotion effect, so it can satisfy individualized demands of consumers and greatly reduce costs in vegetable circulation links. At present, network marketing is widely accepted by agricultural product producers and operators, and e-commerce channel will be an essential mode of future vegetable circulation. It is recommended to bring into full play guidance role of government, cultivate e-commerce based operating entities, sell common vegetables to consumers within Hebei Province, and promote characteristic products of Hebei Province, especially sales of GI products of Hebei Province outside of Hebei Province.

4.2 Bringing into play supervision function of government and compressing the costs of circulation links at institutional guarantee level

4.2.1 Strengthening infrastructure construction and setting up information platform. (i) Transformation and upgrade of agricultural product market system. As urban-rural public auxiliary facilities, agricultural product markets are the most fundamental places to guarantee people's livelihood. It is recommended to make scientific planning for agricultural product market of production and marketing places, to establish a market system consisting of production and marketing place wholesale market, local market, and farmers' market with mutual cooperation and reasonable distribution. (ii) Implementation of transformation and construction of farmers' market. Farmers' markets already built should complete transformation and upgrade as per planning and standard of standardized farmers' market, farmers' markets to be built should set up pilot points with reference to operating pattern and concept con-

struction of supermarket, change original stall leasing form, and develop towards direct sales vegetable shops at par and supermarket-like farmers' markets. (iii) Construction of information platform. The information flow is an essential part of vegetable circulation. The actual situation is: information is disorderly and lacks accuracy, timeliness and authoritativeness. The construction of information platform should have government guidance, explore and set up unified, high efficient, and authoritative integrated vegetable information platform, consolidate planting, sales, logistics, and transportation information, and explore and introduce auction transaction and electronic transaction functions^[20].

4.2.2 Strengthening main channel function and promoting public welfare of wholesale market. Externality is a feature of vegetable circulation. Most developed countries with high circulation efficiency take wholesale market of agricultural products as public welfare circulation infrastructure, while many domestic wholesale markets are mainly private markets and shareholding markets, few wholesale markets are government guided. As a market circulation carrier, wholesale market possesses pricing power. Therefore, it is recommended to make wholesale market return to public welfare, bring into play regulation function of government, make comprehensive evaluation of market operation situation and investment costs, reduce market access charges, stall charges, and management expenses, and reduce factors leading to vegetable price rise^[21].

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2013, the purchase price of middle-season or late indica rice per 50 kg was 135 yuan, then $P_y = 27000$ yuan/ 10^4 kg. By putting it into the above formula, $0.106/x = 4812/27000$, $x = 0.6$ ha, namely the moderate scale land operating area per worker is 0.6 ha. According to Table 1, the average annual total number of effective labor forces per family farm is 9.5, then the moderate scale of family farm is $0.6 \times 9.5 = 5.7$ ha.

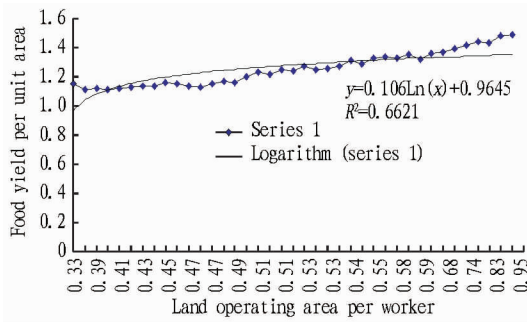


Fig.1 Trend line and function diagram of survey value

4 Conclusions and recommendations

4.1 Conclusions With Guigang City in Guangxi as a point for the study, from the perspective of maximizing income of rural households, this paper uses production function model and marginal balance principle to calculate the moderate scale of food-production-based family farm at 5.7 ha, that is, under current economic and technological conditions, 5.7 ha of land operating scale can create the best economic efficiency. At present, most of the family farms in Guangxi have not yet reached this "moderate scale". Guangxi's current land transfer rate is only 7.2%, 10.6 percent points lower than the national level, and it is the most critical factor that hampers the large-scale development of Guangxi's family farms. It should be noted that China's current moderate operation scale of family farms is much smaller than the operation scale in the United States and Europe. Since the moderate scale operation of land is relative and dynamic, and its size is determined by a number of variables^[3]. Overall, the moderate scale

land operation of family farm will gradually expand with the development of social productivity.

4.2 Recommendations (i) It is necessary to improve the rural land transfer mechanism, and actively guide the transfer of contracted land to family farms; improve land transfer information exchange mechanism, build land transfer policy consultation mechanism, and perfect land transfer price assessment mechanism; ensure orderliness and high efficiency of land transfer, and monitor the transferred land and use effect^[4]. (ii) It is necessary to steadily promote urbanization, accelerate the transfer of rural labor to non-agricultural industries, and free more land to lay the foundation for the development of large-scale family farms. (iii) It is necessary to establish a sound social security mechanism, and make migrant workers become urban citizens; reform the current social security system (including health care, pension and housing) which is in favor of urban residents while ignoring migrant workers; abolish the exclusionary laws and regulations on education, employment and identity for migrant workers, so that they can enjoy the same treatment as urban residents^[5] and the transfer of land is substantially promoted.

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