

## **Systematic Study on Innovative System for Chinese Agricultural Featured Clusters from Low-Carbon Perspective**

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**Abstract.** Currently, accompanied by rapid development of Chinese agricultural featured clusters, the cooperative innovation of clusters is increasing rapidly, but there also existed problems under low-carbon circumstances which prohibited the transform and upgrade for clusters. On the basis of analyzing current innovation situation of agricultural featured clusters, from the view of systematic, this thesis analyzed dynamic factors for innovation system of agricultural featured clusters, then, by introducing the triple-helix model of industrial innovation, the thesis constructed innovative system for clusters based on triple helix model. Based on these exploration, this thesis further researched the systems' actual operation from perspective of systematic dynamics research, thus probed how to strengthen the collaborative innovation of university-cluster-government, so as to accelerate the continuous innovation and development of agricultural featured clusters under the low-carbon background.

### **Introduction**

Triple Helix system has been widely accepted in developed countries, the interaction of university - industry - government in the model has also become a key innovation strategy for countries in the 21st century. In recent years, scholars such as Henry Etzkowitz, Qi Shanhong, Yan Youbing, all made research on development of triple helix model and its application in China. In view of this, starting from a systematic view, this paper drew on triple helix model principle to build the innovative system of agricultural featured clusters, then made further systematic dynamics analysis on it, so as to strengthen innovation capability and promote collaborative development of agricultural featured clusters.

### **Co-Operative Innovation Development of Agricultural Featured Clusters under Low-Carbon**

#### **Co-operative Innovation Situation of Agricultural Featured Clusters**

At present, accompanied by accelerating development of economy, cooperative innovation is becoming the concept and platform for agricultural featured clusters to promote the independent innovation. Among the agricultural processing enterprises in China, over 70% have realized the importance of sharing information resources and deepening of research cooperation, thus most of them have established the cooperative relations, including agricultural information network, deep cooperation of products processing and innovative activities of new products. Nowadays, Chinese government actively promotes scientific and technological innovation system, encourages and supports enterprises, universities, research institutions to carry out research cooperation, has initially built the raw innovation system mainly contains research institutions and universities, technological innovation system which takes enterprises as mainstay and combines production-study-research, and technological innovation system focusing on transformation of scientific and technological achievements.

Good scientific and technological innovation system and good innovation and development environment built by Chinese government, will undoubtedly have great role on the cooperation and innovation of agricultural market, thus will contribute to the in-depth development of agricultural market innovation.

### **Problems in Clusters' Innovative Development under Low-carbon Circumstances**

Currently, with the global warming being concerned and the environmental crisis aggravating increasingly, low-carbon agriculture is the sustainable development mode replacing oil agriculture. The agricultural clusters face many problems in further innovation and development, how to promote the agricultural market innovation capability as soon as possible, is the core issue to enhance and promote its transformation and upgrading.

(1) Level of cluster is relatively low, difficult to form a lasting competitive advantage. The agricultural industry in China is still in low-end of the industry, its current competitive advantage is just built on a low-cost basis, which restricts the enhance of overall competitiveness to a certain extent, and makes industry difficult to form lasting competitive advantage.

(2) Market development is lack of a comprehensive social service system and cultural networks. The agricultural cluster lacks the link performance with high levels, lacks the cooperative concept within agricultural products processing industry, and lacks human relation networks, which impede the free and efficient flow and configuration of information and resources, thus in turn constrain the improvement of innovation level.

(3) Agricultural market has relatively weak research and development process, and lacks independent innovation capability. Which mainly embody in generally small-scale enterprises in industrial clusters, relatively weak product development and talent pool, loosely structured innovation networks, and poor innovative environment.

(4) There are obvious problems in cooperation between government and enterprises, which lead to the non-balanced agricultural market development, mainly embody in that the government lacks the overall planning and guidance to industrial development, the policy measures are not in place, and doesn't create imperfect external environment.

(5) There are still outstanding problems in cooperative innovation between enterprises with research institutes and universities, which embody in, the agricultural products processing industry in China has not yet become the manufacturing base to support design and research, interaction mechanism among them is still not perfect, and research activities seriously divorce from reality, thus make the existing research results difficult to translate into practical productive forces.

### **Innovative System for Agricultural Featured Clusters Based on Triple Helix Model**

Based on the above analysis, in development process of agricultural market in China, the tripartite interaction effect among government-industry-universities is not significant, therefore, this study will introduce triple-helix model to build the innovation system for agricultural featured clusters, so as to promote innovative development of agricultural products processing industry.

#### **Principle of Triple Helix Model**

The triple helix model is introduced by Professor Henry Etzkowitz professor and Leydesdorff, they used triple helix principles in biology to explain the interactive relationship among universities, government and industries in development of knowledge-based economy. This spiral-type association was evolved from different stages of innovation, and made the above-mentioned three innovative bodies interact increasingly closely, and ultimately formed the so-called "triple helix".

Triple helix model includes three basic elements: (a) In the knowledge-based society, universities play a more prominent role in innovation; (b) The three parties will further establish cooperation relationship; (c) Each party in addition to completing their traditional functions, should assume role of other two parties. In this model, the "overlap" of universities, industries and government is the core

unit of innovation system, therefore, we can treat triple helix model as innovation networks which core is the flow of resources], which can promote innovation through internal transformation and network relationships among university—industry—government.

### Innovative System Construction of Agricultural Featured Clusters

Based on the above analysis, this paper built the development system of agricultural featured clusters based on triple helix model, so as to strengthen the collaborative development among government, industrial clusters and universities.

In the innovative system for agricultural featured clusters, clusters, government and universities tripartite constitute the interactive hybrid network organization (UIG). In this system, the agricultural featured clusters are the power sources, leading enterprises and related industries within the clusters use clusters' competitive advantages to lead the industry to high-end development; government is the governor, the role of government must shift from dominating to guiding, actively improve the resource elements and environmental factors, build auxiliary network systems such as financial institutions and industrial associations, and play a good assisting and supporting role; universities and research institutions are knowledge bases, their R & D function will be strengthened and truly combined with production, thus can use high and new technologies to transform and upgrade traditional industries (as shown in Figure 1).

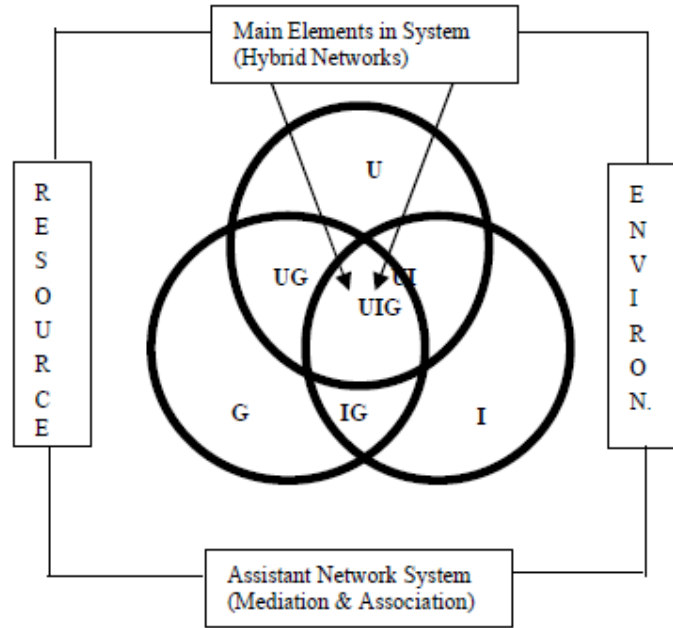


Figure 1. Innovative system for agricultural featured clusters based on Triple Helix Model.

## Systematic Dynamics Analysis on Innovative System for Agricultural Featured Clusters

### Dynamic Factors of Agricultural Featured Clusters

From a systematic point of view, the agricultural featured clusters can be seen as a system composed of multiple elements, the causal relationship of each subsystem and element, the flow and feedback of information cause and promote the innovative development of clusters. The dynamic mechanism of agricultural featured clusters is a process, in which main bodies such as associated industries, resources, enterprises, government, universities and research institutes, under the conditions of resource endowment, resource market, and external environment, coupled with each other and emerged to be strongly rooted self-organization. On this basis, the dynamics factors of the system can be summarized as three levels: main elements, resource elements and environmental elements.

As an open system, the agricultural featured clusters continuously develop and evolve through the causal relationship among various elements, information flow and feedback, and nonlinear effect, but in the actual process, the tripartite interactive effect among government, clusters and universities are not obvious.

### Systematic Dynamics Analysis on Agricultural Featured Clusters

According to the principle of systematic dynamics, the basic characteristics of positive feedback constitute self-enhancing loops of the system, in the innovative development of clusters, talent, technology, capital and market play a decisive role, whose causal feedback constitutes self-enhancing loops of the clusters system.

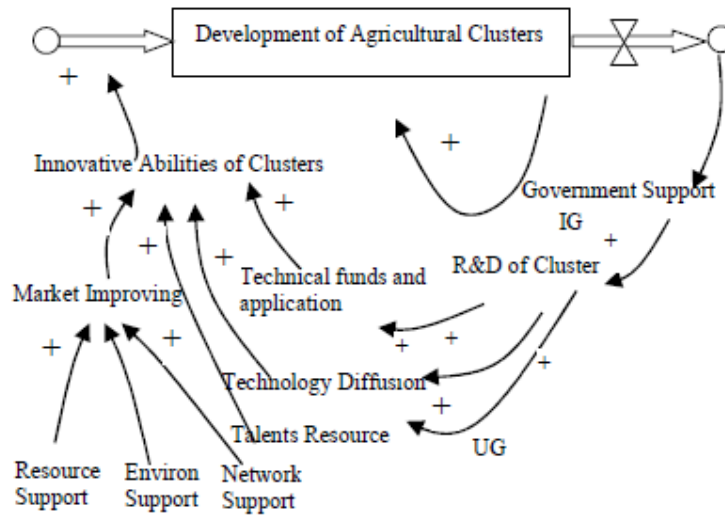


Figure 2. Dynamics analysis on innovative system for agricultural featured clusters

As shown in Figure 2, in the dynamic system, funding and policy supports of government will strengthen R & D efforts of clusters, the government-industry cooperation (IG) constitutes the funds flow of clusters' development; it will also strengthen education and training powers of universities and research institutions, thus the government-universities cooperation (UG) constitutes the talent flow of clusters development; the clusters-universities cooperation (UI) constitutes the technology flow of clusters development, which is useful to diffusion and dissemination of scientific and technological achievements; meanwhile, the resource elements, environmental factors and the secondary network system of clusters system, constitute the market flow of clusters development. These positive feedback through talent flows, technology flows, capital flows and market flows help to enhance clusters' innovation capabilities, so as to achieve the virtuous circle of continuous innovation and development for agricultural featured clusters.

### Summary

The triple helix model emphasizes the interaction of universities, clusters and government, this link provides the network architecture for innovation system on knowledge basis. Using the triple helix model, we will strengthen the cooperation of universities, clusters and government, so as to ensure the development system of clusters more coordinately and effectively function. The development system of agricultural featured clusters is the spiral dynamic process with variables work together, so in order to achieve its transition and upgrade to industrial high-end as soon as possible, we need to strengthen the collaboration among clusters, government and university, by strengthening the positive feedback of talent flow, technology flow, capital flow and market flow within clusters system, ultimately promote further innovation and development of agricultural featured clusters.

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