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Cluster Development of Zhengzhou Urban Agriculture Based on Diamond Model

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Abstract Based on basic theory of Diamond Model, this paper analyzes the competitive power of Zhengzhou urban agriculture from production factors, demand conditions, related and supporting industries, business strategies and structure, and horizontal competition. In line with these situations, it introduces that the cluster development is an effective approach to lifting competitive power of Zhengzhou urban agriculture. Finally, it presents following countermeasures and suggestions; optimize spatial distribution for cluster development of urban agriculture; cultivate leading enterprises and optimize organizational form of urban agriculture; energetically develop low-carbon agriculture to create favorable ecological environment for cluster development of urban agriculture.

Key words Urban agriculture, Cluster development, Diamond model, Zhengzhou City

Urban agriculture is the practice of cultivating, processing and distributing food in, or around, a village, town or city. It is a comprehensive regional economic concept. In essence, it is a well-developed agricultural form with combination of agricultural industrialization and rural industrialization and integration of agricultural modernization and rural urbanization in the course of gradual elimination of differences between urban and rural areas. The urban agriculture originated from cities or around cities of European developed countries, the United States, and Japan. At the beginning of the 1990s, Shanghai and Beijing firstly launched the practice of developing urban agriculture. In recent years, Zhengzhou urban agriculture shows a good momentum of rapid development, but the comprehensive competitive power is not enormous, so taking the road of cluster development is an inevitable choice for Zhengzhou urban agriculture. The industrial cluster is widespread in the course of industrialization, because industrial cluster can improve competitive edge of the industry. Agricultural industrial cluster can promote standardized production of urban agriculture through normative function of organizations, so as to make products and services within the cluster carried out in the same standard, and guarantee quality of products and services. With gradual expansion of influence power of industrial cluster, it will form regional brand, raise popularity of products and services, finally attract more enterprises and customers and improvement competitive edge of the industry. From the perspective of Michael Porter's Diamond Model, I analyzed necessity and effective approach of cluster development of Zhengzhou urban agriculture.

Michael Porter from Harvard Business School, the Diamond Model is a macroscopic tool for analyzing national and regional competitive power. The Diamond Model contains following basic elements: factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry^[1]. Besides, Porter included two variables (chance and government) into the Diamond Model system. The Diamond Model got its name just from the diamond form established by the above four elements and two variables (shown in Fig.1). The Diamond Model can be used to analyze why a certain industry in a country has higher competition strength. It is a two-way enhanced system, with each element interdependent on each other and forming a dynamic incentive and innovative competitive environment.

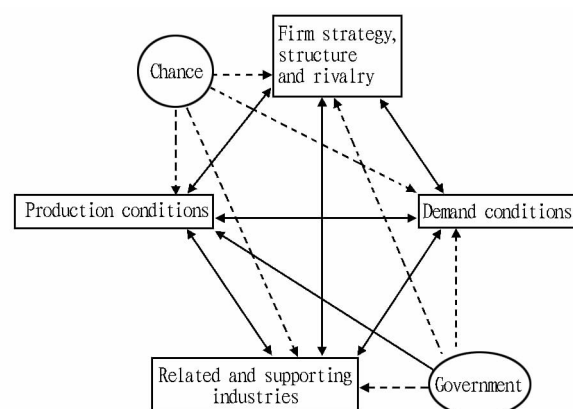


Fig.1 Diamond Model

1 General information of the Diamond Model

Introduced by famous strategic management expert Mi-

2 Analysis on competitive power of Zhengzhou urban agriculture based on four elements of Diamond Model

2.1 Production conditions Michael Porter divides elements into basic factors (primary factor) and higher level fac-

tors. The former includes natural resources, climate, geological location, and population, while the latter includes communication infrastructure, complex and skilled labor, scientific research facilities and specialized technical know-how. Specialized resources are often specific for an industry and important for its competitiveness. Basic factors can provide some initial advantages for a country and these advantages will be strengthened and expanded in higher level factors. In turn, disadvantages of basic factors will put pressure on investment in higher level factors^[1].

Basic factors of Zhengzhou urban agriculture have following advantages. Firstly, human resources and natural resources of urban agriculture. With the land generally sloping down from west to east, Zhengzhou is situated at the transitional zone between the mountainous areas of western Henan and Yellow River-Huaihe river plain. Zhengzhou experiences a monsoon climate of North Temperate Zone and is situated in the transition zone between south and north climate, so both south and north crops can be planted there, which is unparalleled in other provincial capitals. The city has an annual average temperature of 14.2 to 14.6°C. The frost-free period lasts on average 206 to 234 days. The annual precipitation is 599.6 to 707 mm, and there are about 2 400 hours of sunshine per year. The average total volume of water resources is 1.34 billion m³ with per capita water resource of 210 m³. 35 rivers flow through Zhengzhou City. These rivers belong to Yellow River system and Huaihe River system. About 150.4 km of Yellow River flows through Zhengzhou. The geological and natural conditions are favorable to growth of crops, so there is seldom serious drought and flood disaster. Watermelon, flower, Yellow River carp, Zhongmou garlic, Mixian County honeysuckle, Yellow River rice, lotus root leading industries not only have considerable scale, but also enjoy high reputation both at home and abroad. Zhengzhou City is rich in mineral resources. The coal reserve reaches 5 billion tons and ranks the first in Henan Province; reserve of refractory clay is about 100 million tones (accounting for 50% of that in Henan Province); bauxite reserve is also about 100 million tones (accounting for 30% of that in Henan Province). Zhongmou, Xinzheng and Xingyang are national important crop bases. These provide favorable conditions for development of Zhengzhou urban agriculture. In addition, situated in hinterland of China, Zhengzhou is a comprehensive hub of communication and transportation, and it is the third largest post and telecommunication hub in China (only second to Beijing and Shanghai). Furthermore, there are 3.06 million farmers in Zhengzhou, so the agricultural labor force is abundant. Disadvantages of basic factors include low resource utilization rate, great environmental pressure, and quality of urban agriculture should be improved from the scientific, technological and cultural quality of labor forces.

Higher level factors of Zhengzhou urban agriculture have following advantages: Zhengzhou is the economic, cultural, and sci-tech center in central plain, and advanced city of scientific and technological progress recognized by the State Ministry of Science and Technology; currently, there are over 200 sci-

entific research institutions, 180 000 specialized personnel, 10 national-level engineering research centers and key laboratories, 40 colleges and universities (with 570 000 students at schools), 11 postgraduate training organizations, and 126 secondary vocational technical schools (with 300 000 students at schools). Many agricultural colleges and universities and scientific research institutions, including Henan Academy of Agricultural Sciences, Henan Agricultural University, Zhengzhou Institute of Agriculture and Forestry Sciences, etc., provide powerful support for development of Zhengzhou urban agriculture. In addition, its economic development has entered into middle stage of industrialization, so the capability of industry nurturing agriculture is gradually being strengthened. There are also disadvantages, such as backward agricultural and rural infrastructure, low marketization of land circulation, low industrialized level of agriculture, as well as not close connection of production, teaching & research, leading to difficult conversion of quite a lot of sci-tech achievements into actual productivity.

2.2 Demand conditions The Diamond Model theory stresses the role of domestic demand in stimulating and enhancing the national competitive advantages. Generally, enterprises are sensitive to demand of closest customers, therefore, the characteristics of domestic demand play an extremely important role in building up characteristics of domestic products, conducting technical innovation and improving quality^[1]. In Zhengzhou City, there are 8.6 million permanent residents, and 4.042 rural people. According to statistics, the disposable income of citizens per capita reached 18 897 yuan in 2010, 10.4% over the previous year, 8257 yuan higher than the end of the Tenth Five-Year Plan period, with annual increase of 1651.4 yuan. In 2010, the total retail sales of consumer goods was up to 167.8 billion yuan, 19% over the previous year, and total import and export value reached 5.16 billion yuan, 43.3% over the previous year^[2]. With stable growth of salary, Zhengzhou citizens become more and more favoring high quality, healthy, and harmless green foods. The demands are steady on increase for amusement and recreation, health-care, rural sightseeing, and experiencing rural natural leisure.

2.3 Related and supporting industries Porter contended that, one internationally successful industry may lead to advantages in other related or supporting industries; competitive supplying industries will reinforce innovation and internationalization in industries at later stages in the value system, besides suppliers, related industries are of importance. Urban agriculture is a huge system, including production and processing of agricultural products, conversion of agricultural science and technology, development of agricultural tourism, and construction of agricultural ecology, etc. According to statistics, there are over 300 agricultural product wholesale markets and 12 large grain, vegetable, flower and fruit wholesale markets in Zhengzhou City, and the annual turnover reaches 18 billion yuan. Over 20 domestic and foreign banks have set up branches in Zhengzhou, the financial industry is very developed in this city. Zhengzhou Commodity Exchange (ZCE) is one of the three largest commodity exchanges in China and praised as the exchange with

the rapidest growth in the world. The forward price of wheat and cotton in ZCE has become guiding price of wheat and cotton price in China, and been incorporated into the global agricultural product price system. Sound market system provides a broad platform for developing urban agriculture. There are also disadvantages, such as the industrial chain of agriculture is not long; there are few famous brands; some urban agricultural parks are excessively commercial, artificial, or modern, so the ticket price is too high and exceeds consuming capacity of common citizens. To save costs, urban agricultural parks are careless and rough in management, consequently leading to serious plant diseases and insect pests, fallen leaves bestrewn on the ground, without person to manage, so it is hard to play exemplary role in developing modern agriculture^[3]. Zhengzhou urban agriculture is still at the stage of industrialized agriculture, which is a kind of high-carbon agriculture and threatens ecological environment. For example, use of pesticides damages species diversity, use of fertilizers leads to environmental pollution, *etc.*

2.4 Organization structure, business strategy and competitive mode of operating subjects of urban agriculture

The major organizational form of Zhengzhou urban agriculture is household contract responsibility system. This can arouse farmers' enthusiasm to a certain extent, but will also lead to separate and small-scale of agricultural production, make it hard to deal with fast changing market economy. Developing farmers' professional cooperatives is a fundamental way to realize standardized and industrialized development of agriculture. Farmers' professional cooperatives of Zhengzhou City were developed as early as 2005. It has formed a unique model, which is called "Zhengzhou Model" by the Ministry of Agriculture. By the August, 2011, the total cooperatives in Zhengzhou City have reached 1 100, nearly involve the entire sections of agricultural production, including planting, cultivation, agricultural machinery, processing and warehousing, *etc.* Some farmers have been benefited from development of cooperatives and seen bright future of continuing development, so they are full of enthusiasm for increasing investment. Organizational forms of cooperatives mainly include "bases + peasant households", "enterprises + peasant households", "enterprises + bases + peasant households", "enterprises + cooperatives + peasant households", and "joint shares enterprise". In farmers' professional cooperatives of Zhengzhou City, there are problems of lack of standardization in internal operation and management, imperfect operation mechanism, small scale, low level, shortage of funds, and difficulty of financing, *etc.*

Business strategy refers to the aggregated strategies of single business firm or a strategic business unit in a diversified corporation. According to Michael Porter, a firm must formulate a business strategy that incorporates either cost leadership, differentiation, or focus to achieve a sustainable competitive advantage and long-term success. In 2011, *Opinions on Speeding up Promoting Construction of Urban Modern Agriculture* issued by Zhengzhou City People's Government stated the strategic objectives and emphases of Zhengzhou urban agricultural

development. However, Zhengzhou urban agricultural enterprises lack global business strategy and practice due to overall quantity and quality of leading enterprises in Zhengzhou. At present, Zhengzhou urban agriculture is still at early stage, products and services urban agriculture provide are not comprehensive, lack characteristics and innovation. The competition between farmers and farmers' cooperatives is still in disorder, so it is badly necessary to establish and perfect a sound, fair, unified, orderly and competitive market system.

3 Effective approach to lifting competitive power of Zhengzhou urban agriculture: cluster development

Four key elements of the Diamond Model are essential conditions to improve competitive edge of the industry. There are still drawbacks in four elements of Zhengzhou urban agriculture, so it is difficult to form powerful competitive edge. In his book of *Competitive Advantage of Nations*, Michael Porter introduced the concept of Industrial Cluster. Regional competitiveness has considerable influence on competitive power of enterprises. Michael Porter found, in the survey of 10 industrialized countries, that industrial cluster is universal phenomenon in the course of industrialization. Various industrial clusters can be seen in all developed economic communities. Michael Porter pointed out that industrial cluster can lift competitive edge of the industry. Industrial clusters exceed the general industrial ranges, form communities with various industries integrating together and various organizations combining together in certain geographical location, finally create the competitive advantage of the region. The development situation of industrial cluster has become an important indicator for assessing development level of a certain economic community or region. An agricultural industrial cluster generally refers to a geographically concentrated group of independent but interconnected peasant households, and leading enterprises of agricultural circulation and agricultural product processing according to requirements of regional distribution, industrialized operation and specialized production, in the hope of bringing into play of competitive edge of agricultural production^[4].

Spatial agglomeration is inherent law of modern agricultural development and major source of competitive edge of industries. When distribution of enterprises is scattered, every enterprise has to carry out relatively independent infrastructure construction, and make respective investment. Since the strength of one enterprise is limited, it is difficult to invest high level infrastructure construction, and the level of infrastructure is low and possibly accompanied with waste of land and other resources. The spatial agglomeration of the same or connected industries has at least following advantages. Firstly, it expands absolute scale of industry. It facilitates enterprises to realize scale economy in raw material purchase and product sales. Besides, it can drive development of intermediate departments, related auxiliary industries. It not only reduces costs for production and operation, but also is favorable to lifting overall competitiveness. Furthermore, it can improve labor division and

specialization level in the industry, and promote industrial development and expansion.

Scattered distribution is an important feature of Zhengzhou urban agriculture. Human, material and capital factors fail to form advantage of clusters. As a result, most enterprises scattered in rural areas are low in quality and competitiveness, poor in stable development, and short in average life, which are not favorable for improvement of urbanization and industrialization. Industry cluster district is spatial carrier of excellent combination of urbanization, industrialization and agricultural modernization of Zhengzhou City. Through construction of industry cluster district, it is able to promote spatial concentration of industries, drive spatial concentration of population and development of tertiary industry, and naturally lift urbanization level, finally realize coordinated development of new urbanization, industrialization and agricultural modernization of Zhengzhou City.

Marshall contends that industrial cluster can bring about external economic effect. Agricultural industrial cluster can promote standardized production of urban agriculture through normative function of organizations, so as to make products and services within the cluster carried out in the same standard, and guarantee quality of products and services. With gradual expansion of influence power of industrial cluster, it will form regional brand, raise popularity of products and services, finally attract more enterprises and customers and improve competitive edge of the industry.

In Document No. 1 (2007) of the central government, it states that construction of modern agriculture must attach importance to developing various functions of agriculture, making progress in improving breadth and depth of agriculture, and promoting constant optimization and upgrading of agricultural structure. Industry cluster not only can reduce transactional cost and raise benefits, but more important, can improve conditions of innovation. Cluster development of Zhengzhou urban agriculture is favorable to developing various functions of agriculture and satisfying the growing material and cultural needs of the people.

4 Countermeasures and suggestions for cluster development of Zhengzhou urban agriculture

4.1 Optimizing spatial distribution for cluster development of urban agriculture There are differences in resources, geographical location, sci-tech level and traffic conditions of each town or district of Zhengzhou City, so it is required to treat differently the key points of agricultural function development. For spatial distribution of cluster development of Zhengzhou urban agriculture, we should pay attention to following two points.

Firstly, according to different leading industries and key development points, the development space of Zhengzhou urban agriculture can be divided into inner circle, middle circle and outer circle. The inner circle refers to agricultural spatial region with higher level of urbanization. In this circle, traffic condition is superior, and talents, funds and technology are inten-

sive. However, it is short of land resource and labor cost is high. Thus, it is preferable to develop high-end food manufacturing industry, and agricultural service industries, such as agricultural futures, exhibitions, sci-tech innovation, demonstration and popularization, education and training, *etc.* The middle circle is suburban agricultural area, where the land is fertile, traffic is convenient, and labor force is sufficient. Thus, we should develop outskirt-type agriculture, such as green vegetable, characteristic forest and fruit, high-grade flower, seed and seedling, and highlight the sightseeing function. The outer circle refers to base-type agricultural region in outer suburbs. With fertile land, rich water resource and sufficient labor force, this region is the production base of traditional subsidiary agricultural products of Zhengzhou. We should highlight product supply guaranteeing function and ecological balance function of agriculture, and take the construction of large-scale and industrialized agricultural product bases as objective, to actively develop high-yield, high-quality and high-return agriculture, sightseeing agriculture and agricultural and sideline products processing industry.

Secondly, it is proposed to optimize spatial distribution of industrial zone of urban agriculture. On the basis of natural resources, socio-economic conditions and comparative location advantages of districts and counties of Zhengzhou City, four industrial zones should be established. The first is ecological and cultural tourism industrial zone along the Yellow River. This zone has lots of scenic spots and deep humanity history, so it is proposed to introduce the emperor culture and seeking-root culture to the world. The second is Longhai watermelon and garlic industrial zone. Along the Longhai Railway, large-scale watermelon and garlic bases have come into being in Zhongmou Counties, Liuji and Dameng districts. The third is agricultural product processing and logistic zone along Beijing – Zhuhai Highway (now Beijing – Hong Kong – Macau Highway). With convenient traffic, this zone has established over 60 agricultural product processing leading enterprises. Therefore, it has solid foundation for development. The fourth is southeast beef cattle and sheep breeding industrial zone. The animal husbandry production in Zhengzhou City is changing from traditional scattered cultivation to large-scale operation, and constantly expands from milk cow to various types of livestock. In the east of provincial highway No. 223, it has established the beef cattle and sheep breeding industrial zone, giving priority to development of high quality livestock and poultry breeding, fine and deep processing and cold chain logistics^[5].

4.2 Cultivating leading enterprises and optimizing organizational form of urban agriculture It is recommended to focus on agricultural product processing or circulation, and attract farmers to market through various interests connecting mechanism. Leading enterprises play a significant role in cluster development of urban agriculture. With the aid of leading enterprises, peasant households and small and medium-sized enterprises can establish related market labor division system, give full play and utilize limited resources, and realize market value. Foreign experience proves that leading enterprises can drive

peasant households, small and medium-sized agricultural enterprises, and agricultural product bases to closely cooperate and assist in establishing perfect network system, finally to bring about industrial cluster effect. Driving of leading enterprises and development of farmers' economic cooperatives accordingly are central sections of building agricultural industrial chain^[6].

Zhengzhou City should energetically develop farmers' professional cooperatives. Developing farmers' professional cooperatives is a fundamental way to realize standardized and industrialized development of agriculture. Since China's entry into WTO, agricultural production should develop towards harmless and green agriculture. To realize safe production objective of agriculture, agricultural production should be standardized. Nevertheless, it is difficult for the existing individual household decentralized operation of Zhengzhou City to realize the unity of production technology, type and product packaging. Farmers' professional cooperatives are organizers guiding farmers to realize intensive production and large-scale management, and leading farmers to standardize planting (cultivation) types, production technologies, and market sale. Only quality of agricultural products is improved, can the trade barrier be broken through, market share of agricultural products be expanded, and impact and challenge of entry into WTO be fought off. Farmers' professional cooperative is effective carrier for improving farmers' organizational level and "democratic management" level. Farmers' professional cooperatives follow the principle of "run by farmers, managed by farmers, and benefit farmers". Farmers can voluntarily join in or exit from the cooperatives. The principle of democracy and autonomy reflects fair, open and reasonable features of cooperatives, and provides tremendous vitality for cooperatives. Farmers' labor and production actions are restricted by the regulations of cooperatives, which are formulated through discussion of all farmers in accordance with the *Constitution* and the *Law of the People's Republic of China on Farmers' Professional Cooperatives*.

4.3 Energetically developing low-carbon agriculture to create favorable ecological environment for cluster development of urban agriculture In the *Report to the Seventeenth National Congress of the Communist Party of China*, it states that we should promote a conservation culture by basically forming an energy- and resource-efficient and environment-friendly structure of industries, pattern of growth and mode of consumption. It is required to realize economic growth, and coordinated development of agriculture, rural society and ecology. Compared with traditional agriculture, urban agriculture values social benefits and ecological benefits, which are also basic goals of cluster development of urban agriculture. The concept of low-carbon economy first appeared in the UK Energy White Paper in 2003. The low-carbon economy is a general name for a kind of economic form, such as low-carbon

development, low-carbon industry, low-carbon technologies, and low-carbon life. The essence of low-carbon economy is to raise energy utilization efficiency, transform energy structure, and reduce emission of pollutant. With many advantages, low-carbon economy will become the only way to slow down the global warming and realize sustainable development. In vast rural areas, there are many ways to achieve low-carbon agriculture, such as combine the marsh gas construction with change of kitchen, toilet, pigsty, sheepfold, and cattle pen, etc.; domestic rubbish, poultry and livestock feces, and crop straws can be fermented into marsh gas, and the residue (methane liquid) can replace pesticide and methane slag substitutes for fertilizer. Thus, it not only turns waste into wealth, beautifies environment, but also saves expenses and increases revenues. In sum, the low-carbon economy is an inevitable choice of economic development of China, and the low-carbon agriculture is an inevitable trend of development of Zhengzhou urban agriculture.

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