Selection of Regional Leading Industry Based on Comparative Advantage——A Case of Xiqing District, Tianjin City, China

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Abstract Development status of agricultural industry in Xiqing District of Tianjin City in China is introduced. The intensive level of agriculture is relatively high in this region; the new-type agriculture develops rapidly; and the sales income of agricultural byproducts is the main source of household income. Based on the principles of market potential, production resources intensity, and associated promotion, a total of 3 indices for measuring the comparative advantage are selected, which are comparative advantage index, scale advantage index, and comprehensive advantage index. Based on the data analysis, competitive industries in this region are determined. Result shows that economic crops and aquaculture industry have relatively great location quotient, but aquaculture is not suitable for Xiqing District, due to its natural condition, industrial tradition and bases, and output value. Therefore, economic crop is selected as the leading industry in Xiqing District.

Key words Agricultural advantage industry, Leading industry, Evaluation system, China

At present, Tianjin City is at the key period of adjusting structure and promoting development. As an important industry in Xiqing District of Tianjin City, agriculture determines the development trend of leading industry in future, having great significance to the industrial structure adjustment and farmers´ income increase during the Twelfth Five-Year Period. Based on the analysis on the agricultural development in Xiqing District of Tianjin City, an evaluation model of regional agricultural competitive industry is constructed. And agricultural competitive industry in Xiqing District of Tianjin City is selected and evaluated by using this theory, which provides policy guidance for the agricultural development.

1 Development status of agricultural industry in Xiqing District of Tianjin City

Agricultural crops in Xiqing District are mainly the grain crops, economic crops, fruit crops, poultry production industry and aquaculture industry. Among them, grain crops are mainly the corn, rice, and wheat; economic crops are vegetable, cotton and oil plants; forest fruits mainly refer to pear, apple, and grape; poultry production mainly includes the production of pork, beef, mutton, poultry and milk and egg products; and aquatic product mainly includes fish, shrimp and crab. In recent years, agricultural development in Xiqing District has mainly been reflected in the following aspects:

1.1 The relatively high intensive level of agriculture Agricultural industrialization develops rapidly in Xiqing District. At present, there are 36 trade markets, including 20 integrated markets and 16 specialized markets. Table 1 reports the status of agricultural intensive management in Xiqing District of Tianjin City.

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At present, there are 4 large-scale planting units with the overall planting area of 143 hectares, 241 large-scale management units of live pigs with overall 49 138 pigs in stock, and 10 large-scale management units of milk cow with overall 1 874 cows in stock. Thus, the large-scale management of agriculture has achieved an initial success. There are few agricultural leading enterprises in Xiqing District, but they have obtained considerable effects and earnings. Planting area, raising zone and large-scale management are effective measures to improve the agricultural benefits. At present, there are 36 agricultural production service cooperatives and 170 agricultural brokers, who have carried out a pioneering intensive development of agriculture. As the main management mode in implementing "leading enterprise + intermediary organization + peasant household" in future, the leading roles of agricultural specialized cooperatives, specialized markets and leading enterprises are fully exerted, which is an important force promoting the transfer from the interest combination form between industrialization organization and peasant households to the compact-type development.

1.2 The new-type agriculture develops rapidly There are 7 development modes of new-type modern agriculture, including agricultural sightseeing garden, industrialized agriculture, green agriculture, export agriculture, seed production agriculture, order agriculture and special cultivation agriculture. At present, Xiqing District has four types of new-type agriculture with large scale, and their planting area and income are shown in Fig. 1.

Fig. 1 illustrates that facility agriculture develops rapidly in Xiqing District of Tianjin City. At present, there are 767 hectares greenhouse, 1 168 hectares plastic greenhouse, and 44 hectares facility cultivation. Thus, facility agriculture begins to take shape in Xiqing District. At the same time, green agriculture also plays an important role in this district. Planting area of green crops is 993 hectares, among which, vegetable planting area is 801 hectares, accounting for more than 80%. Sight-

seeing agriculture garden and special cultivation have relatively slow development.

1.3 The sales income of agricultural byproducts: the main source of household income The main source of household income in Xiqing District is the wage income of agriculture and related service industries. Table 2 reports the operating income of rural household in Xiqing District of Tianjin City.

Table 2 reports that sales income of cotton, vegetable and other agricultural products play a dominant role in agricultural income, and is the main source of household income. Sales income of vegetable and other agricultural byproducts is the main source of property income. Economic crops play an important role in the income of farmers. And poultry, forest fruit and aquaculture are the important channel of the income increase of farmers.

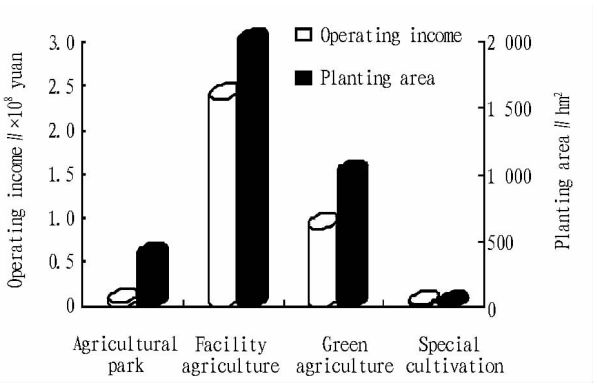

Fig.1 Comparison of the operating income and planting area of characteristic agriculture in Xiqing District of Tianjin City

Table 1 Status of agricultural intensive management in Xiqing District of Tianjin City

Intensive type	Number of units	Peasant households	Planting area // hm^2	Gross operating revenue // $\times 10^4$ yuan
Agricultural enterprises	7	2 950	–	7 281
Agricultural products processing enterprises	1	10	–	48
Planting area	5	1 020	223	920
Animal raising zone	5	636	359	5 065

Table 2 Composition of operating income of rural household in Xiqing District of Tianjin City

Composition of income	Area // hm^2	Total output // t	Income // $\times 10^4$ yuan
Grain	6 320	34 261.00	4 619.38
Cotton	4 073	4 316.00	12 948.00
Vegetable	9 557	371 173.00	44 682.62
Forest fruit	802	6 897.41	124.00
Poultry	–	22 559.00	7 486.00
Aquaculture	5 069	49 554.00	11 687.00

2 Selection of the agricultural leading industry of Xiqing District

Leading industry accounts for a relatively great proportion in the industrial structure in a certain region, and has relatively strong promoting effect in regional industrial structure and the overall regional economic development. Leading industry reflects the evolvement direction of industrial structure and can be cultivated into the main industry or emerging industry[1].

2.1 Selection principles of agricultural leading industry The selection of agricultural leading industry should follow three basic principles. The first is the intensity principle of production resources, which pays attention to exert the local resources advantages, reduces the duplicate of regional leading industry, and promotes the regional division of work and the specialized industrial structure. The second is the principle of market potential. Products with large market demand and broad prospects can be the objects selected by leading industry. The third is the principle of associated promotion. Development of a certain industry can promote the improvement of related industries and can strongly stimulate other industries in this region.

2.2 Selection methods of agricultural leading industry The fundamental line for the selection of agricultural leading industry is to use the theory of location quotient firstly. Preliminary screening of regional advantage industry is carried out. Then, according to the screening principle of leading industry, the index system is established in order to further verify the leading industry of this region[2].

Comprehensive comparative advantage index method is adopted in preliminary screening. This method takes crop unit yield and planting scale as the regional crops comparative advantage to measure the key factor of index. Three comparative advantage measurement indices are established, such as comparative advantage index, scale advantage index and comprehensive advantages index. And the regional advantage industry is determined by data analysis.

2.2.1 Comparative advantage index. Comparative advantage index refers to the ratio of the output value proportion of a given regional department to the proportion of the department output values of the whole city in the overall output value of the whole city. Its equation is

$$Q_1 = (Y_{ij}/Y_i)/(Y_j/Y)$$

where Y_{ij} is the output value of department j in region i; Y_i is the department output value of region i, Y_j is the output value of a given department in background region, Y is all the department output value of background region.

$Q_1 > 1$ indicates that a given agricultural product has comparative advantage in this city. $Q_1 = 1$ shows that a given agricultural product is equal to the regional average level of the city. $Q_1 < 1$ indicates that a given agricultural product has comparative disadvantage in this city.

2.2.2 Scale advantage index. Scale comparative advantage index of a certain agricultural product refers to the ratio of the proportion of sowing area of the product in the overall sowing area of regional crops to the proportion of the sowing area of the product in the whole city. Its equation is

$$Q_2 = (S_{ij}/S_i)/(S_j/S)$$

where S_{ij} is the sowing area of agricultural product j in region i,

S_i is the overall sowing area of agricultural products in region i, S_j is the overall sowing area of agricultural product j in the whole city, S is the overall sowing area of crops in the city. $Q_2 > 1$ indicates that the production of the agricultural product has certain specialization in the city. $Q_2 = 1$ shows that the comparative advantage of a certain agricultural product in the region is equal to the average level of the whole city. $Q_2 < 1$ shows that a certain agricultural product in the region has comparative disadvantage in output in the whole city.

2.2.3 Comprehensive comparative advantage index. Comprehensive comparative advantage index of a certain agricultural product in a city refers to the geometric mean of the comparative advantage index and scale comparative advantage index of grain crops output. Its equation is

$$Q = (Q_1 \times Q_2)^{1/2}$$

Higher Q value indicates greater industrial concentration degree and corresponding significant advantages.

2.3 Establishment of the evaluation index system of leading industry Regional advantage industry is determined according to the industrial structure and basic evaluation index. Based on the influencing factors of advantage industry and the three principles of advantage industry, complement factor index for evaluating the leading industry is utilized. Then, according to the resource endowments, natural conditions, social and economic support conditions, industrial efficiency and other supplementary conditions of advantage industry, the major influencing factor indices system formed by agricultural advantage industry are established.

Table 3 Major influencing factor indices affecting the formation of advantage industry

Type	Influencing factor	Concrete contents
Conditional factors	Natural resources and ecological environment supporting force	Suitability of land resources
		Supply capacity and quality of water resources
		Condition of ecological environment
	Industrial base and tradition	Current status of industrial structure:
		Industrial mechanism, products structure, quality structure
		Specialization, integration of large scale of industry
		Traditional planting (cultivating) habit
	Market and geographic conditions	Distance from consumption center
		Market capacity of products
		Market share of target market
		Brand influence
	Technical support capabilities	Technical service system
		Power and capacity of the manager to accept the skills
	Stock of capital and the ability of agricultural supply	Capital input in agriculture
		Agricultural credit conditions
		Stock of human capital: entrepreneur, able person and broker
	Policy, institutional and industrial organization	Government policy and institution
		Policy and system performance status
		Peasants organization degree
		Industrialization management level
Market factors	Industrial efficiency and effectiveness	Quality level
		Brand
		Cost and price
		Production efficiency
		Agricultural net income level
		Opportunity cost and income expectation of the operators of agricultural production

2.4 Selection of agricultural leading industry in Xiqing District According to the data in 2008 *Tianjin Statistical Yearbook*[3], agricultural comprehensive comparative advantage index in Xiqing District of Tianjin City is calculated (Table 4).

Table 4 Comprehensive comparative advantage index of agriculture in Xiqing District of Tianjin City

Industry	Comparative advantage index	Scale advantage index	Comprehensive comparative advantage index
Grain crops	0.266 610	0.406 815	0.329 000
Economic crops	1.364 861	1.964 343	1.637 000
Forest fruit	0.054 522	0.448 780	0.156 000
Animal husbandry	0.792 448	0.792 448	0.792 448
Aquaculture industry	1.731 898	2.346 571	2.016 000

Table 4 shows that there are relatively great location quotient between economic crops and aquaculture industry. However, aquaculture is not appropriate in Xiqing district due to the natural conditions, industrial tradition and basis and output value. Thus, economic crop is selected as the leading industry in Xiqing District.

3 Conclusion and suggestion

Based on the introduction of the agricultural development status of Xiqing District of Tianjin City, location quotient theory is used to select the leading industry in Xiqing District. The industrial development strategy taking economic crops as the leading industry is further confirmed by supplementary index system, which lays a good foundation for the expansion of agricultural value-added path.

Economic crops in Xiqing District mainly include vegetable, cotton and oil. From the perspective of the ecological environment, Xiqing District has flat land and abundant water resources, which are suitable for agricultural production. Vegetable is in an absolutely dominant position in Xiqing District in both output value and planting area. As for the industrial tradition,

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Continued (Table 5)

Evaluation basis	Second-level index (weight)	Third-level index (weight)	Excellent	Good	General	Mark
		W_4: Supervise fund-raising, charging professional cooperative economic organizations, financial subsidy for farmers and subsidy for village (20%)	20	16	12	
		W_5: Prohibit rural organizations to set up charge items, or adopt illegal ways to restrict farmers, and to transfer fund gap to famers and rural organizations (15%)	15	12	9	
		W_6: Normalization and systemization of rural financial supervision (15%)	15	12	9	

Note: The total mark of this type Y_6 and evaluation grades are classified as "Excellent", "Good" and "General".

3 Blending method of rural comprehensive reform evaluation system

As for blending of overall index system, according to the importance and difficulty of reform, we stipulate 6 first-level index weight respectively as follows: the first item of "change town governmental function" and the sixth item of "strengthen matching reform measures" are 20% respectively; the second item and the fourth item both belong to three main aspects of new round of rural comprehensive reform, accounting for 15% weight respectively; the fifth item of "perfect rural basic public service system" likewise is stipulated as 15% weight, thus the calculation formula of total mark (Y) is: $Y = Y_1 * 20\% + Y_2 * 15\% + Y_3 * 15\% + Y_4 * 15\% + Y_5 * 15\% + Y_6 * 20\%$ (7)

As for the evaluation method of overall effect of rural comprehensive reform, we summarize the mark of foregoing 6 first-level index evaluation items. If the final total mark of comprehensive reform in one region is more than 90, then the region can be evaluated as "excellent", indicating that the effect of reform is marvelous and the reform experience is further popularized and promoted within and without province; if the total mark of comprehensive reform in one region is below 90 but above 75, then the region can be evaluated as "good", indicating that the reform has achieved certain results, but it needs to conduct increasing optimization and upgrade of reform policies; if the total mark of comprehensive reform in one region is below 75, then the region can be evaluated as "general", indicating that the overall effect of reform is not good, yet to be improved in terms of policy implementation and propulsion degree.

All in all, by the quantified disposal on 6 first-level indices, 23 second-level indices and 106 third-level indices, we construct index system which can not only test the effect of one item of reform (like rural compulsory education), but also conduct overall evaluation on effect of comprehensive reform. Along with the further promotion and implementation of comprehensive reform across China, it is necessary to establish scientific and rational quantified evaluation model. The evaluation system designed by us is a try, and the practical effect certainly needs to be further tested and optimized in the process of reform according to the characteristics of different regions.

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Xiqing District supplies vegetables for Tianjin City, such as the "Tianjin Celery Cabbage", "Shawo Green Turnip" and other high quality well-known goods, and has developed green agriculture and facility agriculture. At the same time, Xiqing District is in the suburbs of Tianjin City, having convenient traffic network. The Tianjin Hongqi Farm Market in the suburbs is a major wholesale market of agricultural products, which radiates the whole city of Tianjin. In recent years, with the implementation of various preferential agricultural policies, Xiqing District accelerates the development of agricultural modernization, transforms from decentralized agriculture to intensive agriculture and modern agriculture, relies on Tianjin Academy of Agricultural Sciences, Tianjin Agricultural University and other research institutions, improves the level of agricultural industrialization, and promotes the new varieties. In future, we should take vegetable as the leading industry and value-added chain center of Xiqing District, optimize the regional distribution, promote the standardization production, accelerate the science and technology promotion and innovation, improve the market system, expand the value chain of main products, and create conditions for the income increase of farmers.

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