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Selection of Technological Innovation Models for Agricultural Enterprises in Heilongjiang Province

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Abstract: Agricultural enterprises are the main operators of modern agriculture, the improvement of their technological innovation capabilities is the key to the development of modern agriculture. In recent years, the technological innovation capability of agricultural enterprises has been improved to a certain extent in Heilongjiang Province, however, there are also serious obstacles to development in the process. On the basis of analyzing the selection ideas of technological innovation models for agricultural enterprises, this article conducts a detailed analysis of the internal and external factors that affect the selection of technological innovation models for agricultural enterprises, and proposes the selection of technological innovation models for small and medium-sized agricultural enterprises and agricultural leading enterprises in Heilongjiang Province.

1. The selection ideas of technological innovation models for agricultural enterprises

When agricultural enterprises choose technological innovation models, they should make a comprehensive judgment based on factors such as enterprise development goals, overall business strategy, comprehensive strength, technological factors, industrial competition situation, and national support policies, and finally make the correct choice[1].

1.1 Enterprise development goals

Every enterprise has its own social responsibility, setting its own goals for each period based on its economic interests and market development. Generally speaking, short-term goals are mainly achieved through collaborative innovation or imitative innovation, while long-term goals require independent innovation or short-term continuous imitative innovation to maintain a sustained competitive advantage.

1.2 Overall business strategy of the enterprise

It refers to the resource allocation method at the enterprise level, which is a comprehensive and long-term planning for the survival and development of the enterprise, including centralization strategy, cost leadership strategy, and differentiation strategy. Agricultural enterprises should adopt a

cost leadership strategy through technological innovation on the basis of centralized development.

1.3 Comprehensive strength of the enterprise

It refers to the quantity, quality, and resource allocation capability of the resources owned by the enterprise, such as financial strength, scientific research strength, etc. Different enterprises have different resource scales and resource allocation capabilities.

1.4 Enterprise technology factors

It refers to what technology a company can obtain and how the obtained technology can be adapted to the existing technology of the company. The accumulation of technology within the enterprise itself, external supply, technological characteristics requirements, and the technological development trends of peers and related enterprises in the market will all be the basic factors for the next step of technological innovation of the enterprise.

1.5 Industrial competition situation

It refers to the fact that in addition to competing with competitors in a certain industry, enterprises also need to consider potential entrants, buyer bargaining power, supplier bargaining power, and substitute competition power. In addition, when analyzing their external environment and making innovative decisions, enterprises also need to consider potential entrants, the supply and digestion capacity of the upstream and downstream of the industrial chain, and then comprehensively consider before selecting specific models.

1.6 National policies

It refers that the state formulates guiding policies and supporting policies to support technological innovation in agricultural enterprises, and provides a favorable policy environment for enterprises. No enterprise can leave the macro policy environment of the country, and its development will be influenced to some extent by national policies. The guidance and support policies of the country for agriculture provide a favorable environment for the development of enterprises.

2. Analysis of Factors Influencing the Technological Innovation Model of Agricultural Enterprises in Heilongjiang Province

2.1 Analysis of External Opportunities

2.1.1 In terms of policies

The development of agricultural enterprises is facing an unprecedented opportunity. In recent years, the "No.1 Document" of the Central Government has been locked in agriculture. Against the backdrop and trend of the development strategy of synchronously promoting agricultural modernization in the deepening of industrialization and urbanization, the efforts to promote urban-rural integration and accelerate the construction of modern large-scale agriculture will continue to increase. The central policy system of strengthening agriculture, benefiting farmers, and enriching farmers is constantly improving, and the support is increasing. Heilongjiang Province has also received more policy and financial support in ecological and benefit compensation, agricultural infrastructure construction, and deep processing of agricultural products in major grain producing areas[2].

2.1.2 In terms of economy

The gross domestic product of Heilongjiang Province in 2023 will be 1588.39 billion yuan, an increase of 2.6% over the previous year. The annual growth of local finance provides strong guarantees for industry to support agriculture and cities to support rural areas, and accelerates the construction of a more solid material foundation for modern agriculture. The arrival of the knowledge economy has also provided impetus and intellectual support for the development of agricultural enterprises.

2.1.3 In terms of foreign trade

The implementation of the "the Belt and Road" strategy has expanded the trade scale between Heilongjiang Province and the countries along the route. The 15 member countries of the Regional Comprehensive Economic Partnership Agreement (RCEP) have come into full force, marking that the world's most populous, largest economic and trade scale, and most promising free trade area has entered a new stage of full implementation, adding endless impetus to the sustainable recovery and development of the regional economy. In the first seven months since the RCEP came into effect, Heilongjiang Province's imports and exports to RCEP member countries reached 12.96 billion yuan, a year-on-year increase of 27.1%. All of these have provided a favorable international environment for the development of foreign trade for agricultural enterprises in Heilongjiang Province. Heilongjiang Province, with its border advantages, has 25 national first-class ports that are open to the outside world. In 2022, the total trade import and export volume was 265.15 billion yuan, an increase of 33%, ranking fifth in the country.

2.2 Analysis of External Challenges

2.2.1 The trend of global economic integration

Large agricultural multinational corporations have entered the Chinese market one after another. Faced with the advantages of advanced technology, strong funds, high management level, and long-term accumulated international marketing experience and capabilities of agricultural enterprise groups in developed countries, agricultural enterprises in Heilongjiang Province and even across the country are facing fierce international competition[3].

2.2.2 Green trade barriers

Developed countries have established strict environmental protection technology standards, complex health and quarantine systems, or adopted green environmental labeling, green packaging systems, and green subsidy restrictions for products, forming green barriers that export countries find difficult to overcome. In addition, due to the outdated technical standards, poor environmental awareness, and insufficient experience in developing green agriculture in China's agricultural enterprises, it has seriously affected the export trade of agricultural products from Heilongjiang, even the whole country, and has affected the development of China's agricultural products and international markets.

2.2.3 The acceleration of technological progress

The acceleration of technological progress has increased the pressure on agricultural enterprises to innovate in technology. Faced with fierce competition, enterprises need to master advanced technology, develop new products, and occupy the market with technological advantages[4].

2.2.4 The increase in innovation costs

The continuous rise in prices of agricultural production materials and products has put pressure on the cost of technological innovation in agricultural enterprises.

2.3 Analysis of internal advantages

2.3.1 The advantage of resources

Heilongjiang Province has the largest arable land area and per capita arable land ownership in the country. The vast black soil is one of the only three black soil zones in the world, with flat arable land and deep plowing layers, suitable for the cultivation of high-quality food and economic crops. There are numerous rivers and lakes within the territory, with a total water resources of 81 billion cubic meters, ranking first among provinces in Northeast, North, and Northwest China, and making it the province with the most abundant water resources in northern China.

2.3.2 The advantage of technical talents

Heilongjiang Province has 41 scientific research and teaching units such as Northeast Agricultural University, Heilongjiang Bayi Agricultural Reclamation University, and Provincial Academy of Agricultural Sciences, with 47000 agricultural science and technology and extension personnel. The agricultural science and technology force is strong, and in recent years, a number of scientific and technological achievements with national advanced level have been developed.

2.3.3 The advantage of product quality

Heilongjiang Province is located in a high-altitude and cold region, with a relatively late development time. It has abundant forest, grassland, and wetland resources, a good ecological environment, and unique conditions for developing organic and green food. The certified area and total production of green and pollution-free food have ranked first in the country for many years, and safe and high-quality agricultural products have a high reputation and market share in domestic and foreign markets.

2.3.4 Advantages of industrial foundation

Heilongjiang Province has formed an agricultural product processing system mainly composed of grain, animal husbandry products, and mountain specialty products, and has a group of well-known large-scale agricultural product processing enterprise groups at home and abroad, which has a strong driving effect on the industrialization of agriculture in the province.

2.4 Analysis of internal weaknesses

2.4.1 Lack of innovation drive

In the market competition, agricultural enterprises in Heilongjiang often find it difficult to bear the long cycle of scientific and technological research and development, and are unwilling to bear the financial expenses and uncertainty risks of innovation activities. Driven by the trend of profit seeking motivation, they tend to focus more on production projects with less investment and quick results, and rarely engage in independent research and development.

2.4.2 Shortage of innovation investment

At present, most agricultural enterprises in Heilongjiang Province are small and medium-sized private enterprises in their infancy and growth stages, and the funds available for research and development are almost entirely used to maintain the normal production and operation of the enterprises. A small number of large and medium-sized agricultural enterprises have not achieved a net profit investment of 5% in their independent research and development, which is still far behind the theoretical R&D ratio of excellent companies. Moreover, many R&D investments come from government financial special investments.

2.4.3 Shortage of innovative talents

The overall income of Heilongjiang Province is relatively low compared to the south, and the added value of agriculture is also much lower than other industries. In addition, the technology research and development of agricultural enterprises often have the characteristics of high work intensity and heavy tasks. Many college graduates are unwilling to engage in agricultural related work, resulting in many talents flowing to developed areas and the secondary and tertiary industries. At present, many agricultural enterprises do not have dedicated R&D personnel and lack incentive measures for R&D activities, which naturally makes it difficult to stimulate their enthusiasm and creativity in conducting technological research and development.

3. The Selected Strategy of Technological Innovation Models for Heilongjiang's Agricultural Enterprises

Agricultural enterprises in Heilongjiang should rely on the advantages of Heilongjiang's agricultural resources and make full use of external resources to compensate for their insufficient technological innovation capabilities based on their specific situations. This article suggests choosing different technological innovation models for small and medium-sized agricultural enterprises and leading agricultural enterprises based on the scale and technological innovation capabilities of agricultural enterprises in Heilongjiang.

3.1 Selection of Technological Innovation Models for Heilongjiang's Small and Medium-sized Agricultural Enterprises

Among agricultural enterprises in Heilongjiang, nearly 70% are small and medium-sized enterprises, which are the mainstay of agricultural enterprises. These enterprises are small in scale, lack research and development funds, have low technological levels, lack innovation awareness, and face a serious shortage of innovative and technical talents, as well as dual risks from nature and the market. They often adopt a follow-up strategy and no ability to adopt independent innovation mode in the selection of technological innovation mode[5].

The vast number of Heilongjiang's small and medium-sized agricultural enterprises should mainly adopt the cooperative innovation model, supplemented by imitative innovation (it is not ruled out that some enterprises may choose the independent innovation model). The cooperative technological innovation model is based on enterprises as the main body, relying on government policy support, fully leveraging the advantages of universities and research institutes, and implementing the "government industry university research application" cooperative innovation strategy. Heilongjiang agricultural enterprises can strengthen communication and exchange with universities and research institutes inside and outside the province, such as the Chinese Academy of Agricultural Sciences, China Agricultural University, Northeast Agricultural University, and Heilongjiang Bayi Agricultural University. Based on their own situation, they can either build their own research and development

institutions, invite them to serve as technical support, cooperate with them to build laboratories and research centers, or rely on their production advantages to become their technology achievement test bases and education and training bases. The innovative approach of industry university research cooperation helps to complement each other's strengths. Through the sharing of similar resources and the complementarity of heterogeneous resources, it optimizes the allocation of industrial capital, talent capital, and technological capital, effectively integrates each other's innovative resources, shortens the technological innovation cycle, and accelerates the transformation and utilization of innovative achievements.

3.2 Selection of Technological Innovation Models for Heilongjiang's Leading Agricultural Enterprises

National leading agricultural enterprises in Heilongjiang Province have strong research funding, a strong research team, and a relatively large scale. After years of technological accumulation, they have a certain degree of independent research and development strength. Enterprises generally have their own patented products or independent intellectual property rights, strong awareness of technological innovation, and a good environment for technological innovation. And such leading enterprises have long-term and ambitious development goals, and are in a leading position in the industry. Therefore, their business strategy advocates a leading strategy, especially in key and core technologies, which require leading competitors in the same industry.

The technological innovation model of Heilongjiang's national leading agricultural enterprises should first be led by the independent technological innovation model, strengthen the independent innovation capability of these leading enterprises, continuously enhance their strength, and participate in fierce domestic and international market competition. Secondly, enterprises should adopt imitation innovation model and cooperative technological innovation model, fully utilize and reasonably allocate global resources, strengthen domestic and international technological exchanges, adopt technological innovation strategic alliances and other methods, and lead the faster and better development of agricultural enterprises in Heilongjiang Province.

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Training plan of young innovative talents for general undergraduate higher education institutions in Heilongjiang(Study on technological innovation model of agricultural enterprises in Heilongjiang，UNPYSCT-2017110)

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