Competitiveness Analysis of Processing Industry Cluster of Livestock Products in Inner Mongolia Based on "Diamond Model"

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Abstract Using Michael Porter's "diamond model", based on regional development characteristics, we conduct analysis of the competitiveness of processing industry cluster of livestock products in Inner Mongolia from six aspects (the factor conditions, demand conditions, corporate strategy, structure and competition, related and supporting industries, government and opportunities). And we put forward the following rational recommendations for improving the competitiveness of processing industry cluster of livestock products in Inner Mongolia: (i) The government should increase capital input, focus on supporting processing industry of livestock products, and give play to the guidance and aggregation effect of financial funds; (ii) In terms of enterprises, it is necessary to vigorously develop leading enterprises, to give full play to the cluster effect of the leading enterprises.

Key words Diamond model, Processing industry of livestock products, Industry cluster, Competitiveness, Inner Mongolia

Inner Mongolia Autonomous Region (hereinafter referred to as Inner Mongolia) is an important production and processing base of livestock products in China, having unique world-famous vast grassland and rich species of livestock resources. Through 60 years of construction and development, animal husbandry in Inner Mongolia has made remarkable achievements, realizing a historic leap. By 2010, Inner Mongolia had been equipped with the comprehensive production capacity of annually rearing 0.1 billion head of livestock, producing 2.4 million tons of meat, 0.1 million tons of fluff, 9 million tons of milk, and 0.5 million tons of poultry and eggs; the output of milk, mutton, cashmere and fine wool ranked first in the country, and the output value of animal husbandry had accounted for 45.93% of that of large-scale farming. The comprehensive animal husbandry production level of Inner Mongolia ranks first in China's five major pastoral areas, having made a great contribution to the development of the national economy and the improvement of people's living standards, but the processing industry cluster of livestock products in Inner Mongolia is still in its infancy, and there is an urgent need to find the competitive advantage for cluster development[1-2]. Based on "diamond model", we analyze the competitiveness of processing industry cluster of livestock products in Inner Mongolia, and put forward the corresponding recommendations for improving the competitive advantage of processing industry cluster of livestock products.

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1 The current situation of development of processing industry cluster of livestock products in Inner Mongolia

Inner Mongolia Autonomous Region consists of the agricultural area, pastoral area, semi-farm semi-pasturing area, forest area, and reclamation area, with rich types of livestock products. The well-known fine species include Sanhe horse, Sanhe cattle, Ujumqin sheep, Aohan Merino Sheep, Alpas white cashmere goat and Alarsan camel. Milk cow, beef cattle, sheep, and other livestock products, with high quality and characteristics, have the advantage of scale, which are included in the regional layout of national superior livestock products.

The processing industry cluster of livestock products, mainly driven by the leading enterprises, vigorously develops the deep processing of livestock products, improves the value added of livestock products, creates brand-name products, and improves the commodity rate. Inner Mongolia is a major pastoral area. In recent years, the processing industry of livestock products represented by meat, milk and cashmere has entered a period of rapid development, becoming an important pillar industry for the economic development in Inner Mongolia.

During the "Eleventh Five-Year" period, Inner Mongolia made full use of its advantages in resources, focusing on the development of 6 competitive industries (energy, chemical industry, metallurgy and building materials, processing of agricultural and livestock products, equipment manufacturing, and high technology); laid emphasis on milk, meat, wool, grain and oil, built various production and processing bases of green agricultural and livestock products with characteristics within the whole region; aimed to build green grassland brand, establish the processing base of the green dairy, meat and cashmere in China; vigorously developed a number of clusters of character-

istic leading enterprises with a good momentum of development (taking Hohhot City, Baotou City and Hulun Buir City, as key dairy production bases; taking Tongliao City and Chifeng City as the key production bases of beef cattle, pig and poultry; taking Hulun Buir City, Xing'an League, Tongliao City, Chifeng City, Xilin Gol League, Ulanqab City, Ordos City, Bayannaoer City, as the key production bases of sheep and fine wool; taking Xing'an League, Tongliao City, Chifeng City, Xilin Gol League, Ordos City, Bayannaoer City, Alashan League, as the key production bases of cashmere).

2 Overview of the "diamond model" theory

The concept of "industry cluster" is advanced by famous American strategic management expert Michael Porter in his book *Competitive Advantage of Nations*, and this concept has been widely cited. On the basis of the theory of competitive advantage, Porter published the article "*Clusters and the New Economics of Competition*" in 1998, and systematically advanced the theory of competitiveness.

In the "diamond model" (Fig.1), Potter conducts theoretical discussion on the competitiveness of industrial clusters. Porter's "diamond model" believes that whether a given industry in a country (or region) is competitive hinges on four basic factors: the factor conditions, demand conditions, corporate strategy, structure and competition, related and supporting industries. Two variable factors are also included: government and opportunities.

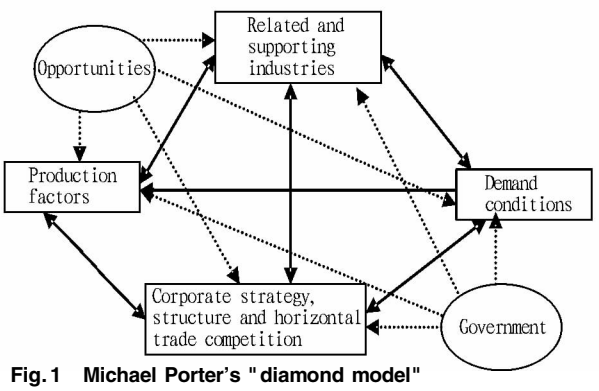

Fig.1 Michael Porter's "diamond model"

Porter believes that these six factors influence and reinforce each other, jointly constituting a competitive environment encouraging the industry (enterprise) to innovate, thereby forming the source of industrial competitiveness. On the basis of the previous studies[3-4], we use "diamond model" to analyze the competitive advantage of processing industry cluster of livestock products in Inner Mongolia.

3 Competitiveness factors analysis of livestock product processing industry cluster in Inner Mongolia based on the "diamond model"

3.1 Production factors

3.1.1 Traditional primary production factors. In general, traditional primary production factors include climatic conditions, geographic location, labor and land, water conservancy and other agricultural natural resources.

Inner Mongolia Autonomous Region is located in China's northern frontier, long and narrow from northeast to southwest. There is a total area of 1.183 million km^2 in the region, accounting for 12.3% of the country's land area, ranking in the third place in China. The grassland area of Inner Mongolia Autonomous Region ranks first among the country's five largest pastoral areas. East from the Great Khingan and west to Juyanhai, it is an important part of the Eurasia grassland, 2 400 km from east to west, 1 700 km from south to north. Inner Mongolia has five stretches of grassland (Hulun Buir Grassland, Xilin Gol Grassland, Horqin Grassland, Wulanchabu Grassland, and Ordos Grassland). There is a total area of natural grassland at 88 million hm^2 in the entire region, accounting for 22% of grassland area in China; the area of usable grassland is 68.666 7 million hm^2, accounting for more than 20% of the area of usable grassland in China, ranking first in the country; more than 900 types of fodder grass can be used for feed, and there are 217 kinds of major high-quality fodder grass.

Meanwhile, relative to the mainland, the land resources are rich, and the price of labor, water and electricity is low. These resources are good basis for the development of processing industry of livestock products. The geographical position of Inner Mongolia Autonomous Region is unique. From east to west, it is divided into humid region, semi-humid region, semi-arid region and arid region; from south to north, it is divided into warm temperate zone, mid temperate zone and cool temperate zone. Different zones and different combination of water and heat make Inner Mongolia Autonomous Region boast good production conditions for farming and animal husbandry, abundant species resources. The rich and high-quality livestock breed resources have laid a solid foundation for the development of processing industry of livestock products in Inner Mongolia Autonomous Region.

3.1.2 Modern advanced production factors. Modern advanced production factors mainly include production technology, human capital, the modern communication infrastructure, production management, *etc.* First, the autonomous region has formed strong ability to add value through the processing and conversion of livestock products. The region has had the production capacity to process and convert 8.8 million tons of milk, 1.5 million tons of meat, and 0.02 million tons of cashmere annually. Overall, the processing level of livestock products in Inner Mongolia Autonomous Region has been in the forefront at home; the production and processing of milk, cashmere and other livestock products maintains a leading position in China. The development of processing industry of livestock products effectively solves difficulty in the marketing of livestock products, and drives the development of the production base, so that the level of productivity in the pastoral areas reaches a higher stage. Second, in terms of production technology, the cashmere industry incessantly launches new high-end cashmere products, and also gives birth to 50 nation-

al patents, filling the blank of related technical field; in terms of dairy industry, the cow sex control technology is credited as " brand-name technology in the autonomous region" .

At the same time, in terms of the improvement of species, the local improved species enjoy a good reputation, and different types of grassland ecology create different types of livestock breeds. The local breeds include, Mongolian horse, Mongolian cow, Mongolian sheep, bactrian camel, and white cashmere goat; 27 excellent breeds have been fostered, such as Sanhe horse, grassland red cattle, Mongolian fine-wool sheep, Mongolian white cashmere goat, and Alashan bactrian camel.

In addition, a number of world-renowned fine livestock and poultry species are introduced, such as Holstein, Simmental, Angus, Dorset and Suffolk, especially the newly cultivated and named Hulun Buir sheep and Bamei sheep fill the blank of hybrid sheep breeds at home, which has played a significant role in providing high-end livestock products. In Inner Mongolia, 5 types of livestock products (meat, eggs, milk, plush, hides) occupy an important position in the country, and some products are renowned abroad.

The fine species breeding system with the livestock breeding station as leader has been established. The total number of livestock with species being improved in one year reaches 102.854 million, with the proportion of 94.7%, basically achieving improvement in the breeds of livestock and poultry.

3.2 Demand conditions The processing industry demand of livestock products in Inner Mongolia is mainly constituted by the domestic and foreign markets, dominated by the domestic market. Various aspects in the domestic demand conditions can strengthen the role each other for competitive advantage, and at the same time, they play a different role in the different stages of the development of industrial clusters.

Some domestic demand factors are very important in the early stage of the creation of competitive advantage, while some other domestic demand factors play an important role in strengthening and maintaining this competitive advantage. Based on its resources and technical advantages, the development of processing industry of livestock products in Inner Mongolia Autonomous Region, is domestic and foreign market oriented; it vigorously develops the superior processing industry cluster of livestock products, forming the effective linking mode of " resources – technology – products – markets – benefits" .

3.2.1 The domestic and foreign market demand. In terms of the domestic food consumption market, due to the large population, great improvement in the people's living standards and huge potential of rural markets, it can be predicted that with the incessant increase in the level of income, the proportion of food consumption expenditure will decline, but the absolute amount will continue to grow in a fairly long period of time, and the domestic market prospects of livestock products are very broad. In terms of the international market, the data show that over the past 20 years, the world's per capita consumption of animal products increased by an average of 3.46%; to 2020, the consumption of animal products will maintain a growth trend.

If the export of agricultural and livestock products in Inner Mongolia Autonomous Region can seize this favorable opportunity to increase technology investment, focus on food security, improve product quality and improve the system of quarantine, the international market of livestock products is expected to open and expand rapidly.

3.2.2 Geographic advantages of Inner Mongolia. Inner Mongolia borders on Mongolia, Russia, Gansu, Ningxia, Shanxi, Hebei, Heilongjiang, Jilin and Liaoning, close to the Beijing – Tianjin – Tangshan area, connecting with Bohai Economic Zone. Whether in terms of sale in domestic market or export, it has strong geographical advantages. At the same time, the Bohai Rim and Northeast China's ability to drive is strengthened, creating new opportunities for opening up and development of processing industry of livestock products in Inner Mongolia Autonomous Region. Thus there is a huge potential market demand.

3.2.3 Recognition of processing brand of livestock products in Inner Mongolia. In 2010, the sales income of Yili and Mengniu exceeded 30 billion yuan, both into the top 20 of the world's dairy product enterprises. Ordos Group becomes the world's largest supplier of cashmere products. Yili, Mengniu, Ordos and other enterprises have become the leading national agricultural industrialization enterprises. Inner Mongolia Autonomous Region actively cultivates the local leading enterprises. Moreover, it has successively introduced Beijing Sanyuan Milk Company, Shanghai Guangming Milk Company, and other national leading industrialized dairy enterprises; Nestle Group, one of world's top 500, also settles down in the region. The groups of superior enterprises are ceaselessly growing.

At the same time, a number of well-known enterprises and famous products emerge. The sales of liquid milk, milk powder, ice cream, and cashmere sweater rank first in the country. Yili and Mengniu Dairy Group have become the deserved peerless lion in China's dairy industry; the processing enterprises of velvet textile products, represented by Ordos, Luwang and Weixin, are leading the trend of the world's velvet textile; the Horqin Cattle Group becomes a well-known processing enterprise of beef and mutton. It is particularly worth mentioning that all these products have been approved by China Green Product Development Center to use the logo of green products. A large number of green products are exported to Japan, South Korea, Canada, and Russia.

Brand means quality and brand means reputation. Brand has opened the door of market for us. The development of well-known brands and superior enterprise clusters, improves the level of development of processing industry of livestock products in the autonomous region, having made a positive contribution to shaping the new image of Inner Mongolia.

3.3 Related and supporting industries With the technological progress and the development of the social division of labor, some of the production functions in variously links of an-

imal husbandry production are separated, forming a series of independent industry sectors having a close relationship with animal husbandry production.

On the one hand, there are various kinds of means of production used for the processing of livestock products, including fine breeds, high-quality fur, feed processing, *etc.*; on the other hand, the related enterprise or institutions with livestock products as the object of processing, sale, transportation, or research and development, also have an urgent need to establish long-term stable cooperative relations with the farmers, so that the livestock products needed by the market can be timely obtained. The scientific research support institutions can also carry out effective work of research and development or service.

3.3.1 Feed processing before production. The feed industry layout in Inner Mongolia Autonomous Region can be divided into five zones (milk cow feed processing zone; cattle feed processing zone; sheep feed processing zone; pig feed processing zone; poultry feed processing zone). Vigorously developing silage is the main way to solve the lack of forage. In terms of the direction of development, it mainly focuses on the special feed for cattle, sheep, and other ruminants, gives full play to the leading advantages of Inner Mongolia Autonomous Region in nutrition research for the ruminants, gradually opens up the ruminant feed market and expands market influence, in order to form the ruminant feed brands with characteristics in Inner Mongolia Autonomous Region and occupy the domestic market, provide ample feed resources for the processing of livestock products.

3.3.2 Relying on resource advantages to build modern circulation system of livestock products. It has established the wholesale trading markets of fur, meat and other livestock products, logistics and distribution infrastructure; created a number of regional wholesale markets of livestock products with a certain size; built a number of the origin wholesale markets that can drive the development of industries with local characteristics; enhanced a number of bazaars in rural and pastoral areas for facilitating the production and life of farmers and herdsmen; initially formed multi-polar, multi-level livestock product market system integrating the functions of slaughtering, refrigeration, primary processing, logistics and distribution, wholesale trading.

In Hulun Buir City, Xilin Gol League, Bayannaoer City, Ordos City and other areas, the sheep processing and trading market is built. The "Ten Thousand Villages and One Thousand Townships Market Project" implemented in the pastoral areas, has promoted the construction of commercial circulation network in the pastoral areas. In the main producing areas of fluff in the east and west, two high starting-point fluff markets at the level of autonomous region are built.

It gives priority to the development of logistics industry of livestock products; gives full play to the network advantages of the logistics system of supply and marketing cooperatives, and postal service in rural and pastoral areas; supports the building of commodity circulation service network and regional distribution center in the pastoral areas; actively carries out activities of providing production and living materials to the herdsmen, and the distribution services of agricultural and livestock products in the city, greatly promoting the healthy development of trade and business enterprises in the pastoral areas.

3.4 Corporate strategy, structure and competition In Porter's "diamond model", corporate strategy, structure and competition mainly include the establishment of company, organization and management environment, and the nature of the domestic competition. Strong local or national competitors can prompt companies to improve technology and engage in innovation, which are one of the most powerful incentive factors maintaining long-term competition. The presence of the domestic competitors has a profound effect on innovation and maintaining of competitive advantage.

After fierce domestic competition, the company will be more competitive, making it easier to win in international competition. For example, Yili Group constantly adheres to the system of innovation, completing "four jumps" of development of the milk base. After completing the first step of "company + farmers", it implements "company + small pasture + farmers", centralized breeding, centralized milking, scientific management, and unified disease prevention. Subsequently, it implements "company + standardized ranch", achieving the transformation of milk cow breeding towards intensification, standardization, and modernization operating model.

Then Yili Group first establishes milk associations, to guide farmers to give their cow to professional organizations for breeding, sticking to the principle of "joining associations voluntarily, quitting associations freely, benefit sharing and risk sharing", completing the process reengineering of leading enterprises and the "first workshop".

In terms of corporate competition, the geographical concentration of Mengniu and Yili is conducive to the informal exchanges of creative ideas and technical secrets between individuals, namely producing knowledge spillover. For example, homogenized dairy products, as Mengniu's initial products, are almost replica of Yili. In the milk process, they add the process of evaporating moisture to enhance the taste of comfort. Of course, this technology is also enjoyed by Yili. Yili was the first to launch yogurt, and then Mengniu was also concerned about yogurt production. After "Mengniu Sour Milk" won success in the market, Yili took the lead to set up Yogurt Division. In terms of the use of resources, the two companies promote the base construction on a large scale, gradually forming the competitive advantages of strategic action group.

3.5 Opportunities and government During the "Eleventh Five-Year" period, Inner Mongolia Autonomous Region launched a large number of new projects with state-of-the-art equipments and large processing scale, and its ability to process livestock products was gradually improved, cultivating a number of leading enterprises and brands with great reputa-

tion and large market share, with dairy industry and cashmere industry ranking in the leading place in China. The industry clusters of milk, cashmere, cattle and sheep with comparative advantage were formed in China, with increasingly prominent driving effect. Two superior production and processing bases of diary products with Hohhot and Hulun Buir as the core areas were formed; Xilin Gol League's sheep, Tongliao and Chifeng's cattle became a leading regional industry; the industry cluster of cashmere industry in Ordos City and Bayannaoer City became important support for the processing of livestock products in Inner Mongolia Autonomous Region.

Inner Mongolia Autonomous Region is in the stage of increasingly accelerated industrialization and urbanization, comprehensive advance of industrialization. With the implementation of national strategy of expanding domestic demand, the pace of production factor flow and industrial transfer at home and abroad is accelerated, providing huge market space and development opportunities for the development of processing industry of agricultural and livestock products in Inner Mongolia Autonomous Region. In accordance with the Constitution and the Law on Regional Ethnic Autonomy, the state has granted a number of preferential policies for ethnic minority areas. At the same time, Inner Mongolia is the earliest ethnic minority autonomous region established in China.

In the new century, Inner Mongolia is included in 12 provinces where the national western development strategy is implemented, enjoying the preferential policies related to the national western development strategy. The national western development strategy, the strategy of revitalizing the old industrial bases in Northeast China, national support for the development of Inner Mongolia, the policy of supporting agriculture and benefiting farmers, and the autonomous region's policy of advancing the development of non-resource-based industries, have created favorable policy conditions for the development of processing industry of livestock products in Inner Mongolia Autonomous Region.

By the foregoing analysis of processing industry cluster of livestock products in Inner Mongolia, we can find that the processing industry cluster of livestock products in Inner Mongolia Autonomous Region has absolute advantage in natural resource endowments, and also comparative advantage in other factor conditions. The market base is good, and the domestic and foreign market demand for livestock products has huge potential for development. The dramatic development of processing industry cluster of livestock products in Inner Mongolia is mainly ascribed to the unique natural resource advantages, good natural conditions for the development, and strong government support.

However, the market competition of livestock products is increasingly fierce, posing a challenge to the development of animal husbandry in Inner Mongolia. The processing industry cluster of livestock products in Inner Mongolia is still in the initial stage of development, so the processing level of livestock products is low; the value added of the product is low; the scale of industry cluster is small. The development of superior leading enterprises has injected new impetus, and they play a leading role, but the development of relevant supporting industries needs to be further improved[5].

4 Rational recommendations for improving the competitiveness of processing industry cluster of livestock products in Inner Mongolia

4.1 The government should increase capital input, focus on supporting processing industry of livestock products, and give play to the guidance and aggregation effect of financial funds Through the form of discount, guarantee, grant, and incentives, the government should increase support for the leading enterprises, cooperative organizations, and herders in the base. The government should pay particular attention to the investment in the standardized production demonstration area of livestock products, production base of pollution-free agricultural and livestock products, the area without prescriptive epidemic disease, the export base of livestock products, and other construction projects.

Inner Mongolia has become large cashmere processing area and large dairy processing area, but the industrialized operation mode of " enterprise + base + herdsman household" has not really taken form; the profit-sharing and risk-sharing mechanism of benefit distribution has not been truly established. So it is necessary to accelerate the pace of technological innovation and new product development, enhance the level of deep processing of livestock products, extend the industrial chain, guide the enterprises to change from producing primary products and intermediate products to the market-oriented end consumer products, and improve product quality and value added.

In addition, there is a need to support a batch of large-scale backbone enterprises to implement association, merger, reorganization and cross-regional operation; integrate agriculture and animal husbandry resources and production factors on a large scale; enhance the core competitiveness of processing industry of livestock products, and increase efficiency; create a group of large scale leading enterprises and groups[6].

4.2 In terms of enterprises, it is necessary to vigorously develop leading enterprises, to give full play to the cluster effect of the leading enterprises The enterprises within the cluster of leading enterprises should implement industrial division of labor and carry out specialized production, so as to form the integrated industry chain within the cluster. The enterprises within the cluster should extend the production chain as much as possible, in order to increase the value added of livestock products. The production of the enterprises within the cluster in various links of industrial chain should keep appropriate proportion, so that the upstream enterprise's finished goods are exactly the raw materials needed by the downstream enterprises. In this way, on the one hand, it avoids repetitive production, makes full use of raw materials, and increases value added of livestock products; on the other hand, it makes the entire clus-

ter of the leading enterprises produce scale effect.

At the same time, we must strengthen technological innovation. Technology is the core competitiveness of enterprises. Only after having advantages in technology, can we occupy the market. So it is necessary to increase input to scientific research to continuously develop and research new products; strengthen the cooperation with scientific research institutions, colleges and universities; allow and encourage the scientific and technical personnel to become shareholder in the enterprises with their own research results and patents; increase investment in science and technology, pay attention to the introduction and cultivation of talents; increase research funding, carry out the experiment, demonstration, and promotion of new species and new technology in the key areas, to increase yield and value added of products; solve the problems of low processing conversion rate of livestock products, single structure of livestock products, insufficient development and low utilization rate of business production capacity, to promote the rapid development of processing industry cluster of livestock products.

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way of offering labor in place of relief subsidies to increase labor input to the construction of agricultural infrastructure.

4.5 Improving the agricultural technology extension system

In the case of inadequate technology input to agriculture and ineffective promotion of science and technology in China at present, we should draw on the experience of Japan.

Firstly, we must build new agricultural research system, and improve the level of scientific research; increase sufficient investment in agricultural research, and deepen the reform of agricultural research and technology promotion system, so that the investment in agricultural research can be concentrated in the units and individuals with research capacity.

Secondly, it is necessary to strengthen the training of agricultural researchers; promote the agricultural research personnel to survey and research new problems in production practice, participate in international academic activities to improve the technological level. Agricultural colleges and universities should adapt to the needs of the development of socialist market economy and modern technology, and further adjust the major structure, to create talents for national and local agricultural research institutions, provide a guarantee for the realization of agricultural modernization.

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