

## Current situation, problems and suggestions on the development of agricultural Spin-off enterprises in China

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### Abstract

Spin-off enterprises, founded in the academic environment, are technology-based enterprises which are based on the technological achievements produced by R&D activities and are established from universities and research institutes. It is a very important method of achievements industrialization in the world. This paper analyzes the necessity of developing agricultural science and technology Spin-off enterprises, the current situation and problems of agricultural science and technology enterprises, and puts forward suggestions for the developing of agricultural Spin-off enterprises, in order to provide reference for the rapid development of agricultural Spin-off enterprises in China.

**Keywords:** agriculture; Spin-off enterprises; transformation of scientific and technological achievements

Recently, “Opinions on Several Policies and Measures for Promoting Popular Entrepreneurship and Innovation” was issued by State Council, which wants to promote mass entrepreneurship and innovation, accelerate economic restructuring and strengthen the new impetus for development. Under the background, it has become a new development trend for science and technology innovation to strengthen collaborative innovation and enhance innovation ability. As the main body of knowledge innovation, universities and scientific research institutions must actively participate in the process of technology innovation, solve the problem of technology innovation with knowledge innovation results, and actively transform knowledge innovation results into enterprises.

Under normal circumstances, the cycle in which universities and scientific research institutions engage in scientific research projects is to start with the project establishment, research results, apply for expert acceptance or appraisal, and award scientific and technological achievements and the entire process will end. However, if researchers have a certain

degree of entrepreneurship, they are very optimistic about the market value of their research results. Under the strong inner drive, they will personally establish enterprises and conduct industrial development of scientific and technological achievements (Ren Hao et al., 2018). This kind of derivative enterprise, which is closely related to universities or scientific research institutes, can effectively shorten the transformation cycle from theoretical knowledge to the economic product and is an important institutional innovation to solve the difficult problem of transforming scientific and technological achievements into industrial achievements, economic and social wealth value creation. (Chen Guanghua et al., 2017).

Therefore, Spin-Off Enterprises have achieved rapid development in all countries of the world, such as the Massachusetts Institute of Technology and its Highway 128 technology promenade phenomenon, Stanford University, and Silicon Valley phenomenon, etc. (Rao Kai et al., 2011; Peng Wei, 2009 ). In recent years, the university spin-off enterprise also got rapid development in China. As of 2017, 23

universities in China have 44 listed University spin-off companies. They are the leaders and demonstrations of university derivatives (Zhang Chenyu et al., 2017; Ren Jingxue, etc., 2013).

Under the background of “mass entrepreneurship and innovation”, creating enterprises by university students or researchers has become a hot topic. The combination of production, study and research and derivative enterprises is an important means to cultivate new economic growth points and realize the transformation of scientific and technological achievements (Wang Nuosi et al., 2012). There are still many problems in the transformation of scientific and technological achievements, the system of extension mechanism in our agriculture, resulting in a low conversion rate of agricultural scientific and technological achievements (Ren Jingxue, etc., 2013). With reference to the development experience of other industries, agricultural colleges and universities or agricultural scientific research institutions establish agricultural spin-off enterprises, and the research and development of agricultural science and technology achievements will rely on spin-off enterprises to transform their achievements. It can also be an important model to promote cooperation in agricultural production, education and research to a higher level.

## **1. PROBLEMS IN THE TRANSFORMATION AND DEVELOPMENT OF AGRICULTURAL SCIENCE AND TECHNOLOGY**

Since the 18th National Congress, the reform of the science and technology system in China has gradually advanced, with the contribution of agricultural science and technology increasing from 53.5 % in 2012 to 58.3% in 2018. However, the conversion rate of agricultural scientific and technological achievements is still at a low level. There are still many problems in the transformation of agricultural achievements and the establishment of science and technology derivative enterprises.

### **1.1 Agricultural science and technology R&D funds are mostly based on universities and research institutes, and enterprise R&D funds are insufficient**

Agricultural science and technology innovation in China is mainly concentrated in agricultural col-

leges and research institutes, and research funds are mainly invested in universities and research institutes, and investment in corporate research funds is relatively low (Wang Tao, etc., 2018; Wu Jijun et al., 2019). In 2017, the top ten landmark achievements in agriculture were all completed by institutions, and the R&D capabilities of agricultural enterprises were insufficient. Agricultural colleges and research institutes mainly use the number of papers published as the basis for the evaluation of professional titles and did not include the actual contribution of agricultural production in the selection index (Wei Jiayi, 2019). The energy of researchers mainly spends on writing and publishing research papers. There is not enough attention to the actual agricultural problems faced by agricultural and rural areas, resulting in the difficulty of direct application of R&D research and development results in enterprises and affecting the conversion rate of scientific and technological achievements (Liu Yu et al., 2018).

### **1.2 The overall level of agricultural science and technology innovation is low, and the results are more repeated at a low level**

At present, the original innovation ability of agricultural colleges and universities in China is still different from that of developed countries. In 2017, of the more than 5,000 new three-board listed enterprises in China, only 282 were agricultural enterprises, accounting for less than 6 % of the total. With variety and technology as the core technology, the competitive advantage of most new varieties is not too obvious, resulting in a low market conversion quota. Taking the development of new Apple varieties as an example, Apple breeding in China began in the 1960s, and more than 40 universities and research institutes in the northern region engaged in Apple breeding research. Since the founding of the People’s Republic of China, more than 330 new varieties have been approved and filed. However, the main varieties of Apple planted in China have mainly introduced varieties or introduced varieties of sprouts, and the comprehensive traits of self-selected varieties can not surpass the introduced varieties, which affect the conversion benefits of new varieties.

### **1.3 The competition between agricultural enterprises is fierce and the core competitiveness of products is not outstanding**

Agricultural enterprises in China are concentrated in seedlings, agricultural resources, fruit management, packaging, logistics, etc.. Most enterprises do not belong to high-tech enterprises, and benefit from the quantity and scale of their products (Wang Xianxu, 2018). In 2017, there were 136,000 high-tech enterprises in China, of which agricultural high-tech enterprises accounted for only 6.3 %. Yantai has more than a hundred enterprises, companies, cooperatives, or family farms engaged in the sale of fruit tree seedlings. Most of these companies do not have their own breeding basis. They select a series of Fuji Bud varieties through Bud selection, and basically use the red Fuji superior system. There is a lack of characteristics between varieties. At the same time, most agricultural enterprises are not aware of technology R&D and innovation, do not have independent R&D capabilities, or even give up R&D. The focus of enterprises is on the scale of seedling breeding or market promotion and development, and it is difficult to form long-term core competitiveness.

#### **1.4 The capacity of agricultural enterprise leaders is not balanced, and the level of team personnel capacity needs to be improved.**

Entrepreneurship plays an extremely important role in the growth of agricultural science and technology derivatives (Wang Zhaozhi et al., 2011). The core of the entrepreneurial ability is the ability to make judgments, that is, to make decisions based only on the information possessed under uncertain conditions. Entrepreneurship itself is a process of continuous learning. People with multiple entrepreneurial experiences will produce an “entrepreneurial thinking” that allows them to constantly discover new entrepreneurial opportunities and repeat entrepreneurship. The talents, technology, assets and other factors owned by an enterprise will not bring direct economic profits to the enterprise, but entrepreneurs can integrate these factors into tangible or intangible scarce resources that did not exist. Bring direct economic value and benefits to enterprises (Zhao Xinying 2016). According to the actual investigation, the person in charge of the agricultural enterprise has some shortcomings in the judgment and macro control ability, and the supervisory initiative is poor. The reason for the poor performance of some derivative agricultural enterprises is that they rely too much on the support of universities

and Institutes of science and technology and ignore the overall construction of the team, resulting in the inability of enterprise personnel to improve their overall ability and their core competitiveness. Eventually, it was gradually eliminated by the market.

## **2. RECOMMENDATIONS FOR THE DEVELOPMENT OF AGRICULTURAL SCIENCE AND TECHNOLOGY DERIVATIVES**

In view of the existing problems in innovation and transformation of agricultural scientific and technological achievements, the author believes that we should improve the innovation and entrepreneurship policies of universities and research institutes as soon as possible, further improve the ability of scientific and technological innovation, explore new modes of cooperation in production, education and research, speed up the transformation of scientific and technological achievements, and organize entrepreneurship policies and skills training.

### **2.1 Improve the policy of innovation and entrepreneurship landing in universities and research institutes as soon as possible**

In recent years, the State Council has issued the Opinions on Several Policies and Measures to Promote Popular Entrepreneurship and Innovation, and Shandong Province has also issued the “Implementation Opinions on Supporting and Encouraging the Innovation and Entrepreneurship of Professionals and Technicians in Institutions.” However, in the process of concrete implementation, each unit lacks specific policies to encourage research personnel to work part-time or start businesses. It is recommended that agricultural colleges or research institutes actively formulate policies and measures to promote public entrepreneurship and innovation, encourage professional and technical personnel to innovate part-time in enterprises, establish enterprises in the workplace, or leave the company to innovate and start businesses, and maintain personal relations within three years in accordance with national policies., according to the basic salary. At the same time, we will incorporate the situation of innovation and entrepreneurship into the assessment system of public institutions, make innovation and entrepreneurship target specific, attach importance

to innovation and entrepreneurship in the system, create an atmosphere for entrepreneurship, and deeply embed the concept of innovation and entrepreneurship in the minds of researchers.

### **2.2 Further enhance core innovation capabilities in agricultural science and technology.**

Agricultural production must rely on scientific and technological progress. The R&D and benefits of agricultural enterprises are closely related to industrial needs and core product competitiveness. On the basis of attaching importance to the research of agricultural theory, agricultural colleges and research institutes should focus on the key common technologies needed for agricultural production and the innovation of modern engineering technologies, and strengthen the research on new varieties and new technologies. The formation of a “market-project-research-production-market” research model is issue-oriented and strives to make the results meet the actual and market needs of agricultural production. Agricultural enterprises should have a strong sense of innovation, dare to innovate in terms of ideas, management, methods, models, culture, and technology, and make their own enterprises as large as possible.

### **2.3 Explore new modes of industrial, academic and research cooperation to accelerate the transformation of scientific and technological achievements**

To carry out the industrialization of scientific research achievements in universities and research institutes, we must rely on the hatching of agricultural enterprises. In this process, there is a need for a bridge that can build a communication platform between universities, research institutes, and enterprises. At the same time, we will explore different forms of cooperation, such as the project link cooperation model. Enterprises, universities, and scientific research institutes will make specific projects the link, sign cooperation agreements, establish cooperation relationships, and carry out commissioned research and development or joint research and development of key technologies. At the same time, we will promote a rational mechanism for the distribution of benefits from scientific and technological achievements, handle the various relationships between the transformation subjects of agricultural scientific and technological achievements,

and explore ways to establish incentives for the transformation of agricultural scientific and technological achievements. A system of benefit sharing and corresponding safeguard mechanisms shall be established for individuals, organizations and institutions that have made substantial contributions to the transformation of agricultural scientific and technological achievements.

### **2.4 Organize entrepreneurship policy and skills training**

Cultivating innovative and entrepreneurial talents is a strategic measure to continuously improve the country’s competitiveness. To promote mass entrepreneurship and innovation, we must first cultivate the awareness and skills of college students or researchers to innovate and start businesses. For entrepreneurial talents, they must have the awareness and skills of science and technology, management, quality, brand, integrity, market, culture, innovation, and finance. The lack of which skills will affect the operation of the company. The start-up education in our country’s colleges and universities started relatively late, and the knowledge of education courses is relatively shallow.

Innovation and entrepreneurship education can only be a primary enlightenment education, and it faces many problems such as few practical links, limited venues, and insufficient funds. The training cannot meet the needs of the development of innovative entrepreneurship education. Agricultural colleges and research institutes should create opportunities, conduct training in entrepreneurial ideas and skills, strengthen the cultivation of entrepreneurial consciousness, focus on process orientation, allow more college students and researchers to participate in the construction of innovative entrepreneurship bases or incubators, and set up different schools and enterprises. Realize the reserve of talents; Young scientist and technology personnel are encouraged to participate in innovation and entrepreneurship competitions and to tap outstanding innovative and entrepreneurial talents and ideas to stimulate the wisdom and creativity of hundreds of millions of people.

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