

# Exploring The Development of China's Seed Industry Under the Legal Empowerment

Shumiao Gao \*

College of Humanities and Development Studies, China Agricultural University, Beijing, China

\* Corresponding Author Email: 2022312040110@cau.edu.cn

**Abstract.** This study aims to explore the impact of legal empowerment on the development of the Chinese seed industry. Firstly, it pays special attention to the comparative analysis of plant breeding intellectual property protection models. Through an in-depth study of the legal systems for the protection of new plant varieties in China, the U.S. and Europe, the current status of intellectual property rights in the domestic and international seed industry is systematically analyzed, and targeted policy recommendations are put forward to promote the development of China's seed industry. Secondly, the paper discusses the implementation status of the 1978 and 1991 Conventions of the International Union for the Protection of New Varieties of Plants (UPOV) and its implications for the innovation of the Chinese seed industry. Finally, the study provides important references for seed industry enterprises to avoid risks in R&D and international trade, and provides theoretical basis for government departments to formulate relevant policies.

**Keywords:** International Treaty on the Protection of New Varieties of Plants (UPOV); Right to Protect New Varieties of Plants; Chinese Seed Industry; Comparison of Laws and Regulations.

## 1. Introduction

This paper systematically studies the current situation of intellectual property rights in the seed industry at home and abroad through a comparative analysis of the protection modes of plant breeding intellectual property rights [2] in China, the United States, and Europe in the light of the International Treaty on the Protection of New Varieties of Plants (UPOV) [1] 1978 and 1991 Conventions. This study focuses on analyzing the legal framework of the right to protect new plant varieties [3] and its impact on the innovation of the Chinese seed industry and exploring how to enhance the international competitiveness of domestic seed industry enterprises [4] through legal means. The study categorizes the intellectual property protection models of different countries and analyzes and evaluates the impact of the legal environment on the research and development [5] and international trade of seed industry enterprises. Through in-depth research on international conventions, targeted policy recommendations are put forward, aiming to provide practical references for governments and enterprises in seed industry protection [6]. In summary, this paper systematically analyzes the legal path of the development of China's seed industry and provides an important theoretical basis and practical guidance for seed industry enterprises to avoid the risk of import and export intellectual property rights as well as government policy making.

## 2. Comparative Analysis of Intellectual Property Protection Models for Plant Breeding in China, the U.S. and Europe

### 2.1. Separation Mode

China currently adopts a “separation model”, whereby plant varieties and non-biological breeding methods are protected by plant variety rights and patents respectively. The new plant variety right protects the results of plant breeding and extends downstream to the substantial derivative varieties through the substantial derivative variety system, while the breeding patent only protects the non-biological methods of producing plants and the non-propagating materials of plants; the two do not overlap with each other, nor are they interconnected. The whole breeding process leaves many vacuums where IP protection is not possible, such as newly acquired plants or propagating materials.

Thus, new plant variety rights and breeding patents in China can be seen as “separate models” that do not touch each other.

## **2.2. Complex Mode**

The United States has adopted a “composite model” that combines patents and plant variety rights to provide more comprehensive protection for plant breeding innovations. The U.S. can grant utility patents, plant patents and plant variety protection certificates to plant varieties in three ways for multiple composite protection. Breeders are free to choose one or a combination of the three types of intellectual property rights in order to fully protect their intellectual achievements in breeding.

## **2.3. Dual-Track Model**

Europe adopts a “dual-track model”, i.e., patent protection and plant variety rights protection in parallel, but is more cautious in patent protection, with clear limitations on patent protection for plants. The EU adopts a compulsory selection model, i.e. the new plant variety protection system provides protection for inventions and innovations of plant varieties, and the invention patent system provides protection for plant inventions other than plant varieties. For a breeding intellectual achievement, the breeder must make a compulsory choice between plant variety rights and patent rights. If it constitutes a plant variety, it is excluded from patenting and can only be protected by variety rights; if it does not constitute a plant variety, it cannot be granted plant variety rights and can only be protected by patents. Patents and plant variety rights in Europe do not overlap with each other and complement each other, forming a “dual-track model” of intellectual property protection for plant breeding, which not only realizes the full coverage of the two types of intellectual property rights on the breeding technology, but also avoids the overlapping of multiple types of intellectual property rights for the same breeding results.

## **2.4. Comparative Analysis**

Comparative study of the intellectual property system of plant breeding technology in the United States and European developed economies found that the United States plant breeding intellectual property protection “composite model” can fully safeguard the rights and interests of breeders, but the same technology is easy to cause a variety of intellectual property rights of the type of overlap and duplication, for the subsequent use of intellectual property rights, infringement litigation and so on, bringing greater pressure. Pressure. The “dual-track model” of IPR protection for plant breeding in Europe can fully cover all kinds of intellectual achievements in the breeding process, but also avoid the duplication and over-expansion of the types of rights.

At present, in China's plant breeding industry, new plant variety rights and patents are not effectively connected, and there is a vacuum in intellectual property protection. The “separate mode” of protection of new plant variety rights and patents is insufficient to safeguard the rights and interests of breeders and promote the scientific and technological progress of the seed industry. Therefore, China needs to innovate in the protection of intellectual property rights in plant breeding and explore a model suitable for its own development.

### **2.4.1 Improvement of Laws and Regulations**

With the rapid development of seed science and technology, the existing laws and regulations may not be able to fully meet the new challenges and needs. China's current “separation model” leaves many vacuums in the entire breeding process where intellectual property protection is not possible. Therefore, China can learn from the European “dual-track model” and further strengthen the protection of specialized laws. Specifically, it can amend the Regulations for the Protection of New Varieties of Plants, the Seed Law, the Regulations for the Protection of New Varieties of Plants and other relevant laws and regulations to expand the scope of protection, extend the period of protection, and increase the penalties for infringement of rights, enhance the adaptability and foresight of the law, effectively protect the breeder's innovations, stimulate their innovation enthusiasm, and provide a

more solid rule of law for the protection of breeding innovation. In terms of patent law, China can learn from the experience of Europe to further clarify the scope and standards of protection for plant production methods, cells, tissues and organs of plants, as well as genes and vectors. It can also extend the protection period of the patent law appropriately to better protect the rights and interests of breeders.

#### 2.4.2 Strengthening Administrative Enforcement and Judicial Protection

China can strengthen the construction of law enforcement teams for intellectual property rights in the seed industry, improve the professional quality and law enforcement capacity of law enforcement officers, and at the same time, at the judicial level, set up additional specialized intellectual property courts, establish a case guidance system, and unify the standards for judicial decisions. The Supreme People's Court regularly releases typical cases of judicial protection of intellectual property rights in the seed industry, guides the trial practice of courts at all levels through specific cases, unifies the adjudication standards, and improves the transparency and predictability of judicial protection. The Chinese government can strengthen regulatory and law enforcement activities in the seed industry, regularize special rectification, and use big data and other new technological means to strengthen the supervision of seed production bases. In addition, it can innovate regulatory methods, especially for the regulation of seeds sold on e-commerce network platforms, in order to cope with new sales patterns and challenges. In addition to administrative enforcement and judicial protection, China can encourage the resolution of intellectual property disputes in the seed industry through arbitration, mediation and other non-litigation methods to reduce judicial pressure and improve the efficiency of dispute resolution. In addition, the efficiency and authority of judicial protection can be improved by setting up intellectual property courts to centralize the hearing of IPR cases in the seed industry.

#### 2.4.3 Strengthen International Cooperation and Protection

China can strengthen cooperation with Europe as well as other countries to jointly study and solve problems and challenges in plant breeding IPR protection. Through international cooperation, we can share experiences, learn from each other and jointly promote the development of plant breeding IPR protection. China can actively participate in the activities of international organizations such as the International Union for the Protection of New Varieties of Plants (UPOV), promote international mutual recognition of new plant variety rights, and strengthen cooperation and exchanges with other countries in intellectual property protection.

### 3. Analysis of the Possibility of China's Accession to UPOV 1991

#### 3.1. China's Current Membership in UPOV 1978

China joined the International Union for the Protection of New Varieties of Plants (UPOV) in 1999, and the number of UPOV plant variety right applications will peak in 2021 (Fig. 1), thanks to the large number of applications and grants in Asia.

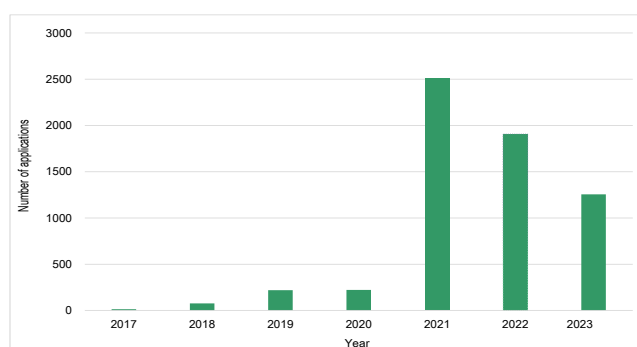
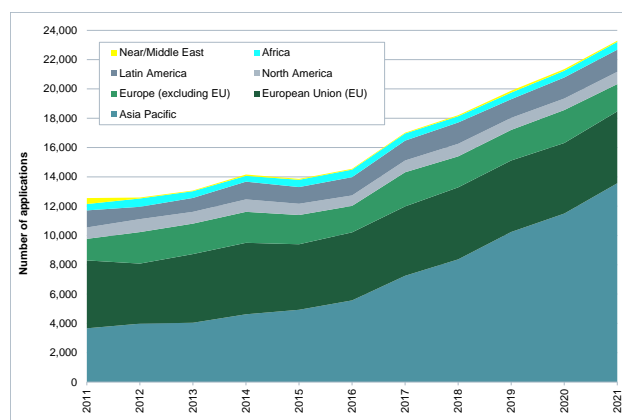


Fig. 1 Applications in UPOV PRISMA in the first nine months of 2023



**Fig. 2** Plant breeder's rights applications - by region

The Convention for the Protection of New Varieties of Plants (UPOV Convention) is an important international agreement for the protection of the rights and interests of breeders, and China acceded to the 1978 text of UPOV in 1999, becoming the 39th member of UPOV. China's protection of new plant varieties has made great progress, especially the number of applications for authorization has grown rapidly and ranked high in the international arena. As shown in Fig. 2, compared with the strong countries in the seed industry, the internationalization of China's new plant variety protection is insufficient, and the level of international protection of plant variety rights is obviously low, with gaps such as the small number of non-nationals applying for and granting licenses, the relatively low number of applications abroad, the narrow scope of the protected genera, and the small number of participation in the cooperation of international examination and testing.

### 3.2. Comparison of the 1978 and 1991 Texts of the UPOV Convention

The system of protection of new plant varieties originally originated in Europe, and China acceded to UPOV (1978 text) on April 23, 1999, and began to accept domestic and foreign applications for new plant variety rights.

According to the analysis, there are mainly the following differences between the 1991 Text and the 1978 Text:

#### 3.2.1 Changes in the Number of Plant Varieties Protected

The scope of protection has been expanded from the name recording in the 1978 text to the protection of all species in the 1991 text. 1978 Convention stipulates that member states joining UPOV must protect varieties of at least 24 genera or species within 8 years, while the 1991 Convention requires member states to expand the scope of protection to all plant genera or species within 10 years and agree to protect "all plant genera and species". The 1991 Convention requires member states to extend protection to all plant genera or species within 10 years and agrees on the interpretation of "all plant genera and species".

#### 3.2.2 Changes in the Scope of Protected Plant Varieties

The scope of variety rights was extended in the 1991 text to cover all aspects of the use of varieties, including both harvested material and directly processed products. the 1978 Convention protected only the propagating material itself, allowing varieties authorized in one country to be taken for use in another country that did not protect the variety, and the final product to be exported to the country of origin. However, the 1991 Convention provides protection for this situation. Specifically, if the propagating material is derived from the use of unauthorized propagating material and the holder of the variety right does not have a reasonable opportunity to exercise the rights associated with that propagating material, the variety right must be extended to the harvested material and processed products of that propagating material.

### **3.2.3 Changes in the Duration of Protection of Protected Plant Varieties**

In the 1978 text, the term of protection was 15 years for plants in general and 20 years for woody plants such as forest trees and fruit trees. In the 1991 version, the term of protection was changed to 20 years for plants in general and 25 years for woody plants.

### **3.2.4 Protection of Substantial Derivative Varieties**

Substantial derivative varieties are varieties that have some but not significant differences between the new varieties introduced by the breeder and the original varieties that have been granted protection of variety rights. The breeder can apply for protection of this variety, but must obtain a license from the owner of the variety right of the original variety, and the license needs to cover the variety right of the new variety as well. UPOV believes that this addresses the negative impact of the phenomenon of parasitic breeding on the interests of variety right holders.

## **3.3. Adaptation of Relevant Domestic Legislation on New Varieties of Plants to UPOV**

This section analyzes the possibility of China's accession to UPOV 1991 and the legal matters that need to be taken into account, taking into account China's relevant legal documents in the field of protection of new plant varieties.

### **3.3.1 On the Number of Protected Plant Varieties**

China has implemented a list of protected plant varieties. The Ministry of Agriculture (MOA) has issued ten batches of agricultural plant variety protection lists involving 138 plant genera or species.<sup>18</sup> The Forestry Bureau (FB) has issued six batches of forestry plant variety protection lists involving 206 plant genera or species.<sup>19</sup> It can be said that in practice the range of plant genera and species protected in China is much larger than that required by the 78th UPOV, but there is still some way to go before reaching the requirements of the 91st UPOV. If the 1991 text is acceded to, then it is necessary to provide variety right protection for all plant genera within five years of accession.

### **3.3.2 Relevant Provisions on the Scope of Protection of Variety Rights**

China's Regulations stipulate that “the term of protection of variety rights shall be 20 years for lianas, forests, fruit trees and ornamental trees, and 15 years for other plants from the date of authorization”. It can be seen that China's provisions on the term of protection are slightly longer than those of the 78th edition of the Regulations, but there is still a gap between the 91st edition of the Regulations and the 91st edition of the Regulations.

### **3.3.3 Provisions on the Scope of Variety Rights**

The amendment of Article 28 of the Chinese Seed Law focuses on the expansion of the scope of variety rights and protection, and the changes in this article are mainly reflected in the following three aspects.

#### **(1) Expanding the Scope of Protection of New Plant Varieties**

The scope of protection is extended from the propagating material of the authorized varieties to the harvested material obtained by using the propagating material of the authorized varieties without permission. Any harvested material obtained by using the propagating material of the authorized varieties without permission shall obtain the permission of the owner of the right to the new varieties of plants.

#### **(2) Extension of the Protection of New Plant Varieties**

Compared with the original Seed Law, the new Seed Law expands the protection links of variety rights from four to eight, and adds five links of “treatment for propagation, promise to sell, import, export and storage”, which extends the protection chain of new plant varieties.

### **(3) Establishment of Substantial Derived Variety System (EDV)**

Essential Derived Variety (EDV for short) refers to the varieties substantially derived from the original varieties, or the varieties derived from the substantial derivatives of the original varieties, which are distinctly different from the original varieties and, except for the differences in traits caused by the derivation, are identical to the original varieties in terms of the expression of the basic traits generated by the original varieties' genotypes or combinations of genotypes. identical to the original variety. Generally speaking, it refers to the derivative varieties selected from the modification and improvement of a bred variety. With the advancement of breeding technology, it is possible to produce substantial derivative varieties through mutation breeding, transgenic, gene editing and other methods.

## **4. The Impact of the International Plant Variety Protection System on Enterprises and Their Responses**

### **4.1. Impact of the International Plant Variety Protection System on International Seed R&D**

The implementation of the International Plant Variety Protection (IPVP) system, which provides legal security for breeders' intellectual property rights on a global scale, has had a significant incentive effect on international seed research and development (R&D). By ensuring that breeders have exclusive rights to the new varieties they produce for a limited period of time, the PVP system not only helps to recoup R&D investments, but also promotes sustained technological innovation and advances in agricultural science and technology. In addition, the system promotes international technical exchanges and cooperation, provides breeders with broader markets and opportunities for cooperation, and facilitates the dissemination and development of global agricultural science and technology.

In order to further promote the development of seed R&D and international trade, it is necessary to continuously optimize and improve the new plant variety protection system. Reducing the cost of rights protection and improving the efficiency and fairness of legal protection will help to incentivize more breeders to participate in seed research and development, as well as enhance the competitiveness of seed products in the international market. Governments and international organizations play a key role in promoting the improvement and enforcement of the new plant variety protection system and need to balance the rights and interests of breeders, biodiversity conservation and farmers' rights in order to achieve sustainable development of global agriculture.

### **4.2. Impact of the International Plant Breeder's Rights Protection System on International Seed Trade**

The International Plant Variety Protection (IPVP) system sets a series of basic rules for seed trade, including the definition of a new variety, the scope of breeders' rights, the duration of protection, and the legal consequences for infringement. The 1978 version of the UPOV clarifies the definition of a new variety, requiring that varieties possess novelty, specificity, consistency, and stability, and ensures that only varieties that meet these conditions can receive protection. Second, breeders are granted a range of exclusive rights, including control over the production, marketing, export and import of their new varieties, usually for a period of protection of 20 years, which helps breeders to reap financial rewards from their R&D investment. At the same time, the system takes into account the interests of farmers by allowing them to use protected seeds for propagation purposes but restricting them from selling these seeds commercially. Ensuring that only varieties that meet specific conditions are allowed to enter the market, the new plant variety protection system improves the quality and safety of seed products, thus promoting fair competition in the market. In addition, the system encourages international technical exchanges and cooperation, enabling the global dissemination of breeding techniques and new varieties, and promoting the advancement and application of agricultural science and technology.

Comparing the two texts of the UPOV Convention, the 1978 text provides a preliminary international standard for the protection of new plant varieties, which helps to harmonize the legal requirements of countries in the seed trade and reduces uncertainty in international trade. The 1991 text, on the other hand, builds on and expands on this foundation, providing stricter standards of protection, including protection for substantially derived varieties and limitations on farmers' privileges. These changes have resulted in stronger protection for breeders globally but have also increased compliance requirements and legal risks in international trade.

#### **4.3. Risk Avoidance for Businesses under the International Plant Breeder's Rights Protection Framework**

The risks faced by companies under the international plant variety rights protection framework are mainly related to IPR infringement, increased compliance costs and legal uncertainty in international trade. Enterprises need to adopt a series of strategies to protect their rights and interests and ensure the smooth operation of their business.

First, companies should enhance their learning and compliance with the Plant Breeder's Rights protection system. This includes in-depth knowledge of the UPOV Convention and the specific legal requirements of the member countries that are the subject of international trade transactions. Enterprises should ensure that all aspects of their R&D, production and sales comply with the requirements of relevant laws and regulations, so as to avoid legal proceedings and economic losses caused by infringement. In addition, enterprises should pay close attention to the latest development and changes in the protection system of new plant variety rights in order to adjust their strategies and operations in a timely manner.

Secondly, enterprises should establish a sound internal compliance system, including the formulation of detailed compliance policies and procedures, the training of employees in IPR protection, and the conduct of regular compliance audits. Through these measures, enterprises can reduce the risk of infringement due to mismanagement and improve their ability to respond to potential legal issues.

Third, when engaging in international trade, enterprises should fully assess the legal environment and the level of protection of new plant variety rights in their target markets. This may require enterprises to work with specialized legal advisors to ensure the legality and security of the transaction. At the same time, enterprises should consider adopting appropriate contractual protection measures, such as specifying IPR clauses in contracts, providing for dispute resolution mechanisms, and setting appropriate compensation clauses.

In addition, enterprises should actively participate in international cooperation and exchanges, and jointly promote the improvement and development of the protection system of new plant variety rights through cooperation with international organizations, industry associations and other enterprises.

Finally, enterprises should consider adopting diversified market strategies to spread risks. This includes developing multiple markets, cultivating diverse varieties, and exploring different business models. In this way, enterprises can reduce their dependence on a single market or variety, thereby maintaining business stability and growth in the face of the challenges posed by the new plant variety rights protection system.

## **5. Conclusion**

Through a comparative analysis of the intellectual property protection models of plant breeding in China, the United States and Europe, and in light of the framework of the International Union for the Protection of New Varieties of Plants (UPOV) 1978 and 1991, this paper discusses in depth the key role of law in promoting the development of innovation in China's seed industry. This study emphasizes the importance of legal empowerment in enhancing the international competitiveness of China's seed industry and puts forward constructive suggestions for China's accession to UPOV 1991.

In addition, specific measures are proposed for Chinese seed enterprises, aiming to enhance learning and compliance with the plant variety rights protection system, establish a compliance system, and assess the legal environment in international trade. Enterprises should actively participate in international cooperation to promote the development of the new plant variety right protection system. The significance of this study is to provide theoretical support and practical guidance for the legal framework and policy formulation of China's seed industry, and at the same time to provide practical paths for seed enterprises to avoid intellectual property risks and enhance market competitiveness.

## References

- [1] YANG Hongqi, XU Lanjie, YU Yongliang, et al. Discussion on the protection mode of new plant varieties and development countermeasures in China [J]. *China Seed Industry*, 2022, (07):1-5. DOI: 10.19462/j.cnki.1671-895x.2022.07.043.
- [2] TENG Wenjing, ZHANG Bin, ZHONG Hui. Development history of plant molecular breeding industry and intellectual property protection in China [J]. *China Seed Industry*, 2024, (10):4-7. DOI: 10.19462/j.cnki.zgzy.20240722001.
- [3] Introduction to the Protection of New Plant Varieties [J]. *Zhejiang Forestry Science and Technology*, 2023, 43(04):62.
- [4] Zhang Xi. Study on the economic benefits of R&D inputs and outputs of Chinese seed industry enterprises [J]. *Molecular Plant Breeding*, 2024, 22(23): 7960-7965. DOI: 10.13271/j.mpb.022.007960.
- [5] Shao Yan. Research on the influencing factors of scientific and technological innovation in China's seed industry [D]. Henan University of Finance and Politics, 2022. DOI: 10.27113/d.cnki.ghncc.2022.000525.
- [6] Yang Chenguang. Study on the infringement determination of new plant variety right [D]. Zhongnan University of Economics and Law, 2023. DOI: 10.27660/d.cnki.gzczu.2023.000380.