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Empirical Analysis on Dominant Agriculture in Agricultural Districts and Counties of Tianjin

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Abstract At present, developing the dominant agriculture plays an essential role in promoting the agricultural modernization of Tianjin. Based on the theory of location quotient, this paper made a quantitative analysis of the dominant agriculture in the agricultural districts and counties of Tianjin. According to the analysis, it made a qualitative analysis of the factors. Finally, it determined the dominant agriculture of each agricultural district and county of Tianjin.

Key words Agricultural districts and counties, Dominant agriculture, Empirical analysis, Tianjin

1 Significance of developing the dominant agriculture of Tianjin

At present, developing the dominant agriculture plays an essential role in promoting the agricultural modernization of Tianjin. (i) The determination of dominant agriculture comprehensively considers the regional resource endowment and market demands. Thus, developing the dominant agriculture is favorable for realizing reasonable and effective allocation of agricultural resources, transformation of agricultural economic growth power to market driven power, really liberating and developing rural social productive forces, and enhancing the development strength of agriculture. (ii) Developing the dominant agriculture is favorable for changing the waste of resources brought about by extensive economic growth, favorable for protecting, developing and using agricultural resources of Tianjin, increasing the utilization rate of agricultural resources, and realizing sustainable development of agriculture in Tianjin. (iii) Through the effective absorption of new technological achievements, the dominant agriculture can extend to processing and sales of agricultural products, develop jointly with other related industries, create new growth point for regional economic development, expand internal employment capacity of the agriculture, increase income of rural residents, and strengthen the pulling of rural consumption for economic growth.

2 Necessary conditions for development of dominant agriculture

The dominant agriculture should be the agriculture that takes a large portion in agricultural structure of a certain region and can be developed into the agriculture driving regional economic development. The dominant agriculture of a certain region represents the evolution direction of agricultural structure of the region.

Through the effective absorption of new technological achievements, the dominant agriculture can extend to processing and sales of agricultural products, and obtain new production function. The dominant agriculture of a certain region should have following conditions. Firstly, the dominant agriculture should fully reflect the regional resource endowment, avoid or reduce the similarities with dominant agriculture of other regions, to achieve regional division of labor and specialized agricultural production. Secondly, the dominant agriculture should have high market demands and high elasticity of price demands of its agricultural products or income demands. Thirdly, the dominant agriculture should connect with other industries in the input and output, to realize coordinated development with other industries in the region.

3 Quantitative analysis on dominant agriculture in agricultural districts and counties of Tianjin

Based on the theory of location quotient, we analyzed the dominant agriculture in agricultural districts and counties of Tianjin taking the comprehensive comparative advantage index as the basis. The dominant agriculture of a region is the result of many factors such as natural resources endowment, labor resource status, socio-economic environment, location condition, agricultural technology level, planting system, and market demands. The level of yield of a certain agricultural product in a region is a comprehensive reflection of the local natural resource endowment, the level of input of various factors and the scientific and technological progress, while the production scale is the comprehensive reflection of natural resource endowment, input ability of various factors, market demands, planting system and macro-economic policy guidance. When determining the comprehensive comparative advantage index, we took the yield level and the production scale as the basis.

The comprehensive comparative advantage index Q of a certain agricultural product in an agricultural district (county) is calculated by following formula:

$$Q = \sqrt{Q_1 \times Q_2}$$

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

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

The comparative advantage index Q_1 is the ratio of the output value of a certain agricultural product in an agricultural district (county) to the total output value of all the agricultural products in the district (county) and the ratio of the total output value of the agricultural product in the agricultural district (county) to the total output value of all the agricultural products in the city. In the formula, Y_{ij} denotes the output value of the j -th agricultural product in the i -th agricultural district (county); Y_i denotes the total output value of all agricultural products in the i -th agricultural district (county); Y_j denotes the total output value of the j -th agricultural product in all agricultural districts (counties) of the city; Y denotes the total output value of all agricultural products in the city.

The scale advantage index Q_2 is the ratio of the sown area of a certain agricultural product in an agricultural district (county)

to the total sown area of all the agricultural products in the district (county) and the ratio of the total sown area of the agricultural product in the agricultural district (county) to the total sown area of all the agricultural products in the city. In the formula, S_{ij} denotes the sown area of the j -th agricultural product in the i -th agricultural district (county); S_i denotes the total sown area of all agricultural products in the i -th agricultural district (county); S_j denotes the total sown area of the j -th agricultural product in all agricultural districts (counties) of the city; S denotes the total sown area of all agricultural products in the city.

The higher the Q value, the more obvious the comparative advantage of the agricultural product in the agricultural district (county). According to the basic situation of agricultural production in Tianjin agricultural district (counties), the comprehensive comparative advantage index of the main agricultural products in each agricultural district (county) of Tianjin is shown in Table 1.

Table 1 Comprehensive comparative advantage index of the main agricultural products in each agricultural district (county) of Tianjin

Industry District (county)	Grain crops	Cash crops	Forest and fruit crops	Animal husbandry	Aquaculture
Xiqing District	0.3293	1.6374	0.1564	0.8902	2.0160
Jinnan District	0.6543	0.7972	0.2457	0.9738	2.7688
Beichen District	0.6439	1.6937	0.9215	0.6372	0.8716
Dongli District	0.2338	1.6898	0.8334	0.6515	1.8917
Tanggu District	0.1370	1.2532	0.4639	0.7259	5.7541
Hangu District	0.1984	0.5105	5.6750	0.4862	3.7458
Dagang District	1.3165	0.3968	0.2412	0.8960	2.3684
Jinghai District	1.1790	1.1596	1.1847	0.6636	0.4536
Wuqing District	1.2054	0.5940	0.3014	0.4098	0.5052
Baodi District	1.7237	0.4387	0.3085	0.7551	0.4852
Ji County	1.9715	0.4963	1.3379	0.6667	0.3670
Ninghe County	0.5775	1.4527	0.9018	0.9420	0.7558

4 Comprehensive analysis on dominant agriculture in agricultural districts and counties of Tianjin

4.1 Selection of dominant agriculture in Xiqing District

According to the comprehensive comparative advantage index, the agriculture of Xiqing District with obvious advantages is the cash crop and aquaculture. According to the natural resources and the agricultural production tradition of Xiqing District, it is not suitable to take the aquaculture as the dominant agriculture of Xiqing District. The cash crops of Xiqing District mainly include vegetable, cotton, and oil crops. From the perspective of natural resources and ecological environment, Xiqing District has flat land and rich water resources, suitable for the development of crop production; from the perspective of production and planting scale, vegetable cultivation in Xiqing District takes an absolute dominant position in the agricultural production; From the perspective of agricultural production tradition, Xiqing District has been a vegetable basket of Tianjin, for example, Tianjin Cabbage and Shawo Turnip are famous throughout the country, and facility agriculture and green agriculture are relatively developed. From the perspective of location conditions, Xiqing District is located in in Tianjin suburb and has convenient transportation. Tianjin Hongqi farm

market is the most important wholesale market of agricultural products in Tianjin, agricultural products are radiated to all areas of Tianjin through this platform. In recent years, with the implementation of various preferential agricultural policies of the government, Xiqing District gives full play to the driving role of leading enterprises, farmer professional cooperatives and professional market. Besides, relying on Tianjin Academy of Agricultural Sciences and Tianjin Agricultural universities and other scientific research institutions, the level of agricultural industrialization has been improving. Therefore, Xiqing District should take the production of cash crops as its dominant agriculture.

4.2 Selection of dominant agriculture in Jinnan District

According to the comprehensive comparative advantage index, the agriculture of Jinnan District with obvious advantages is the aquaculture. From the perspective of natural resources and agricultural production tradition, Jinnan District mainly relies on fishing and farming, and the current breeding of new, special and excellent aquatic species has also been introduced into Jinnan National Agricultural Science and Technology Demonstration Zone. From the perspective of location conditions, Jinnan District in Tianjin suburb and has convenient transportation, which is favorable for at-

tracting science and technology enterprises to invest and build factories in the park. At the same time, relying on the construction of Haihe Education Park, through the combination of industries, universities, and research institutions, the transformation of scientific and technological achievements is conducive to the introduction of new varieties, and favorable for raising the overall scientific and technological strength of the aquaculture industry in Jinnan District. Therefore, Jinnan District should take the aquaculture industry as its dominant agriculture. In addition, Jinnan District also has a famous agricultural product "Xiaozhan Rice" production tradition. The comprehensive comparative advantage index of grain crops in Jinnan District is 0.6543, the advantage is not obvious. However, relying on the agricultural brand of "Xiaozhan Rice", Jinnan District should take the production of "Xiaozhan Rice" as its dominant agriculture.

4.3 Selection of dominant agriculture in Beichen District

According to the comprehensive comparative advantage index, the agriculture of Beichen District with obvious advantages is the cash crops. From the perspective of natural resources and ecological environment in Beichen District, the area is small, the land resources are scarce, and the natural resource endowment is lacking in general. Therefore, It is suitable for the development of characteristic agriculture which saves both water and farmland. Besides, with the constant development of suburban industrialization, agricultural land is declining; from the perspective of production and planting scale, the planting of cash crops and vegetables in Beichen District has obvious advantages in agricultural production; from the perspective of agricultural production tradition, the "vegetable basket project" started earlier in Beichen District, and the corresponding production base construction has a certain basis, and facility agriculture is relatively developed; from the perspective of location conditions, Beichen District belongs to the four districts around Tianjin, has convenient transportation, and its agricultural products can radiate towards the whole Tianjin City. In recent years, with the implementation of various preferential policies of government, Beichen District has introduced a large number of food and beverage processing enterprises, which create favorable conditions for the development of cash crops and forest and fruit crops of Beichen District. According to the comprehensive comparative advantage index, Beichen District should take the forest and fruit crop production as the second dominant agriculture. Therefore, Beichen District should take the production of cash crops, vegetable, and forest and fruit crops as its dominant agriculture.

4.4 Selection of dominant agriculture in Dongli District

According to the comprehensive comparative advantage index, the agriculture of Dongli District with obvious advantages is the cash crop and aquaculture. According to the natural resources and the agricultural production tradition of Dongli District, it is not suitable to take the aquaculture as the dominant agriculture of Dongli District. From the perspective of natural resources and ecological environment in Dongli District, the area is small. It belongs to a typical hinterland. In the agricultural development, it is appropriate to adhere to the principle combining ecology and benefit, and to carry out characteristic agricultural production on limited land. From the traditional point of view of agricultural production, Dong-

li District has established four types of characteristics agriculture, namely, flowers, edible fungi, livestock and poultry, and ornamental fishes. From the perspective of production and planting scale, the planting of cash crops and vegetables has obvious advantage in agricultural production of Dongli District. From the perspective of location conditions, Dongli District is situated in Tianjin suburb, closely attached to the Tianjin Binhai Hi-Tech Industrial Development Area, has convenient transportation and developed modern logistics industry. In recent years, under the initiative of the government, Dongli District Agricultural Science and Technology Park has developed rapidly, it has introduced a large number of agricultural product processing enterprises, has established the road of earning foreign exchanges through vegetables and flowers, which creates excellent conditions for development of agricultural production such as vegetables and flowers in Dongli District. Therefore, Dongli District should take the characteristic cash crop as its dominant agriculture.

4.5 Selection of dominant agriculture in Tanggu District

According to the comprehensive comparative advantage index, the agriculture of Tanggu District with obvious advantages is the cash crop and aquaculture. However, Tanggu District is located in the core area of Tianjin Binhai Hi-Tech Industrial Development Area, the land resource is scarce and the salinization is serious, agricultural scale is small, so the cash crops are not suitable for being taken as the dominant agriculture of Tanggu District. Located in the coast of Bohai Sea, Tanggu District has the advantages of the coast and its agriculture reflects the characteristics of urban agriculture and fisheries. Tanggu District has a developed industrial base. Through giving full play to the advantages of large cities and small rural areas, it can vigorously promote the factory-based and facility-based development of aquaculture industry, promote the development of coastal leisure tourism, so as drive upgrading and development of the agriculture in Tanggu District. Therefore, Tanggu District should take the aquaculture industry with leisure and sightseeing function as its dominant agriculture.

4.6 Selection of dominant agriculture in Hangu District

According to the comprehensive comparative advantage index, the agriculture of Hangu District with obvious advantages is the forest and fruit crops and aquaculture. From the perspective of natural resources and ecological environment, Hangu District is close to the coast and suitable for the development of aquaculture. Besides, Chadian Town of Hangu District is also the estuary of Jiyun River, the soil, light, heat and other natural conditions are very suitable for the cultivation and growth of Muscat grapes; from the traditional point of view of agricultural production, Hangu District is reputed as the "home of Chinese Muscat grape", and the Yangjiapo aquatic products are also famous in the whole country; from the location point of view, Hangu District is the connection between Tianjin Binhai Hi-Tech Industrial Development Area and Beijing Tianjin and Hebei economic circle. Relying on such advantages, Hangu District can build the grape picking and fishery sightseeing tourism, to build Hangu District into a characteristic agricultural ecological tourism district. In recent years, under the advocacy of the government, relying on the Science and Technology Parks, Hangu District constantly enhances the technological in-

novation capacity of the grape industry and the aquaculture technology level. Therefore, Hangu District should take the forest and fruit crop and aquaculture industry with leisure and sightseeing function as its dominant agriculture.

4.7 Selection of dominant agriculture in Dagang District

According to the comprehensive comparative advantage index, the agriculture of Dagang District with obvious advantages is the grain crop and aquaculture. From the point of view of natural resources and ecological environment, the land of Dagang District is formed by sea retreat and river alluvial, the phenomenon of land salinization is serious, the soil texture is sticky and the soil structure is poor, so the grain crops are not suitable for the dominant agriculture in Dagang District. Adjacent to Bohai Bay, Dagang District has coastal advantages. It is an inevitable choice for Dagang District to vigorously develop aquaculture and strengthen the status of aquaculture in agriculture. Therefore, Dagang District should take the aquaculture industry as its dominant agriculture.

4.8 Selection of dominant agriculture in Jinghai County

According to the comprehensive comparative advantage index, the agriculture of Jinghai County with obvious advantages is the grain crops, cash crops and forest and fruit crops. From the point of view of natural resources and ecological environment, Jinghai County is a retreat land, the soil has serious problem of salinization, water and soil resources are poor, not suitable for field crop production, but suitable for the development of drought-resistant, salt-resistant forest and fruit crops and cash crops; from the perspective of agricultural production tradition, through vigorously developing forestry and taking use of forest resources advantages, Jinghai County has established characteristic agricultural sectors such as forest land edible fungi, forest land poultry and fruit, and developed facility agriculture. In recent years, under the initiative of the government, relying on the construction of agricultural demonstration park, Jinghai County continuously improves the development level of under-forest economy and facility agriculture. Therefore, Jinghai County should take the characteristic cash crop and under-forest economy as its dominant agriculture.

4.9 Selection of dominant agriculture in Wuqing District

According to the comprehensive comparative advantage index, the agriculture of Wuqing District with obvious advantages is the grain crops. From the perspective of natural resources and ecological environment, Wuqing District is located in the plain area and has fertile land, thus it is suitable for grain crop production; from the perspective of agricultural production tradition, the farming of Wuqing District takes up an important position in its agricultural production, and grain is its most important crop. In addition, in grain crops of Wuqing District, maize and wheat have obvious advantages. In recent years, with the implementation of various preferential policies of government, Wuqing District has brought into full play the leading role of leading enterprises and farmers' professional cooperatives, and has promoted the introduction and development of new agricultural varieties and promoted agricultural efficiency and development by relying on the construction of agricultural demonstration parks, and also increased farmers' income. Therefore, Wuqing District should take the high quality grain crop as its dominant agriculture.

4.10 Selection of dominant agriculture in Baodi District

According to the comprehensive comparative advantage index, the agriculture of Baodi District with obvious advantages is the grain crops. From the perspective of natural resources and ecological environment, Baodi District is located in the plain area and the soil is fertile, suitable for agricultural production; from the perspective of agricultural production tradition, agriculture in Baodi District takes up an important position. In addition, Baodi District has obvious advantages in grain crops, wheat, and maize. In recent years, under the initiative of the government, Baodi District has a national wheat breeding base and maize breeding demonstration area, relying on scientific support of leading enterprises, bases, and parks, it is able to promote the adjustment of agricultural structure. Therefore, Baodi District should take the high quality grain crop as its dominant agriculture.

4.11 Selection of dominant agriculture in Ji County

According to the comprehensive comparative advantage index, the agriculture of Ji County with obvious advantages is the grain crops and forest and fruit crops. From the perspective of natural resources and ecological environment, Ji County is located in boundary of the northern mountain and plain area of Tianjin, the soil is fertile, and farming conditions are superior. The plain area is suitable for planting grain crops, the northern mountain is suitable for developing fresh fruits, green foods, and agricultural ecological tourism; from the perspective of agricultural production tradition, Ji County has obvious advantages in maize and wheat, and forest and fruit crops have higher reputation and competitive edges. In recent years, under the initiative of the government, Ji County, known as Back Garden of Tianjin, connects the tourism, planting and fruit production, thus should vigorously develop agricultural tourism. At present, Ji County has formed the agricultural development pattern of combination of ecological, social and economic benefits. Therefore, Ji County should take the grain crops and forest and fruit crops with sightseeing function as its dominant agriculture.

4.12 Selection of dominant agriculture in Ninghe County

According to the comprehensive comparative advantage index, Ninghe County has obvious advantages in cash crops, forest and fruit crops, animal husbandry, and aquaculture. From the perspective of agricultural production tradition, Ninghe County is a typical large agricultural county, and agricultural production function is outstanding. In recent years, under the initiative of the government, Ninghe County has formed the development pattern of vegetable in the east, grain in the west, aquaculture in the south, and animal husbandry in the north. Relying on leading enterprises and park construction, Ninghe County should make effort to build pollution-free agricultural products supply base such as vegetable, Xiaozhan Rice, dairy products, and meat products. Therefore, Ninghe County should take high-quality cash crops, fruit crops, animal husbandry, and aquaculture as its dominant agriculture.

5 Conclusions

Through the analysis of the dominant agriculture in each agricultural district (county) of Tianjin, we studied the land use from the

such as Xi'an, Shenyang, Beijing, Zhengzhou, Shanghai and Guangzhou, and distribute the navel orange to the cold storage in central cities, make full use of the cold chain transportation facilities and developed logistics system to achieve smooth flow of goods, fast and efficient logistics effect, and solve the problems of weak transportation capacity and many circulation links, and reduce the logistics time and save the costs.

3.3.2 Precisely positioning the market and doing a good brand promotion. Navel orange is a kind of domestic high-end fruit and consumer goods. City is the main consumer market. Therefore, it is recommended to take the city marketing as the main line, for example, in Beijing, Shanghai, Guangzhou, Shenzhen, and radiated market, expand market in Henan, Shandong, Shanxi, and Liaoning, also in Fujian, Guizhou, Hainan, and Yunnan, and avoid sweet orange production area in Hunan, Hubei, Sichuan, Chongqing, and Guangxi. The government should strengthen the brand promotion of Gannan navel orange, attach great importance to the role of public transport in brand media, and bring into play the propaganda role of daily necessities such as shopping bags, umbrellas, kettles and backpacks. Southeast Asia, Eastern Europe and other countries and regions are Gannan navel orange traditional export market, these markets still have further development space^[13], South Korea and Japan are two large markets to be explored. Government should raise the popularity of Gannan navel orange through various foreign media or sponsoring to hold international events in China.

3.3.3 Selling fruit by grades and beautifying the fruit packaging. It is recommended to follow the principle of developing fine fruit in developed cities and fruit supermarket, and selling popular fruit in small and medium-sized cities, supermarkets, stores, and sell Gannan navel orange by grades, to meet the requirements of different consumers. Besides, it is recommended to beautify Gannan navel orange sales packaging and improve product quality and image. For the high-end consumer groups, it is recommended to change the simple carton packaging of Gannan navel orange, popularize the use of the foam screen or take a single independent packaging; the external packaging should be diversified, try to use high-end packaging, for example, use traditional bamboo basket; for export of navel orange, it is recommended to use vacuum pack-

aging during the transport process, to ensure the quality of navel orange.

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social, economic and ecological perspectives, to make rational arrangement and use of natural resources, make a scientific planning for agricultural economic activities of Tianjin, to make the agricultural development of Tianjin reflect the harmony between man and nature and coordination between economic and social development, so as to realize sustainable development of the agriculture in Tianjin.

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