# Study on the Innovation Model of Resource-Based Agro-Processing Industry Cluster[*]

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**Abstract**   According to the degree of competition and cooperation among enterprises, and knowledge dependence of cluster, this paper classifies agro-processing industry cluster into three types, which are resource-based cluster, chain-type cluster, and cyclic cluster, resource-based cluster is most common. The innovation model varies with the type of cluster, for this reason, the innovation model of resource-based agro-processing industry cluster is constructed. Resource-based agro-processing industry cluster carries out innovative activities through technological innovation platform that is found by the government, which is taken as the core. Furthermore, this paper makes deep research on the main body's status, the function, and the movement way of behaviors in this cluster.
**Key words**   Resource-based; Agro-processing industry; Industry cluster; Innovation model

## 1 Introduction

Since reform and opening up, China's agro-processing enterprises have developed fast. It is obvious that the enterprises' organization becomes network day by day, and massive industry clusters come up, many of them rely on the agricultural resource. The development of agro-processing industry cluster has also brought prosperity of related theory research.

Chinese scholars mainly study on three aspects, namely agro-processing industry cluster, resource-based industry cluster, and innovation of industry cluster. Zhang Xia, Ru Deyin, et al. consider that local government should promote the development of agro-processing industry cluster judging by local comparative advantage, creating cluster brand, promoting culture of trust and cooperation, and supporting the intermediary service system and other measures[1]. Zhou Tao and Wang Juan build up three models of agro-processing industry cluster, they are distribution model based on regional natural resources, organization model based on business division, and virtual space model based on overall regional competitiveness. Yang Weimin and Qin Zhihong believe that the government can foster cluster's competitive advantage in accordance with the characteristics of resource-based cluster's life cycle[2]. Zhang Wei suggests that the development of resource-based industry cluster should mainly rely on scientific and technological progress of the circulation economy instead of resource-dependent[3]. Zhao Guanghui points out that the co-innovation is the main form of innovation in industry cluster[4].

Foreign scholars mainly study on food industry innovation. Ray Winger consider that the trend of food industry development is more towards labor-saving in developed countries, innovation in product development is contextual and depends on location and the range of products currently in a given market[5]. Sari Forsman seeks to examine the competitive strategies of small food processing firms, competitive strategies are approached from the resource-based view that emphasizes internal firm factors as sources of competitive advantage and long-term success [6]. Brewin, D. G., Monchuk, D. C., et al. study the factors associated with innovation in the food processing industry by using a survey of Western Canadian food processors. He thinks that product innovations can help enterprises to keep pace with competitors[7].

China has rich agricultural resources which create conditions for the generation of resource-based agro-processing industry cluster. Resource-based agro-processing industry cluster plays an important role in enhancing the overall competitiveness of agriculture, improving the level of urbanization, and promoting the transfer of rural surplus labor force and so on, but the ability of innovation and competitiveness of this cluster is weak. What innovation model should be taken for such industry cluster is lack of detailed theoretical study.

## 2 Classification of Agro-processing Industry Cluster

Agro-processing industry cluster is a phenomenon that a group of agro-processing enterprises, upstream and downstream enterprises, and related institutions gather with high concentration in a certain

area, they keep in touch with each other by way of trade and non-trade, and work by specialized division of labor. Agro-processing industry cluster makes regional economy keep sustainable competitive advantage. As the difference of conditions of development and industry attribute, different industry cluster shows different development model, actors within the cluster also show different division of labor and cooperation and competition. Industry clusters reflect biological growth increasingly, knowledge within clusters flows frequently, cooperation between enterprises is strengthened, and the effect of learning mechanisms plays a major role. Therefore, to industry clusters, the dependence on knowledge is a feature. This paper, which selects the degree of competition and cooperation among enterprises and the dependence of cluster on knowledge as the basis of cluster categories, and combines the features of agro-processing industry, classifies agro-processing industry cluster into resource-based cluster, chain-type cluster, and cyclic cluster (figure 1).

Resource-based agro-processing industry cluster is an economic community, which is consisted by farmers, agro-processing enterprises, relevant enterprises and institutions through institutional arrangements within a certain range relying on abundant agricultural raw materials. In chain-type agro-processing industry cluster, large-scale agro-processing leading enterprises is as the core, upstream and downstream enterprises link to each other by specialized division of labor named "product chain". Cyclic cluster is an eco-industry cluster, in which, agro-processing enterprises or enterprises that take agricultural products as raw materials are interrelated, interdependent and symbiotic under the guidance of the concept of circular economy. The purpose of cyclic cluster is to reduce waste and pollution, improve the utilization of agricultural resources.
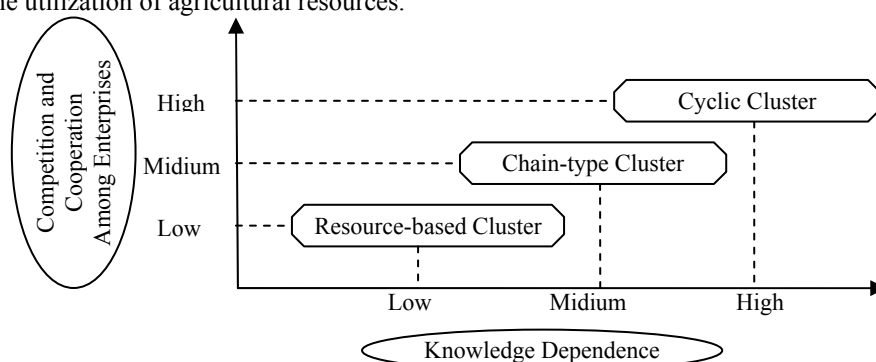


**Figure 1　Comparison of Different Type of Agro-processing Industry Cluster**

The degree of competition and cooperation among enterprises measures level of enterprises' division of labor, cooperation and competition within industry cluster. In resource-based cluster, enterprises tend to compete, division of labor is lower, while enterprises in cyclic cluster more incline to cooperate. The degree of knowledge dependence measures science and technology dependence for enterprises' business activities, as well as the degree of knowledge flow within the cluster. There are low-tech products and low level of knowledge flow in resource-based cluster; but cyclic cluster has high-tech products and frequent knowledge flow; the products and knowledge flow of chain-type cluster are between resource-based cluster and cyclic cluster.

As the existence of labor efficiency, economies of scale, agglomeration economy and reduction of transaction costs, the formation and growth process of industry cluster have some common features: change from low form to high form, build regional innovation system constantly, optimize industrial organization, adjust relevant system, accumulate social capital. Therefore, the three industry clusters are not static, the evolution path of agro-processing industry cluster will be resource-based cluster→ chain-type cluster→ cyclic cluster.

## 3 The Features of Resource-based Agro-processing Industry Cluster

Resource-based agro-processing industry cluster has itself features. Such as strong resource dependence, loose inter-firm linkages, weak competence of innovation. Understanding and mastering the following features of resource-based agro-processing industry cluster will help to build the corresponding innovation model.

(1) Cluster formation depends on agricultural resources. The geographical area of agro-processing raw materials resources is the layout foundation of agro-processing industry cluster. As the difference of each area superior agricultural resources and they are in a state of non-equilibrium, it is possible to form

different agro-processing industry cluster depending on each area own superior resources. Agro-processing industry cluster, which relies on special agricultural resources, achieves product series and makes competitive advantage in the market through the rough and deep processing materials,

(2) Enterprises in the cluster are small-scale, less contact with each other, and weak in innovation. Most enterprises in the cluster were evolved from the family workshops and they are small-scale. The supply relationships of natural resources among cluster members make the supply chain short and limit the cooperation of cluster enterprises and other industry department, as well as inter service agency. The formation of cluster has low requirement on the firm size, technology, labor quality. Low entry barriers lead to fierce competition. Low level knowledge of employees, less innovation consciousness and imitation among enterprises result in lack-ness of innovation.

(3) Cluster product chain is short, product category is single and low-tech. The products produced from resource-based agro-processing industry cluster are generally low-tech primary processing and relatively single, because the product chain is not formed and lack of deep processing. Many agro-processing enterprises' development follows linear quantitative growth model of "resources →products→waste", large quantities of pollutants generated from those enterprises gather together, which causes serious pollution of the location of the cluster[8].

(4) This type of cluster is a relatively closed system. Knowledge flow among the members of resource-based agro-processing industry cluster is not formed basically, so the spillover effect of cluster on the surrounding areas is weak, the whole system is relatively closed.

## 4 Innovation Model of Resource-Based Agro-processing Industry Cluster

Although resource-based industrial clusters mainly depend on the input of natural resources, but with the convergence of resources and increased competition, social resources, which represent as technology, human resource, capital, information, etc., becomes supportive resource for the development of resource-based industrial clusters[9]. The competitive advantage of resource-based agro-processing industry cluster should not only rely on geographical exclusivity of agricultural resources, but also build knowledge dissemination and innovation networks to realize the upgrading of cluster's competitiveness through flexible combination of local government, related supporting institutions (such as industrial associations, financial institutions, and universities).

(1) Government founds technology innovation platform which is as the core carrier of cluster innovation. The enterprises within resource-based agro-processing industry cluster are mainly small and medium enterprises, they are lack of innovation incentive, or there is a desire of innovation, but they does not have innovation strength. To this end, the government plays an absolute role in the guidance of innovation. On the one hand, the government integrates the power of capital and technology personnel to build technology innovation center. Technology innovation center's mission is to carry out innovation activities, such as technology development, technology transfer and promotion, technical advice and training of personnel, etc. Enterprises pay for the services of technology innovation center, share common technology R & D achievement. Government, through the docking of research institutions and enterprises, attract universities and research institutes to involve in technology innovation center's research activities, or make universities and research institutes cooperate with enterprises directly, to solve specific technical problems for enterprises. On the other hand, government introduces leading enterprises that have advanced technology to establish technology demonstration base (figure 2).
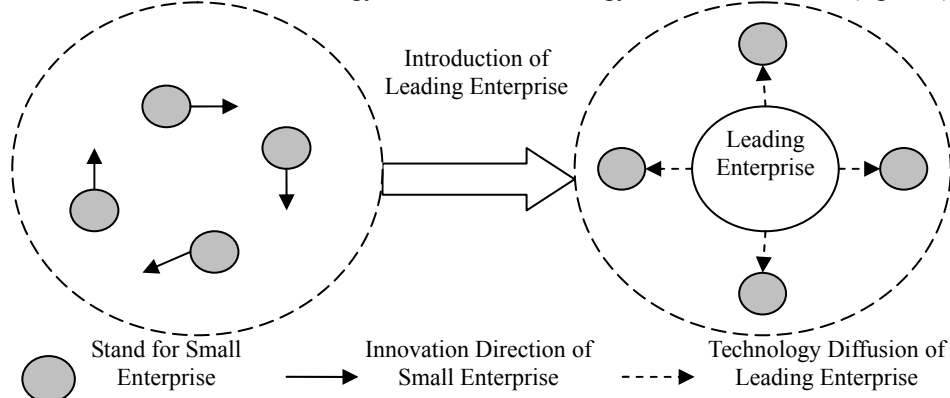


**Figure 2    Technology Demonstration Effect of Leading Enterprise**

As the government's support and own efforts of enterprises, there are some leading agro-processing enterprises which are strong in R & D in China, these play an important role in promoting the regional innovation capabilities. Government attracts leading enterprises settled in resource-gathering area to establish technology demonstration base through various preferential policies, and support leading enterprises' innovation activities. In the cluster, because the communication between enterprises is subtle, leading enterprises can play a very good demonstration effect with their own influence, so small enterprises will be in line to the leading enterprises, the knowledge spillover of leading enterprises achieves technology diffusion and makes small enterprises share the achievement of innovation.

(2) Agricultural cooperative organization is sponsor and promoter of cluster innovation activities. Agricultural cooperative organization is intermediary organization of agro-processing chamber of commerce and agricultural cooperative, it connects agro-processing enterprises and farmers. Farmers provide quality of agricultural raw materials for agro-processing enterprises, and these raw materials will be processed into products with market potential by enterprises. Farmers are agro-processing enterprises' "upstream suppliers", so they will inevitably become important participants in cluster innovation. Agricultural cooperative organization in the promotion of cluster innovation mainly plays the following role: ① collecting technical difficulties within cluster, tracking the latest progress of the industry, responsible for the interaction of technology innovation center and enterprises. ② as a director in technological transformation of enterprises, promoting production equipment for the update. ③ training employees for enterprises and improving their overall quality and management level. ④ uniting farmers and responsible for the promotion and guidance of new technologies for farmers.

(3) Innovative knowledge comes from the outside of cluster. As resource-based agro-processing industry cluster does not have the knowledge source and information source that cluster innovation needs, so the cluster must be an open system, and absorb outside forces of innovation. Technology innovation platform establishes different degrees and forms of industry-university collaboration relations with outside universities and research institutes through technology innovation center and technology demonstration base, such as to build R & D centers with universities, to commission research institutes for technology research by form of contract and so on. In addition, the cluster can hold seminars and innovation exchange with relevant organizations, hire experts to offer a wide range of vocational training courses.

(4) Innovation achievement is conversed by enterprises, leading enterprises form in survival of the fittest. Agro-processing enterprises are the main body when innovation achievement is conversed. Only when the innovation achievement is conversed into consumer goods by enterprises, and generates economic benefits in the market, the entire innovation process is completed. Enterprises have different learning abilities and tacit knowledge, when innovation knowledge accumulates and proliferates in the cluster, small enterprises that is poor in strength and economic returns and unable to carry out technological transformation will be gradually eliminated. Under the participation of government, cluster cultivates leading enterprises through annexation and reorganization, and create famous brands. Processing is complex from the initial processing to deep processing. Industrial chain is formed by the leading enterprises and the upstream and downstream necessary enterprises.

(5) Financial institutions ensure the development and implementation of cluster innovation activities. Agro-processing enterprises are lack of own funds, so the liquidity problems will be on the face after fixed capital investment, it must result in innovative activities of small enterprises being restricted in the reason of insufficient funds. Therefore, investment and financial system which is conducive for the development and implementation of innovation activities should be established. Government can support innovation activities of agro-processing industry cluster by way of holding joint conference of financial institutions and enterprises, expanding credit quota, using credit loans, and subsidized loans, etc.

In summary, the overall operation of resource-based agro-processing industry cluster innovation model is shown in figure 3.
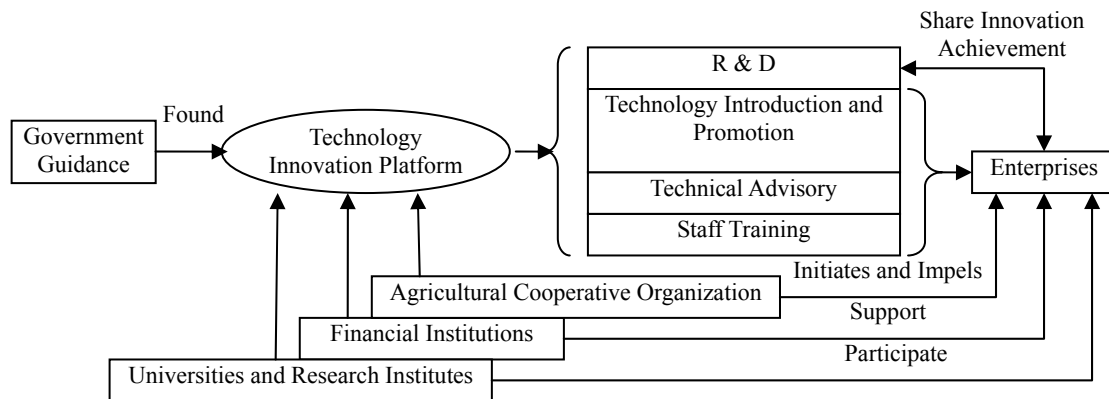
**Figure 3　Innovation Model of Resource-based Agro-processing Industry Cluster**

## 5 Conclusions

Different agro-processing industry cluster would show different cluster innovation model. Resource-based agro-processing industry cluster carries out innovative activities through technological innovation platform that is found by the government. In resource-based agro-processing industry cluster, universities and research institutes are sources of innovation knowledge, agricultural cooperative organization initiates and impels innovative activities, and financial institutions provide financial support for the conversion of innovation achievement and the proliferation of innovation knowledge.

For the role of each member on innovative activities in resource-based agro-processing industry cluster, the paper makes the following recommendations: (1) Members within the cluster should be mutually beneficial. Cluster can access to broader space for development by functional complementation and benefit sharing. (2) To strengthen synergistic competition among enterprises. Enterprises launch collaborative innovation on the basis of specialized division of labor and cooperation, the ultimate goal of synergistic competition is to achieve the rapid development of the whole cluster. (3) To achieve resource sharing in cluster. By way of sharing technology infrastructure, information resources and professional talent, enterprises can innovate and reduce transaction costs. Resource-based agro-processing industry cluster achieves upgrading through constant innovation. Consequently, the innovation models of chain-type and cyclic cluster agro-processing industry cluster need further study.

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