

# Rule of Law Research on Seed Intellectual Property Rights

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**Abstract:** In the context of the global economy, the rapid development of seed technology had brought unprecedented opportunities and challenges to agricultural production. Seeds, as the foundation of agricultural production, technological progress and innovation play a vital role in ensuring global food security, improving crop production and promoting agricultural sustainable development. With the advancement of agricultural technology, the research and development of seeds was also increasingly valued. Both companies and research institutions were seeking to break through the bottleneck of seed technology and provide higher quality and more competitive seeds for agricultural production. The purpose of this study was to explore the role of intellectual property protection in the development of seed industry, so as to provide scientific basis for relevant strategy formulation. It was hoped that this study could reveal the impact of intellectual property protection on the development of seed industry, provide useful reference and suggestions for strategy makers, seed industry enterprises and researchers, and promote the healthy and sustainable development of seed industry.

**Keywords:** Intellectual Property Right; Seed Industry Intellectual Property Rights; Plant New Variety Right

## 1. Basic Theory of Seed Intellectual Property Protection

### 1.1 The Basic Concepts of the Knowledge Property and Its Use in the Seed Industry

The intellectual property rights referred to the rights that people enjoyed in creating and using knowledge. intellectual property is a kind of property right based on knowledge, including patents, trademark rights, copyrights, trade secrets, and many other forms [1]. Among

them, patent rights referred to the exclusive right to a new technology, product, or method; trademark rights referred to the exclusive right to use a certain trademark; copyright referred to the exclusive right to a certain literary, artistic, or scientific work; trade secrets referred to the exclusive right to a certain commercial information or technology.

Seed intellectual property usually covers the following four aspects:

(1) Plant variety rights: For a specific new plant variety, the exclusive right to produce, sell, and other commercial uses is granted to the breeder.

(2) Patents: Seed innovation related to biotechnology or genetic engineering may be protected by patents.

(3) Brand: The seeds or technology of certain brands can be protected by a trademark to ensure the uniqueness and popularity of the brand.

(4) Trade secrets: Certain information or techniques related to seed production and reproduction may be considered trade secrets [2].

## 1.2 The Distribution of Intellectual Property Rights in Seed Industry

### 1.2.1 Domestic layout

From 1999 to 2019, the total number of applications for new plant varieties in China was 33,803, with an average annual growth rate of 25.77%, and the total number of grants was 13,595, with an average annual growth rate of 28.80%. In 2019, there were 7,032 applications for variety rights, of which 6,635 were domestic entities, accounting for 94.4%, and 397 were overseas entities, accounting for 5.6%. From 2001 to 2019, overseas entities applied for 3,045 new plant variety rights in China, and 1,148 cases were authorized. The application amount of new plant variety rights was consistent with the growth trend of China's seed imports. Affected by the negative list of seed industry investment, vegetables and

flowers that apply for the right of new plant varieties in China are mainly overseas subjects. The overseas subjects applying for new variety rights in China mainly come from the seed industry intellectual property power. The Netherlands, the United States, France, Germany, Japan, Chile and Denmark jointly accounted for 82.74% of the total applications of overseas entities in China and 88.57% of the total authorization. The distribution of overseas main countries is consistent with the source of seed import in China [3].

### 1.2.2. Foreign layout

In 2010, the international distribution of intellectual property rights in China's seed industry also increased, but the total amount was small and the global proportion was low. The United States, Japan, the Netherlands, and South Korea were the main countries in the international distribution of intellectual property rights in China's seed industry, ranking the top four in the export volume of vegetables and flower seeds in China. China's new plant variety rights account for less than 1% of the world. The top five countries in the international distribution of intellectual property rights in seed industry (the United States, the Netherlands, France, Germany, and Switzerland) accounted for 72.51% of the global applications for new variety rights. It could be seen that the intellectual property rights of China's seed industry were mainly concentrated in China, while the intellectual property rights of developed countries were mainly directed to foreign countries. The international distribution of intellectual property rights showed a highly concentrated development trend in the developed countries of seed industry, which was consistent with the trend of the international status of seed industry in various countries [3].

## 1.3 The Evolution of the Protection of Seed Knowledge Property

The concept of seed intellectual property protection originated in the mid-20th century, especially with the advancement of biotechnology and genetic engineering. The International Convention for the Protection of New Species of Plants (UPVP Convention) was established in 1961, setting the framework for the protection of plant variety rights between countries. The establishment of the UPVP Convention marks the international

recognition of plant breeding innovation and provides guidance for countries to implement intellectual property protection. In China, seed intellectual property protection started late, but it has developed rapidly in recent years. Since the late 1980s and early 1990s, China began to attach importance to intellectual property protection and gradually established a corresponding legal system [4]. In 1997, China announced the implementation of the Regulations of the People's Republic of China on the Protection of New Plant Species, providing breeders with protection for their innovative varieties. In addition, China had also joined the UPVP Convention, marking the country's integration with the international community in the protection of plant variety rights. At the same time, however, China faced challenges in intellectual property protection, such as how to balance the rights of breeders and the interests of farmers, and how to ensure the preservation of biological species. In recent years, with the development and application of genetically modified organisms (GMOs) technology in China, the issue of seed intellectual property protection has become more complicated. In general, whether it was global or specific to China, the protection of seed intellectual property rights was constantly developing and improving. It not only encouraged technological innovation and ensured the sustainable development of agriculture, but it also brought a series of social, economic and ecological challenges that required the joint efforts of all parties to find a balance.

## 2. The Impact of Seed Intellectual Property Protection on the Development of Seed Industry

### 2.1 Current Situation of Seed Intellectual Property Protection in China

In recent years, the state has attached great importance to the high-quality development of agriculture and seed industry, focusing on the improvement of the comprehensive production capacity of seed industry and the comprehensive competitiveness of seed industry market. It has continuously strengthened the protection of intellectual property rights in seed industry, and at the same time, it has once again emphasized the main position of seed industry enterprises in

innovation, providing a strong policy guarantee for the construction of a legal system for the protection of intellectual property rights in seed industry with Chinese characteristics. The basic policies and norms for the protection of intellectual property rights in China's seed industry have been gradually established, such as the outline for the construction of a strong country with intellectual property rights (2021-2035), the No.1 document Nongfa [2022] No.1, the action plan for seed industry rejuvenation, and the guiding opinions on protecting the intellectual property rights of seed industry, cracking down on counterfeit and inferior license plate and creating a good environment for seed industry rejuvenation. At present, China has made great efforts to build a relatively complete legal system of intellectual property rights in the seed industry, and has issued and implemented relevant laws and regulations. Such as the Regulations of the People's Republic of China on the Protection of New Plant Species, the Rules for the Enforcement of the Regulations on the Protection of New Plant Species (Agriculture Part) (Forest Part), the Seed Law of the People's Republic of China, the Regulations on the Treatment of Infraction of New Plant Species Right (2003), the Administrative Enforcement Methods for the Protection of New Forest Plant Species, and the Civil Code of the People's Republic of China. In addition, the Supreme People's Court strengthened the protection of intellectual property rights in the seed industry and issued the Notice on the Trial of New Plant Species disputes.(Fa [2001] No.18), the Interpretation of Several Questions on the Trial of New Plant Species disputes (Fa Shi [2001] No.5), the Supreme People's Court's Several Regulations on the specific application of law in the trial of disputes over new plant varieties (Fa Shi [2007] No.1), and the Several Regulations on the specific application of law in the trial of disputes over new plant varieties (II)(Fa Shi [2021] No.14), etc. The competent department of agriculture, rural areas, and forest and grassland under the government sector issued 11 batches of agricultural plant variety protection lists and 8 batches of new forest plant variety protection lists. In order to adapt to the new requirements for the protection of intellectual property rights in seed industry, the Seed Law of the People's Republic of China was revised twice in 2015

and 2021, both of which took the protection of intellectual property rights in seed industry as an important content, expanded the protection scope of new plant variety rights, expanded the protection links, established a substantial derivative variety system, and strengthened the compensation responsibility for damages caused by copyright encroachment. The patent law of the People's Republic of China, the anti-unfair competition law of the People's Republic of China, the trademark law of the People's Republic of China, and the criminal law of the People's Republic of China also provided intellectual property protection for the seed industry from the perspective of different categories of intellectual property rights. China had also joined the International Convention for the Protection of New Plant Species, which had basically achieved international standards for the protection of intellectual property rights in seed industries.

At present, the intellectual property protection of China's seed industry has achieved remarkable results, but the problem of using fake seeds and "imitation seeds" is still prominent. It not only violates the legitimate rights and interests, but also restrains independent innovation. It also brings potential hidden dangers to agricultural production and seriously affects national food security. From the side, it reflects that the protection mechanism of new plant varieties in China is not perfect. As the intellectual property protection system lagged behind the development needs of the seed industry, the purification effect of intellectual property protection on the development environment of the seed industry was getting weaker and weaker. The number of applications for new plant variety rights in China has ranked first in the world for four consecutive years. More than 70% of the main crop varieties have been authorized and protected, but the number of seed industry copyright incidents has increased significantly. 2016-2020 In 2010, the number of cases involving new plant varieties that were concluded by the courts nationwide increased from 66 to 252, of which more than 80% were cases of copyright infringement. To purify the development environment of seed industry, we must keep pace with the times and improve the intellectual property protection system of seed industry.

## 2.2 The Positive Impact of Protecting Seeds 'IP

The protection of intellectual property was not only a legal issue, but also the key to economic, cultural and social development. Incentives for innovation: The intellectual property system encouraged research and innovation. Knowing that their innovation would be protected and profitable, developers and creators were more willing to invest time, energy, and money in research and development. Business value: intellectual property results often represent the core competitiveness of an enterprise. For example, patents or trade marks could enhance the market position of a company and bring huge economic benefits. Cultural and social value: intellectual property is not only about the economy, but also the cornerstone of cultural and social development. The protection of artists and creators ensured a multiculturalism and a creative society [5].

With the acceleration of the global process and the development of science and technology, intellectual property played an important role in all walks of life, and this influence was even more prominent in the seed industry. Seeds were the foundation of agricultural production. Their scientific research, breeding, and innovation undoubtedly had a profound impact on agricultural production and food safety. In this process, intellectual property played a key positive role, especially in technological innovation, investment incentive, and market order.

## 2.3 The Negative Effects of Protecting Seeds 'Knowledge Property

As intellectual property protection gained more and more attention worldwide, the seed industry was no exception. However, this protection mechanism not only brought about the positive effects of technological innovation and market order, but also some negative effects. This paper focuses on the problems that the protection of seed intellectual property rights may bring about in the market, farmers' rights and interests, and the biological variety. First of all, regarding market monopoly, the original purpose of intellectual property protection was to encourage innovation and protect the rights and interests of researchers. However, in reality, some large seed companies used intellectual property rights to restrict the research and development and sales

of certain seeds by other small companies or research institutions through legal means, thus achieving market control and monopoly. For example, by protecting a particular seed gene or reproductive technology through patents, large companies could effectively prevent other competitors from entering the field, thus forming market barriers. A market monopoly would not only lead to an increase in seed prices, but it could also negatively affect the quality and variety of seeds. In an environment devoid of competition, large seed companies may lack the motivation to continue innovation and improvement, while consumers and farmers are forced to accept the limited choices they provide. In addition, regarding farmers' rights and interests, farmers' freedom of planting may be restricted. In some countries, the intellectual property rights of seeds have reached the point where farmers can no longer use the seeds they grow in their own homes to replant. This was a huge change for many traditional farmers. Farmers have been accustomed to preserving a portion of their crops for the next year's seeds, but in the context of strong intellectual property protection, this practice may be regarded as patent violation [6]. Lastly, regarding the issue of biological variety, excessive intellectual property protection could threaten the biological variety of crops. From a long-term ecological perspective, biological variety was a key factor in maintaining the stability and health of the ecosystem. However, excessive seed intellectual property protection could lead to a decline in the genetic variety of crops. In order to pursue economic benefits, large seed companies may focus their resources on developing and promoting several crop varieties with high economic value, resulting in the alienation or abandonment of other local or traditional varieties. Not only does this result in the loss of world agricultural heritage, but crops that lack genetic variation are also more vulnerable to threats when they encounter disease or climate change[7]. In short, although intellectual property protection played an important role in encouraging seed technology innovation, its negative effects could not be ignored. In order to ensure the sustainable development of the seed industry, governments and international organizations needed to study this issue in depth and formulate corresponding strategies and

measures.

### 3. Positive Analysis

#### 3.1 Case Study: A Case Study of Seed IP Protection and Seed Industry Development in China

In recent years, China has gradually strengthened the importance of seed intellectual property protection. The policy clearly supported the research and development of seed technology. At the same time, it also supervised foreign seed companies to ensure the healthy development of the domestic seed industry. In recent years, the Chinese government has invested a lot of money to support domestic seed research and development, successfully cultivating a number of high-quality rice, wheat, and corn varieties protected by intellectual property rights. At the same time, the government also strengthened the supervision of foreign seed companies to ensure the healthy development of the domestic seed industry. China aimed to build an intellectual property rights system for seeds that was in line with international standards, encourage technological innovation, and pay attention to protecting the interests of farmers.

According to the cases of judicial protection of seed industry intellectual property rights announced by the Supreme People's Court in the past three years, the seed intellectual property rights have the following characteristics:

(1) The impact of the seed fraud cases was greater and the increase was faster. In April 2023, the Supreme People's Court issued the third batch of 15 typical cases of judicial protection of intellectual property rights in the seed industry. The proportion of cases of seed license fraud was relatively large, accounting for 80% of the total. It mainly included two specific forms. One was the typical seed license fraud, which directly used one's own seed to apply the name of another person's seed or applied the name of another person's seed to one's own seed, which were essentially "fake seeds"; The other way was to modify and improve other people's seed varieties and become the owner of the variety. Therefore, in order to better protect the economic benefits of the seed industry's creators, the courts at all levels in judicial practice increased the

application of punitive damages and imposed heavier punishments within the legal range to fully compensate the economic losses of the right holders. For example, the case of the new variety of corn plant 'Yufeng 303' was the dispute between Beijing Lianchuang Seed Industry Co., Ltd. and Wu Moushou, which reflected the judicial concept and judicial orientation of comprehensively protecting the interests of the variety right holders according to law. It was clarified that the violator should still be responsible for compensation for losses even if the pirated reproductive materials were deactivated.

(2) Criminal cases of selling fake seeds were increasing year by year. In the judicial practice, it was still difficult to investigate and collect evidence for illegal and criminal acts such as counterfeit and inferior products, license plate fraud, etc., and it was difficult to file a case for investigation and transfer judgment, which seriously affected the innovation environment of seed industry. In order to better solve these problems, strengthen the effective connection between administrative law enforcement and criminal justice, and promptly transfer cases suspected of committing crimes to the public security organs for handling, the people's court must severely punish criminal cases of selling fake and inferior seeds according to law, strictly investigate the source of fake and inferior seeds, the transaction price, conduct loss identification and explain the identification methods, and accurately determine the facts of the crime according to law.

(3) The use of e-commerce online platforms and other digital media to violate the intellectual property rights of seeds is increasing day by day. In recent years, the rapid development of e-commerce had brought about a high number of intellectual property rights. Due to the difficulty of property preservation in intellectual property rights violation cases, the difficulty of obtaining personal identity information of e-commerce operators, and the low cost of violating intellectual property rights on e-commerce platforms, the difficulty and cost of rights protection increased. The above-mentioned situation caused the cost of rights protection in the seed knowledge production area of the e-commerce platform to be relatively high, and the phenomenon of violation of rights could

not be stopped.

### 3.2 Analysis results: main findings based on the research

Through the positive analysis of China's seed intellectual property protection and seed industry development, the following five main findings can be obtained:

(1) With the increasing complexity and specialization of seed technology, how to protect research and development results, prevent technology from being stolen or illegally copied, and how to ensure that the efforts of companies and researchers were properly rewarded had become important issues facing the seed industry. This also meant that in the context of global trade, the importance of intellectual property protection in seed industry was becoming increasingly prominent. The protection of intellectual property rights, especially the protection of seed intellectual property rights, is not only a legal and economic issue, but also a major issue related to global food safety, agricultural production, and the healthy development of seed industry [8].

(2) IP protection could motivate developers to carry out more innovation and research because they knew that their efforts and results would be properly protected and rewarded.

(3) The protection of intellectual property rights also helped maintain fair competition in the market and prevent improper market practices, such as fake and inferior seeds entering the market and harming the interests of farmers.

(4) The protection of intellectual property rights could also promote the exchange and cooperation of seed technology between countries, because countries and enterprises were more willing to share and transfer technology in an environment with good intellectual property protection.

(5) The protection of intellectual property rights also brought some negative effects in the seed industry. For example, excessive intellectual property protection could lead to a monopoly in the seed market, limiting farmers' planting choices and rights. In addition, for some developing countries, the high cost of intellectual property rights may hinder their access to advanced seed

technology.

## 4. Strategy Suggestions

### 4.1 Balance Interests: Ensure that Intellectual Property Rights on Seeds Encourage Innovation while Protecting Farmers and Ecological Species

With the development of technology, intellectual property protection became the key to promoting seed industry innovation. However, this did not mean that the rights of farmers and the value of ecological variety could be ignored. For this reason, this study puts forward the following three suggestions:

(1) Encourage open innovation: Seed companies should be encouraged to participate in open R & D cooperation and share some of the R & D results to stimulate broader technological innovation.

(2) Protect farmers' 'right of use': When formulating intellectual property policies, it is necessary to clarify farmers' right of use of seeds, especially traditional seeds, to ensure that they can preserve and exchange seeds without restrictions.

(3) Protection of ecological variety: encourage the development of diverse crop varieties, reduce dependence on a single high-yield variety, promote crop variety, and enhance the stability of the ecosystem.

### 4.2 Strengthening Regulations: Enhancing the Enforcement and Efficiency of IP

An effective intellectual property protection system was inseparable from a strong supervision system. In order to ensure the authority and fairness of intellectual property rights, the following suggestions are worth considering:

(1) Establishment of specialized agencies: It is recommended to establish a specialized seed intellectual property management and enforcement agency, which is responsible for handling the application, review, authorization and dispute resolution of seed intellectual property rights.

(2) Technology support: Use modern technology, such as blockchains, DNA fingerprints, etc., to track and verify the origin and legitimacy of seeds.

(3) Public education: strengthen intellectual property education for farmers and the public through various channels, so that

they understand and respect intellectual property rights and reduce copyright abuses.

#### **4.3 International Cooperation: Strengthening Cooperation and Conversation on Seed IP within a Global Framework**

The issue of seed intellectual property rights was not just a national issue, but a global issue. Therefore, cooperation between countries was particularly important.

(1) Establishing an international dialogue mechanism: It is recommended that countries establish a regular seed intellectual property dialogue mechanism under the framework of existing international organizations, such as the World Trade Organization and the International Seed Testing Association [9].

(2) Sharing of research and development results: encourage seed research and development cooperation between countries and share research and development results, especially for those varieties that are aimed at solving global problems, such as drought resistance, disease resistance, nutritional enhancement, etc.

(3) Harmonize regulations and policies: promote the coordination of regulations and policies on seed intellectual property rights between countries to reduce possible obstacles in cross-border seed transactions and cooperation [10].

#### **5. Conclusion**

Crops seed industry was the foundation to promote the long-term stable development of agriculture and ensure national food security. The development of seed industry has made an important contribution to improving the comprehensive agricultural production capacity, ensuring the supply of agricultural products and increasing farmers' income. Seeds are the key to China's food security. With the application of new technologies such as gene editing, big data, artificial intelligence, and high-density molecular marker-assisted breeding in seed industry innovation, new requirements have been put forward for intellectual property protection. At present, China has formed a batch of independent scientific research achievements and patent intellectual property rights of seed industry. At

the same time, there are also problems such as the comprehensive service system of seed industry intellectual property rights is not perfect, the protection ability is insufficient, and the means to prevent and resolve intellectual property disputes in seed industry are limited. In short, the protection of seed intellectual property rights not only involved technological innovation and economic benefits, but also involved farmers' rights and interests and ecological richness. In the future development, it is necessary to strengthen cooperation with world organizations such as the World intellectual property organization, add technology and innovation support centers, introduce international intellectual resources, form an intellectual property layout that accurately serves the main body of seed industry innovation, and explore the development of new agricultural plant genes, new varieties of foreign applications or transfer matters, and other innovative international businesses. Therefore, comprehensive consideration was needed to formulate reasonable policies to ensure that the protection of seed intellectual property rights could not only strengthen the protection of seed industry development, but also bring more extensive social, economic and ecological benefits.

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