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# Independent Innovation System of China's Agricultural Products Processing Industry

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**Abstract** This paper introduces the importance of innovation system for agricultural products processing industry. Based on the principles of openness, dynamics, systematization, outstanding industrial characteristics and close cooperation, a diversified agro-processing innovation system is constructed. It is an innovation subject system of agricultural products processing industry which takes agricultural products processing industry as the core, independent innovation as the center, and university, scientific research institution, government, intermediary organization, financial institution and peasant as the supplements. It is also an innovation operation system of agricultural products processing industry which consists of knowledge innovation, technological innovation, knowledge propagation and application. These 4 subsystems are analyzed based on guaranteeing the basic position of agricultural products processing industry in development system, which are technology innovation extension of agricultural products processing industry, system guarantee in innovation system of agricultural products processing industry, knowledge propagation taking university as the core, and innovation service of agricultural products processing industry adapted to the law of market. Measures for innovation system of agricultural products processing industry in these 4 subsystems are also pointed out.

**Key words** Agricultural products processing industry; Independent innovation; Innovation system; China

Agricultural products processing industry refers to an innovation system including research, dissemination, services, and institutional assurance for knowledge and technology, which is composed of agricultural products processing enterprises, universities, research institutions, government, intermediaries and other innovation subjects, in order to improve the innovative capability of agricultural products. A healthy innovation system for agricultural products processing industry is of great significance to the development of agricultural products processing industry.

## 1 Importance of the innovation system for agricultural products processing industry

With the increasing competition in agricultural products processing industry and the pervasive impact of financial crisis on real economy, how to survive and develop in this adversity becomes an important issue for many agricultural products processing enterprises. It is well known that innovation is the source for the development of enterprise; and independent innovation is an important means to improve the core competitive advantage of enterprises. However, during the development history of agricultural products processing industry in China, the phenomenon of "system failure" in the process of innovation often happens, such as the lack of cooperation and connection between agricultural products processing industry and scientific research unit, public service agency, government, university and other innovation subjects, mainly reflected in the mismatch between the innovation achievement and the production capacity of processing enterprises and the market demand of products, as well as the defects in innovative information, training,

human resources and management for processing enterprises. Besides, the insufficient innovation resources in processing enterprises and the ill development of operation are also the main factors affecting the capability of independent innovation<sup>[1]</sup>. Governments all over the world, including China, adopt policies and measures to increase investment on innovation and to encourage innovation and cooperation. However, market allocation failure of innovative resources is always the premise for government participation. Hence, "government failure" may occur at the same time, so that low efficiency of innovative resources is caused. This is because innovation system of agricultural products processing industry is a systematic project with policy compatibility, stressing the complementarity of policies and the interaction of innovative elements<sup>[1]</sup>. Its essence is the institutional arrangements of innovation resources in the virtuous circulation of innovation subjects. It defines the scope of government interfering innovation activities that government should not exceed<sup>[2]</sup>.

## 2 Construction of a diversified innovation system for agricultural products processing industry

### 2.1 Principles for constructing a diversified innovation system for agricultural products processing industry

**2.1.1 Principle of openness.** Openness is an important source of innovation. No organization can possess all the resources for innovation. A good innovation is an effective integration of scientific and technological resources, human resources, operational mechanism, innovative policy and government management. Therefore, when constructing the innovation system for agricultural products processing industry, we should strengthen both knowledge flow and technology flow,

play down the concepts of department, region and membership, and stress on the openness of innovation system.

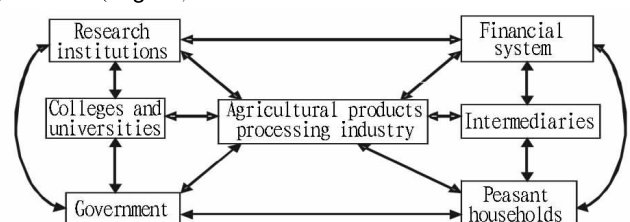
**2.1.2 Principle of the outstanding industrial features.** Agricultural processing industry is an agro-processing system with agro-processing enterprise as the main body, supplemented by university (especially agricultural university), research institution, government management departments and so on. This system is affected by agricultural resources, manufacturing resources and social and cultural factors. Thus, when constructing innovation system for agricultural products processing industry, we should take into account the characteristics and regional environment of subjects, make full use of the resource advantages of innovation subjects, and set up a competitive and cooperative innovation system with advantage complementation and bidirectional flow of the processing subjects of agricultural products.

**2.1.3 Dynamic principle.** Cooperative relations between innovation subjects should be adjusted according to the process of innovation. Operation of innovation system should be promoted by government and transformed into a market-oriented operation mode. During the early stage of the establishment of innovation system, government planning, support and promotion are needed due to the temporary and unsystematic cooperation of innovation subjects. With the operation and adjustment of innovation system and the stability of cooperation between innovation subjects, the market-oriented innovation system should take processing enterprises as innovation subjects, supplemented with government promotion.

**2.1.4 Principle of close cooperation.** Close cooperation among agricultural products processing enterprises, agricultural products processing enterprises and agricultural producers, agricultural products processing enterprises and other innovation participants is the guarantee of a successful innovation. Cooperation between agricultural products processing enterprises and other innovation subjects in fact aims to upgrade the use of internal resources and capabilities into the use of internal and external resources and capabilities of enterprises, so as to effectively reduce the research, development and sale costs, to produce cooperation effectiveness, and to share innovation risk. When establishing the innovation system for agricultural products processing industry, we should emphasis on cooperation and interaction of innovation subjects, and create environment suitable for the close cooperation of innovation subjects.

**2.2 Subject system in the innovation system for agricultural products processing industry** According to the construction principles mentioned above, learning from the relevant literature and other design for industrial innovation system, I set up a innovation subject system for agricultural products processing industry with agricultural products processing enterprise as the core, independent innovation as the center, and university, scientific research institution, government, intermediary organization, financial institution and peasant as the supplements, so as to stimulate the innovation of agricultural products processing industry, to improve the innovation ability and processing level of agricultural products, and to develop modern

agriculture (Fig. 1).



**Fig. 1 Innovation system of agricultural products processing**

Fig. 1 illustrates that innovation subjects are engaged in a wide variety of innovative activities. Agricultural products processing industry is the core, participating in development, processing and marketing of innovative product. While university and research institution are responsible for basic research related to agricultural products processing. Financial system offers the required funds for agricultural innovation. Human resources, technical services and other intermediary agencies provide agricultural innovation with intermediate service. They are the auxiliary organs for innovation system, participating in various services for agricultural innovation under the regulation of market and government<sup>[3]</sup>. Government coordinates the relationships among different innovation subjects through developing macro-innovative strategies, innovation support policy and other regulation means. It also conducts macro-monitoring on innovation activities. Peasant household, on the one hand, offers raw materials for the processing of agricultural products. On the other hand, peasant is a consumer of agricultural products. Thus, peasant household plays an important role in the innovation system of agricultural products. These interdependent innovation subjects interact with each other. And their connection and constraints depend on market mechanism and non-market mechanisms composed of national innovation strategies, regional innovation strategies, innovation system and policy system. Of the two mechanisms, market mechanism is the leading one. In order to overcome market failure, non-market mechanism of government regulation should be fully exerted; and the two mechanisms should complement each other. The function and objective of innovation system are to create, extend and use new knowledge, and to enhance the core competitiveness of innovation subjects.

**2.3 Operating system in the innovation system for agricultural products processing industry** Operating system in the innovation system for agricultural products processing industry is a network system consisted of knowledge innovation, technological innovation, knowledge dissemination and application. Knowledge and technology are disseminated between the core innovation businesses and the auxiliary innovation subject, which can not be separated from government departments offering policy, system and resource support and other service objects offering technical advice, financial services and so on<sup>[4]</sup>. Therefore, knowledge and technology innovation system, knowledge dissemination system, institution ensuring system and innovation service system are important subsystems for the operation of innovation system for agricultural products

processing industry. Among them, knowledge and technology innovation system is the core, bearing the knowledge research, technological development and application; knowledge dissemination system, institution ensuring system and innovation service system provide industrial science and technology innovation with talent, capital, systems and service guarantee. The healthy operation of innovation system for agricultural products processing industry depends not only on the operation condition of subsystems, but also on the coordination among the running subsystems.

### **3 Suggestions on constructing the innovation system for agricultural products processing industry**

#### **3.1 Ensuring the fundamental position of the innovation system for agricultural products processing**

**Main function** of the research and development system of agricultural products processing industry is to conduct research and development on the knowledge about agricultural products processing, which is not only a source for the processing and innovation of agricultural products, but also the basis of the innovation of agricultural products processing industry. According to the national conditions of China and the technological innovation characteristics of agricultural products processing industry, research subjects of agricultural product processing industry at present should include universities, research institutions, and agricultural products processing enterprises. In general case, universities and research institutions are the main bodies of the research on knowledge about agricultural products processing; and agricultural products processing industry is the technology main body. Since the majority of China's agricultural products processing enterprises are township enterprises with small scale and weak technical strength, there are no large-scale agricultural products enterprises similar to those in developed countries, which combining basic research, applied research, production and sales together. Therefore, universities and research institutions are the major knowledge and technology providers at present during the innovation of agricultural products processing in China. At the same time, they are important sources for the innovative activities of China's agricultural products processing industry. We should ensure the basic position of knowledge and technology research, increase corresponding input in innovation resources, establish perfect policy system and system protection, enhance the close cooperation of industry, university and research institution, carry out coordinated reform of research units, increase the innovation enthusiasm of scientific research institutes, strengthen the independent innovation ability of agricultural products processing enterprises, and make them become the real subjects and cores of the independent innovation.

#### **3.2 Perfecting the technological innovation extension system of agricultural products processing industry**

**Technology extension** of agricultural products processing, an intermediate link connecting the suppliers and recipients of agro-processing technology, is the key to complete technological innovation. During

this process, agricultural products processing enterprises are the developers and even the recipients of new knowledge and technology, as well as the providers of technology products. This particular status determines that agricultural products processing enterprises will inevitably be developed in accordance with the market, or will choose to accept and promote technology, which are the real main forces of technology extension. However, technology acceptance and promotion of agricultural products processing enterprises in China are affected by the restriction of scale, capital, human resources and other factors. Thus, other extension agencies are needed for joint participation and cooperation. Based on this, a diversified technology promotion system with agro-processing enterprise as the main body and other participants as the supplement should be set up according to China's national conditions. On the one hand, teaching department and scientific research department in colleges and universities can use their technological advantages to conduct test promotion, product development demonstration, technical advice, technical training and other auxiliary promotional activities. On the other hand, intermediary institution should play the role of bridge, strengthen the cooperation with production, teaching and research departments, and promote technologies with bright market prospects, high technical content, high value-added, strong industrial relevance and significant economic benefits in order to transfer into agricultural products processing enterprises and agricultural producers, and to accelerate the pace of technological innovation.

#### **3.3 Perfecting the institution ensuring system of the innovation system for agricultural products processing industry**

**Institution ensuring system** of innovation system for agricultural products processing industry takes governments at all levels as the theme, administrative function as the support, and laws, norms, policies and system as the tools. It is a system to encourage and protect the healthy operation of the innovation system for agricultural products processing industry. During the construction of institution ensuring system, works in the following aspects should be well done:

**3.3.1 Improving the macro-management mechanism of government.** In the innovation system of agricultural products processing, we should gradually improve the government's macro-management mechanism, use administrative means and market means to implement the indirect management, strengthen the interaction and cooperation of innovation system subjects through innovative planning, guidance, supervision and service, form interaction management mechanism and enhance the effectiveness of innovation. During innovation management, government should make long-term planning and annual innovation plan according to the innovation laws of agricultural products processing industry. Based on this, government can design the innovation topic, establish fair and reasonable bidding, evaluation and inspection mechanisms for the topic, and form a scientific and reasonable ensuring system for the innovation of agricultural products.

**3.3.2 Perfecting policy system to support innovation.** Policy system is needed to support the establishment of a favorable

environment for technological innovation. There exist financial, technical and other bottlenecks in the development of China's agricultural product processing industry, so that government should constitute relevant tax preference policy, human resources preference policy, financial funds support policy and other policy guarantee system. Meanwhile, government departments should gradually develop and improve the product safety management system, risk management systems, intellectual property rights system, as well as policies and related systems about technology and industry in technological innovation system, which directly promote the agricultural products processing to provide an institutional guarantee for the healthy operation of innovation system.

**3.4 Constructing knowledge propagation system with university as the core** Processing technology, management skills, and marketing techniques are needed during the innovation of agricultural products processing, as well as the corresponding technology development personnel, technicians and managers in application and promotion. During the construction of knowledge propagation system, universities, especially agricultural universities, should adjust speciality provision and personnel training mode on time according to the development needs of the innovation of China's agricultural product processing industry. They can adopt various forms to consolidate the cooperation with universities, enterprises, and research institutions at home and abroad. And it is necessary to cultivate high-level talents, and complex talents. In addition, training and guidance to peasants should be strengthened, because they are both the original suppliers of raw materials and the main recipients of innovative products. The inferiors and superiors of applied technology directly determine the effect of innovation and the degree of industrialization. Therefore, television, radio, newspapers and other media can be used to publicize new technologies to peasants, and to enhance the utilization skills of peasants<sup>[4]</sup>.

**3.5 Establishing the innovation service system for agricultural products processing industry suitable for the laws of the market** Innovation system for agricultural products processing industry is a network system providing financial and information support for industrialization, technology development, and achievements transformation. It is an important guarantee for the healthy operation of innovation system. There are problems of difficult financing, big risks and flow jam of knowledge in the technological innovation of agricultural products processing. Therefore, intermediary service organizations and service network should be developed in the aspects of technological innovation consultation of enterprises, achievements transformation of technological innovation, promulgation of public scientific and technological information and so on. As for the intermediary services, government can set up innovation center of agricultural products processing, introduce and promote new technology, support the public science and technology intermediaries, and offer information and financing services for agricultural products processing enterprises. In the fields of network construction of technological innovation for agricultural products

processing, we should set up special funds, establish innovation-related technical standards and statistical caliber, improve innovation database, speed up the network construction among universities, enterprises, and other innovation subjects, and provide innovation subjects with national policies and regulations, industry trends, scientific and technological achievements and other information services<sup>[5]</sup>.

## 4 Conclusion

In a word, innovation system for agricultural products processing industry is the major route for the sustainable development of agricultural product processing industry. It is a complex innovation system organized by various innovation activities of agricultural products processing enterprises, research institutions, financial system, intermediaries, peasants and other innovation subjects. Its operation depends primarily on running performance and integration degree of knowledge and technology innovation system, knowledge dissemination system, institution ensuring system and innovation service system, which is of great significance to the competitiveness of agricultural products processing enterprises in China and the reduction of financial crisis.

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## 生态补偿制度与土地沙漠化治理研究

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**摘要** 从生态补偿的视角分析了中国沙漠化治理中存在的问题。一是沙漠化治理缺乏生态补偿制度的保障。在厘清土地沙漠化内涵的基础上,以中国西部地区为例,分析了土地沙漠化带来的严峻后果。概述了生态补偿制度的涵义及其重要性,并介绍了国际上关于解决生态环境利益补偿问题的观点。生态补偿主要依据公共产品补偿理论和生态环境价值理论,强调利用税收实现资源外部收益的内部化。二是现行生态补偿制度的缺失导致群众治理沙地的积极性不高。介绍了国家现有的生态效益补偿的相关规定。目前,国家没有出台系统而完备的有关沙地治理生态补偿的管理办法和相关法规,治理主体的利益难以得到有效保障,从而严重挫伤了林农进行沙地治理的积极性。基于此,提出应把沙漠化治理与当地的经济紧密结合起来,以建立沙漠化治理与经济发展相互促进的长效机制。最后,探讨了沙漠化治理进程中构建生态补偿制度的几点建议。一是以科学发展观为指导,加强生态补偿立法的力度;二是进行生态补偿机制的途径创新;三是实现生态补偿机制的政策创新;四是修改《中华人民共和国防沙治沙法》,将生态补偿的具体规定加入其中,从而使土地沙漠化治理的鼓励措施法律化、具体化。

**关键词** 生态补偿制度;土地沙漠化;创新构想

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## 我国农产品加工业自主创新体系研究

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**摘要** 简述了农产品加工业创新体系的重要性,提出农产品加工业创新体系是农产品加工业持续发展的主要途径。根据开放性原则、系统性原则、突出行业特色原则、动态原则和紧密合作原则构建多元化农产品加工业创新体系,分别为以农产品加工企业为核心,以自主创新为中心,以高校、科研机构、政府、中介机构、金融机构、农户为辅的农产品加工业创新主体系统和由知识创新、技术创新、知识传播和应用构成的农产品加工业创新运行系统。农产品加工业创新主体系统的各主体相互影响,其联系和约束主要依靠市场机制和非市场机制,其运行主要取决于知识技术创新体系、知识传播体系、制度保障体系和创新服务体系的运行绩效和整合程度,因此从这4个方面提出构建农产品加工业创新体系的建议。在保证农产品加工研发体系基础地位的同时,分析了农产品加工业技术创新推广、农产品加工业创新体系的制度保障、以大学为核心的知识传播和适应市场规律的农产品加工业创新服务4个子系统,并分别提出在这4个子系统中农产品加工业创新系统良性运行的措施,这对我国农产品加工企业提升竞争能力、应对金融危机影响具有重要意义。

**关键词** 农产品加工业;自主创新;创新体系