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Patent Protection for Plant Varieties in Vietnam: The Key to Success for the Digital Transformation of the Agricultural Sector

Abstract

Patent protection plays a crucial role in fostering innovation and facilitating the application of technology in agricultural production. In Vietnam, where agriculture remains a vital sector in the national economy, the development and implementation of technologies related to plant breeding, propagation, cultivation, harvesting and postharvest processing are of strategic importance – particularly in the context of accelerating digital transformation. However, the current legal framework primarily focuses on plant variety protection for newly created varieties, while the protection of technological processes associated with plant variety development through patent law has not been fully utilized. This underutilization limits the incentives for innovation and weakens the link between research outcomes and practical applications in the agricultural sector. Drawing on international experiences from countries such as Israel and China, where patent systems are effectively integrated into agri-tech development policies, this study examines the role of patent protection in enhancing the technological capacity of Vietnam's agricultural sector. The analysis highlights how the combination of strong intellectual property regimes, increased investment in research and development, and effective

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collaboration among the state, research institutions, and enterprises can serve as a catalyst for agricultural digitalization. The paper concludes by proposing legal and institutional reforms to improve the patent protection of plant-related technological innovations, aiming to promote sustainable, innovation-driven growth in Vietnam's agriculture and contribute to a successful digital transformation of the sector.

KEYWORDS: agricultural digitalization, plant variety, intellectual property, patent protection

1 The Role of Agriculture in Shaping Vietnam's Economic Development Orientation

Over the nearly four decades since the inception of the Renovation reforms, agriculture has consistently served as a cornerstone of Vietnam's socio-economic development. The sector not only ensures national food security for a population approaching 100 million, but also functions as a critical stabilizing pillar of the national economy during periods of crisis – particularly in the face of global economic volatility, natural disasters or epidemics. The agricultural sector has maintained stable growth, averaging approximately 2.8 to 3% per year over the past decade, thereby reinforcing its strategic importance in the country's overall development trajectory.[1] This has contributed to maintaining balance within the economic structure and mitigating the adverse impacts of external crises. Even in 2024, the agriculture, forestry and fisheries sector continued to record positive growth of 3.27%, contributing approximately 5.4% to the total value added of the national economy. Although the rate of labor in this sector has declined in structural terms, it still accounts for approximately 27% of the total national workforce, reflecting the sector's enduring role as a sustainable source of livelihood for rural areas (General Statistics Office of Vietnam, 2025).[2]

1 Le Minh Hoan, "Vị thế nông nghiệp Việt Nam sau gần 40 năm tiến hành công cuộc đổi mới" *Communist Review*, 11 March 2025. https://www.tapchicongsan.org.vn/web/guest/kinh-te/-/2018/1061702/vi-the-nong-nghiep-viet-nam-sau-gan-40-nam-tien-hanh-cong-cuoc-doi-moi.aspx. [accessed: 9.8.2025].

2 General Statistics Office of Vietnam, "Báo cáo tình hình kinh tế – xã hội quý IV và năm 2024" Ministry of Finance, January 2025. https://www.nso.gov.

Vietnam's agriculture is no longer merely a traditional production sector; it has been, and continues to be, a driver of new growth through increasing product value, expanding exports and fostering the development of global value chains. In 2024, the total export turnover of agricultural, forestry and fishery products reached USD 62.4 billion, representing an 18.5% increase compared to the previous year, with a trade surplus of USD 18.6 billion – the highest level ever recorded.[3] By 2030, Vietnam aims to be among the world's top 15 agricultural exporters.[4] To achieve this goal, the agricultural sector must continuously improve crop varieties, production processes and supply chain management, with innovation and intellectual property serving as central pillars.

In addition, agriculture plays a crucial role in the strategy for poverty reduction, job creation and social welfare assurance, particularly in rural, mountainous or remote areas. The agricultural sector accounts for a significant proportion of the national labor force and serves as a nurturing environment for the development of cooperatives, small and medium-sized enterprises and production – consumption linkage models. These linkages foster the modernization of rural areas.

In the context of the digital economy becoming an inevitable trend, agriculture is expected to be among the pioneering sectors in digital transformation. The application of advanced technologies, such as the Internet of Things (IoT), artificial intelligence (AI), blockchain, geographic information systems (GIS), smart sensors and e-commerce in the production and distribution of agricultural products has yielded positive results. These innovations have contributed to improving productivity, product quality, traceability and competitiveness in the international market.

Furthermore, the agricultural sector holds a pivotal position in the national strategy for a circular economy and green growth. The reuse of agricultural by-products, the integration of production with environmental

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vn/bai-top/2025/01/bao-cao-tinh-hinh-kinh-te-xa-hoi-quy-iv-va-nam-2024/. [accessed: 10.8.2025].

[3] Thanh Tra, "Xuất khẩu nông lâm thủy sản năm 2024 – Kỷ lục mới, vị thế mới" *Nhan Dan Online*, 20 December 2024, https://nhandan.vn/xuat-khau-nong-lam-thuy-san-nam-2024-ky-luc-moi-vi-the-moi-post851502.html. [accessed: 9.8.2025].

[4] Resolution No. 19-NQ/TW of the 5th Plenum of the 13th Central Committee, dated June 06, 2022 "On Agriculture, Farmers and Rural Areas to 2030, with a vision to 2045" and Decision No. 150/QĐ-TTg of the Prime Minister, dated January 28, 2022, "Approving the Strategy for Sustainable Agriculture and Rural Development for the 2021-2030 Period, with a Vision to 2050."

protection and adaptation to climate change have become core elements in action programs at both ministerial and local levels. In this process, investment and protection of intellectual property rights for research-based products, particularly plant varieties, are considered one of the "key enablers" to ensure sustainable development and innovation in the digital era.

From the above analysis, it is evident that agriculture is not only an essential economic sector of Vietnam, but also plays a strategic role in shaping a sustainable, inclusive and modern economic development model. In this context, plant variety patent protection policies should be regarded as a critical tool for enhancing innovation capacity, attracting investment, and promoting comprehensive digital transformation in the agricultural sector.

2 Vietnamese Legal Framework on the Protection of Plant Varieties

Under Vietnamese law, plant varieties are protected solely through provisions on rights to plant varieties as prescribed in the Law on Intellectual Property 2005. According to Article 158, a plant variety shall be eligible for protection if it simultaneously meets the following conditions as prescribed by law: novelty, distinctness, uniformity, stability and an appropriate denomination.[5] A plant variety that meets these requirements shall be granted a protection title upon the request of its owner to the Department of Crop Production and Plant Protection. Once the protection title is issued, the owner is entitled to a set of rights, including the right of commercial exploitation, the right over harvested materials, the right to prohibit others from using and the right to dispose of the protected plant variety.[6] The term of protection for a plant variety protection title is twenty-five (25) years for woody plants and woody vines, and twenty (20) years for other plant varieties, counted from the date of issuance of the protection title.[7]

5 Article 158 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

6 Article 186 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

7 Article 169.2 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

In addition to the Law on Intellectual Property, the provisions of the Law on Biodiversity 2008 (amended and supplemented in 2018) establish a legal framework for the protection of plant varieties in Vietnam, particularly through principles and mechanisms for the conservation and sustainable utilization of genetic resources, including endemic and valuable plant varieties. According to Article 4, access to, exploitation, and use of genetic resources must be permitted and accompanied by an obligation to share benefits with the State and relevant communities. Integrating these provisions with the plant variety protection mechanism under the Law on Intellectual Property holds significant importance. Specifically, when entities engaged in research and breeding enter into contracts for access to genetic resources and benefit-sharing, the issuance of a protection certificate for a new plant variety serves as a critical catalyst for promoting transparent benefit-sharing. This regulation aims to prevent the indiscriminate exploitation and use of genetic resources for breeding new plant varieties while establishing a legal mechanism to ensure that economic benefits derived from the commercialization of plant varieties are reinvested into activities supporting biodiversity conservation and development, as well as aiding local communities providing the genetic resources, while safeguarding the exclusive exploitation rights of plant breeders. Furthermore, Articles 55 to 62 of the Law mandate that access to genetic resources (including plant varieties for research or commercial production) must be authorized and conducted through benefit-sharing contracts to ensure a balance of interests among plant breeders, farming communities, and the State. These domestic legal provisions align with the Nagoya Protocol 2010 on Access to Genetic Resources and Benefit-Sharing, to which Vietnam is a party. Thus, the integration of plant variety protection with mechanisms for genetic resource access and benefit-sharing not only fosters innovation in agriculture, but also contributes to sustainable development, harmonizing the interests of researchers, communities, and the State.

The advantage of Vietnam's legal framework on plant varieties is the establishment of a specialized legal system tailored to their biological characteristics, while maintaining consistency and avoiding conflicts with international regulations, such as the 1991 UPOV Convention (International Convention for the Protection of New Varieties of Plants) and the TRIPS Agreement.[8] The extension of protection rights to harvested materials

[8] Article 27.3.b of the TRIPS Agreement: "Members may also exclude from patentability:

enhances the capacity to prevent infringements at multiple stages of the production chain. This mechanism contributes to encouraging the breeding and development of new varieties suited to Vietnam's ecological and social conditions, thereby improving the productivity and quality of agricultural products. At the same time, the clear stipulation of protection terms and conditions builds trust for entities investing in plant breeding, thus fostering the development of new, high-yield and high-quality varieties.

However, alongside the benefits brought by the legal provisions on plant variety protection, several significant limitations remain. Specifically, the registration process for protection is often lengthy, with the requirement for technical testing (DUS)[9] consuming considerable time and resources, creating difficulties for farmers and small enterprises. Furthermore, latent conflicts persist between the rights of plant breeders and the rights of farmers to use traditional varieties. In particular, granting breeders exclusive rights to exploit new varieties may limit farmers' access to seeds, especially when such varieties are developed from genetic resources that already exist in traditional agricultural production. This raises the issue of balancing the promotion of innovation with the protection of farmers' rights and traditional farming practices.

Under the current legal framework in Vietnam, the scope of protection does not extend to plant breeding processes, which constitute a key factor in maintaining and enhancing the innovation capacity of the breeding sector. The absence of protection for such processes not only diminishes incentives for long-term research investment, but also creates a legal gap in safeguarding the legitimate rights of entities engaged in plant breeding. In practice, breeding processes, although potentially incorporating advanced technical solutions, novel technologies and a high degree of creativity, are not independently protected as patents under Article 59.6 of the 2005 Law on Intellectual Property, but rather only as part of the protection granted

(a) diagnostic, therapeutic and surgical methods for the treatment of humans or animals;
(b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement."

[9] Article 3.5 of Decree No. 79/2023/ND-CP: "Technical testing (hereinafter referred to as DUS testing) means the testing of the distinctness, uniformity, and stability of a plant variety."

to plant varieties themselves. This legal limitation renders it difficult to secure direct protection for technological achievements in breeding, such as gene-editing techniques, polyploid breeding and tissue culture. Consequently, competitors may employ similar processes to create different plant varieties without infringing existing rights, thereby intensifying competitive pressures and further reducing incentives for innovation.

Therefore, it is necessary to establish a mechanism allowing for the combination or supplementation of plant breeding process protection in the form of patents. Such a mechanism would ensure comprehensive protection for both the plant variety and the associated breeding technology, while at the same time maintaining a balance between breeders' rights and the broader interests of the agricultural sector.

Patent rights fall under the category of industrial property rights and are governed by Chapter VII of the 2005 Law on Intellectual Property. A patent is defined as a technical solution in the form of a product or process that resolves a specific problem through the application of natural laws[10]. To be eligible for a patent, an invention must satisfy the criteria of novelty, inventive step and industrial applicability. Protection in the form of a utility solution patent requires only novelty, industrial applicability and non-obviousness to a person skilled in the art.[11] The term of protection for a patent is 20 years from the filing date, while that for a utility solution patent is 10 years from the filing date.[12]

In the agricultural sector, the scope of patent protection plays a crucial role in the process of generating propagating materials, notably including asexual propagation techniques, polyploid breeding, gene editing and tissue culture. In parallel, protection for harvested materials is equally significant, encompassing technologies for mechanized harvesting, post-harvest handling and storage. Overall, the protection of these processes directly safeguards core technologies, prevents unauthorized replication and facilitates the recovery of research costs. This is particularly important given that research expenditure often constitutes a substantial proportion of costs in high-tech plant breeding and agricultural production.

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10 Article 12.4 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

11 Article 58 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

12 Article 93 of the Law on Intellectual Property 2005 (amended and supplemented in 2009, 2019, and 2022).

The patent protection mechanism has the advantage of providing broad coverage, encompassing both products and processes. This facilitates the development of new technologies, promotes mechanization and incentivizes the automation of production. In particular, process protection addresses the "gap" in the plant variety protection regime, which only protects the final result (the new variety) and purely biological processes, but does not extend to the underlying technology used to create it. Such protection helps prevent the replication of processes to produce similar or identical varieties without infringing upon plant variety rights. However, the requirements for patent protection are considerably stricter than those for plant variety protection, particularly with respect to novelty and inventive steps. Many domestic agricultural technologies fail to meet these standards, as they involve only minor improvements to pre-existing technologies.[13] The costs associated with patent registration, maintenance and enforcement are relatively high, requiring financial capacity and legal expertise that farmers or small enterprises often find difficult to meet. In practice, the number of agricultural patent applications in Vietnam remains limited, with the majority originating from multinational corporations or large research institutions.[14] This situation increases the risk of dependence on imported technologies and reliance on the terms of technology transfer from foreign entities.

13 Philip A. Jackman, Blaž Vculek, "Seeds of Innovation: Cultivating Tomorrow's Growth through Robust Intellectual Property Safeguards for Novel Plant Varieties," *Sterne Kessler Goldstein & Fox PLLC*, 1 December 2023. https://www.sternekessler.com/news-insights/publications/seeds-of-innovation-cultivating-tomorrows-growth-through-robust-intellectual-property-safeguards-for-novel-plant-varieties/. [accessed: 10.8.2025].

14 Nhi Anh, "Số lượng sáng chế của chủ thể Việt Nam chỉ bằng 1/7 so với chủ thể nước ngoài" *VnEconomy*, 29 March 2024. https://vneconomy.vn/so-luong-sang-che-cua-chu-the-viet-nam-chi-bang-1-7-so-voi-chu-the-nuoc-ngoai.html. [accessed: 10.8.2025].

3 International Experience

In the context of digital agricultural transformation, the registration of intellectual property rights, particularly patents and plant variety rights, plays a pivotal role in promoting the development of crop-based agriculture by safeguarding research outcomes and creating competitive advantages. Agriculture, however, is a value chain that spans from seed production, cultivation and harvesting to post-harvest processing. Therefore, to comprehensively assess the current status of protection and utilization of patents in this sector, it is appropriate to categorize them into three main groups: plant varieties, cultivation technologies and post-harvest technologies. Such categorization enables a comparative evaluation of the effectiveness of patent protection among China, Israel and Vietnam, while also allowing for the identification of best practices from the former two countries in terms of research investment and effective exploitation of intellectual property assets in agriculture.

3.1. China: Plant Variety Protection and AgriTech Patent Framework

Over the past decade, China has emerged as the leading country within the UPOV system in terms of the scale of plant variety protection (PVP) registrations. According to UPOV data from 2023, China received 16,184 PVP applications, accounting for 55.7% of the total number of applications worldwide, demonstrating its dominance in the protection of new varieties among UPOV member states.[15]

With respect to agricultural inventions, patent landscape reports published by WIPO identify China as one of the principal drivers of AgriTech growth, particularly in sub-sectors related to mechanization and autonomous equipment, the Internet of Things (IoT) and sensors, as well as post-harvest supply chains. Globally, over 3.5 million patent families in the broader AgriFood domain have been published over the past two

15 World Intellectual Property Organization, *World Intellectual Property Indicators 2024: Plant Variety Highlights*, 2024, https://www.wipo.int/web-publications/world-intellectual-property-indicators-2024-highlights/en/plant-variety-highlights.html. [accessed: 11.8.2025].

decades, of which AgriTech accounts for approximately 60% (~2.1 million) and FoodTech for 40% (~1.5 million). However, only around 12% of these constitute international patent families, reflecting the tendency of innovation chains to target domestic markets, especially in Asia and China. Within this landscape, the segment of *autonomous devices in precision agriculture* has experienced an average annual growth rate of 10.4%, with China ranking among the leading sources of patent output alongside the United States and Germany.[16] In the specific domain of post-harvest sensors, patent data analysis reveals a marked increase since 2014, with the majority of patenting activity originating from Asia and China emerging as the leading granting authority. This trend reflects the region's technological capabilities in quality monitoring of agricultural products, preservation, packaging and the integration of artificial intelligence into post-harvest processes.[17]

To achieve these accomplishments, China has established an exceptionally robust legal framework, including:

> Firstly, the amended Law on Seed of China, effective as of 1 March 2022, expanded the scope of Plant Breeders' Rights in accordance with the UPOV standards. The revision introduced legal protection not only for propagating material, but also for harvested material and incorporated the system of Essentially Derived Varieties (EDV) into the national legislation.[18]

Secondly, the Regulations on the Protection of New Plant Varieties (2025), comprising 8 chapters and 49 articles, introduce a number of significant amendments. Notably, the scope of protection has been expanded from being limited solely to propagating material to also include harvested products; the term of protection has been extended from 20 to 25 years for trees and vines and from 15 to 20 years for other plant varieties. The Regulations also clarify the guidance for determining Essentially Derived Varieties

16 World Intellectual Property Organization, *Patent Landscape Report – Agrifood: Autonomous Devices in Precision Agriculture*, 2023. https://www.wipo.int/web-publications/patent-landscape-report-agrifood/en/7-autonomous-devices-in-precision-agriculture.html. [accessed: 12.8.2025].

17 Željko Kevrešan et al., "Insights from a Patent Portfolio Analysis on Sensor Technologies for Measuring Fruit Properties," *Postharvest Biology and Technology*, 2024. https://www.researchgate.net/publication/376916406_Insights_from_a_Patent_Portfolio_Analysis_on_Sensor_Technologies_for_Measuring_Fruit_Properties. [accessed: 12.8.2025].

18 ChinaIPR, *China's New Seed Law: Reflection of PVP Expansion and EDV Inclusion*, 2022. https://www.chinaipr.com/2022/.

(EDVs) and increase the penalties for infringements of Plant Breeders' Rights. In particular, if propagating material is used without authorization to produce harvested products, Plant Breeders' Rights protection shall still apply, except in cases where the right holder had no reasonable opportunity to exercise their rights at the propagating material stage.

Thirdly, the Judicial Interpretation II, which is issued by the Supreme People's Court of China (SPC), further clarifies and provides detailed guidance on the application of the Law on Plant Breeders' Rights. This document introduces several noteworthy innovations: (i) it explicitly defines the farmer's privilege, allowing farmers to use harvested propagating materials for replanting on their own farmland for non-commercial purposes; (ii) in certain circumstances, it shifts the burden of proof for infringement to the alleged infringer, thereby easing the evidentiary burden for rights holders; and (iii) it permits the application of the technical benchmark comparison method in dispute resolution, assisting in determining the uniformity and stability of plant varieties. These provisions not only aim to increase deterrence against infringement, but also help reduce litigation costs, thereby facilitating more effective protection of breeders' rights.[19]

Finally, the legal framework fosters AgriTech innovation. China's Patent Law (amended in 2021, effective June 01, 2021) introduced a number of provisions aimed at strengthening the protection and utilization of patents, thereby creating strong incentives for the high-tech agriculture (AgriTech) sector. Key amendments include: (i) reinforcing the principle of good faith in the registration, application and exploitation of patents; (ii) enhancing penalties for infringement, including the application of punitive damages of up to five times the assessed amount; (iii) allowing the extension of patent terms if the examination process is delayed due to objective causes; and (iv) introducing an open licensing mechanism to encourage the sharing of patents where statutory conditions are met. In addition, the Patent Law Implementing Regulations (2023) and the prioritized examination guidelines clearly identify fields eligible for fast-track protection, including food security, post-harvest technology, seed materials and digital agriculture. The prioritized examination mechanism plays a key role in shortening

19 Mark Cohen, "China's New Judicial Interpretation on Harmonizing Plant Variety Protection with IP Reforms and Agricultural Policy" *China IPR*, 10 October 2021. https://www.chinaipr.com/2021/10/10/chinas-new-judicial-interpretation-on-harmonizing-plant-variety-protection-with-ip-reforms-and-agricultural-policy-in-chinas-new-judicial-interpretation/. [accessed: 12.8.2025].

the patent processing cycle: from 2013 to 2017, the number of prioritized examination requests increased by an average of 30% annually, reaching 18,855 requests in 2017; by 2018, the figure had risen to 34,673. With this mechanism, the examination period for patents in priority fields such as AgriTech can be reduced to as little as 03 to 06 months, helping to swiftly bring new technologies into production and commercialization.[20]

3.2. Israel: High-Tech Agricultural Ecosystem Closely Linked to PVP and Patents

Israel has developed high-tech agriculture on the foundation of being "water-scarce but technology-rich": precision irrigation, smart greenhouses, environmental sensors-data systems, along with an institutional framework that encourages R&D and strong IP protection. Regarding plant variety protection (PVP), Israel is governed by the Plant Breeders' Rights Law 5733-1973 and related subordinate legislation; the basic protection term is 20 years, while for trees and vines it can be up to 25 years, consistent with UPOV practices. The competent authority clearly defines the scope of rights and registration procedures, thereby creating legal certainty for plant breeders.

In the patent pillar, Israel's Patents Law 5727-1967 establishes the examination-publication-opposition sequence; notably, the pre-grant opposition period is three months from the date of acceptance publication, in principle non-extendable helping shorten the lag in bringing technology to market compared with many other systems. The opposition procedure applies uniformly to all related claims, creating an inter partes check mechanism while avoiding delays in grant timelines.[21]

The science-innovation ecosystem is the decisive foundation. The Volcani Center (National Agricultural Research Organization) under the Ministry of Agriculture, with constituent institutes on agricultural engineering, soil-water-environment, plant protection, post-harvest and food

20 Armstrong Teasdale, "2020 Amendments to China Patent Law" *Armstrong Teasdale Thought Leadership*, December 22, 2020. https://www.armstrongteasdale.com/thought-leadership/2020-amendments-to-china-patent-law/. [accessed: 12.8.2025].

21 Section 30 Patents Law 5727-1967 of State of Israel.

technology, serves as Israel's "knowledge factory" for agriculture. On the applied side, Netafim originating in the Negev desert (1965-1966), which is marked the invention-commercialization milestone for drip irrigation and still leads global precision irrigation; at the same time, Israel maintains a wastewater reuse rate of nearly 90% for agriculture-institutional-technical infrastructure rare worldwide, enabling endogenous demand for water-saving technologies.[22]

In terms of funding and application-filing promotion policies, the Israel Innovation Authority (IIA) operates multiple support programs for AgriTech/Agrifood R&D: grants of up to 50% of R&D costs (plus 10% in development zones), mega-fund/technology-incubation programs for startups, and bilateral cooperation funds, such as SIIRD (Israel – Singapore). The co-funding mechanism – paired with an obligation to repay based on revenue – lowers the cost barrier to patent/international (PCT) filing for SMEs, accelerating the commercialization of irrigation, sensor, robotics, and farm-data-analytics technologies.[23]

Regarding IP activity intensity, WIPO national profile statistics show Israel's high patenting intensity in measurement technology, ICT, and medical-pharmaceutical fields; in agriculture, these platforms translate directly into sensor-, data-, and irrigation/micro-climate-control-based AgriTech. Combined with a stable PVP legal framework and short opposition timelines, Israel's ecosystem creates a "fast loop" from research to protection to pilot deployment to market, allowing planting and post-harvest solutions (handling, storage, cold logistics, AI/sensor-based sorting) to enter production with low delay.[24]

Policy implications for Vietnam: (i) Design a fast-track route for patents serving food security, irrigation-sensors-greenhouses-robotics, coupled with opposition within a fixed timeframe similar to Israel; (ii) establish IIA-style co-funded R&D programs for AgriTech/Agrifood, prioritizing field trials (pilot) and providing financial support for PCT applications; (iii) strengthen post-harvest research capacity (cold chain, quality sensors,

22 Israel Ministry of Agriculture, About Plant Breeders' Rights, n.d. https://www.agri.gov.il/. [accessed: 13.8.2025] presents the 20/25-year protection term and the scope of rights.

23 Ibidem.

24 World Intellectual Property Organization, *Intellectual Property Statistics Country Profile – Israel*, 2023. https://www.wipo.int/edocs/statistics-country-profile/en/il.pdf. [accessed: 12.8.2025].

digital traceability) via specialized centers closely linked to businesses, to shorten the "last mile" between exclusive rights and application.

4 Policy Implications

Experiences from China and Israel demonstrate that a successful protection model for high-tech agriculture must operate simultaneously on two legal pillars: (i) plant variety protection and (ii) patent protection in AgriTech/Agrifood.

China has established a comprehensive legal framework with priority examination and adjudication mechanisms, expanding the scope of protection from propagating material to harvested material, introducing stricter penalties and issuing judicial guidelines to reduce the costs of rights enforcement. Israel, despite its smaller agricultural scale, has optimized the effectiveness of protection by extending the PVP term, implementing a centralized registration system and maintaining reasonable farmer exemptions, alongside robust research-commercialization support programs.

However, expanding the protection of breeding processes in the form of patents carries the risk of conflict with the right to access genetic resources, particularly where traditional varieties or native germplasm are used. Patent rights, by granting exclusive exploitation, may restrict farmers' access to technology, thereby impacting food security and biodiversity. This necessitates the harmonized coordination of intellectual property law, biodiversity law and international instruments such as the UPOV Convention 1991, the TRIPS Agreement and the Nagoya Protocol 2010.

From a practical standpoint, international experience also underscores that the effectiveness of patent protection is strongly shaped by natural conditions, cultivation practices and production structures. Vietnam, where farmland is fragmented, topography is mountainous and the proportion of perennial crops is high (coffee, pepper, rubber, durian) is difficult to implement large-scale mechanization as Brazil or the United States. Therefore, innovation should target locally adapted solutions, for example, small-scale coffee harvesters for the Central Highlands or sensor-robot systems for fruit orchards on steep terrain. Patent application should cover all three stages: pre-harvest (mini tillers, precision seeders, pest- and disease-resistant varieties), harvest (harvesters, robotic pickers, ripeness

sensors) and post-harvest (processing lines, vacuum packaging, deep-cold storage). The case of Vietnam losing durian export market share to China due to failure to meet post-harvest processing and preservation standards is a clear demonstration of the link between innovation capacity, IP protection and international competitiveness.

Policy implications for Vietnam include: (i) establishing a fast-track examination mechanism for patents serving food security, smart irrigation, sensors, greenhouses and robotics, combined with a limited-time opposition procedure as in the Israeli model; (ii) implementing co-funding programs for AgriTech/Agrifood R&D similar to the Israel Innovation Authority, with priority for field trials and PCT application support; and (iii) strengthening post-harvest R&D capacity (cold chain, quality sensors, digital traceability) through specialized centers closely linked to enterprises, thereby shortening the gap from patent grant to commercial application. This is the legal-technical foundation for modernizing agricultural production, reducing dependence on imported machinery and enhancing the position of Vietnamese agricultural products in global value chains.

From a legal-social perspective, patenting breeding processes can generate conflicts with the right to access genetic resources, particularly where the process relies on traditional varieties or local germplasm. By granting exclusive exploitation, patents may restrict farmers' technological access, affecting food security and biodiversity. Harmonization between intellectual property law, biodiversity law, and international agreements such as the UPOV Convention 1991, TRIPS, and the Nagoya Protocol 2010 is therefore essential.

In practical application, the effectiveness of patent protection in agriculture depends on natural conditions, cultivation patterns and production structure. Vietnam's fragmented farmland, mountainous terrain and high proportion of perennial crops (coffee, pepper, rubber, durian) limit the feasibility of large-scale machinery deployment as seen in Brazil or the U.S. For example, while Brazil employs large-scale integrated coffee harvesters in the Amazon region, Vietnam must develop small, lightweight harvesters adapted to the Central Highlands representing a promising innovation direction for domestic enterprises.

Patent utilization spans the entire production cycle: pre-harvest (mini tillers, precision sowing technology, pest-resistant varieties), harvest (combine harvesters, robotic pickers, ripeness sensors) and post-harvest (processing lines, vacuum packaging, deep-freeze storage). Vietnam's loss of durian export share to China due to insufficient post-harvest processing

and preservation technology illustrates the direct connection between patent protection, technological innovation capacity and global agricultural competitiveness.

From a policy standpoint, integrating plant variety protection with patent protection not only safeguards the interests of breeders and inventors, but also stimulates innovation across the agricultural value chain. This constitutes a critical legal foundation for modernizing production, reducing reliance on imported machinery, increasing value-added and elevating the global standing of Vietnamese agricultural products.

5 Conclusion

The analysis reveals that both China and Israel have achieved remarkable success in protecting and exploiting intellectual property rights in agriculture, albeit through two distinct strategic approaches: China adopts a comprehensive and large-scale protection model, optimizing legal frameworks, priority examination procedures and expanding the scope of plant variety protection to create a domestic "technology shield". Israel, by contrast, leverages a fast-paced innovation ecosystem, short statutory opposition periods and robust financial support for R&D to bring technologies from the laboratory to the market with minimal delay and broad international reach. Based on these findings, the study suggests a dual-track pathway for Vietnam: (i) strengthen the legal framework for PVP and patents in an integrated manner, prioritizing AgriTech fields and applying fast-track examination for critical technologies; and (ii) implement financial support and technology incubation policies similar to Israel, encouraging enterprises and research institutions to pursue international protection and commercialization. Combining the breadth of China's model with the depth of Israel's model could enable Vietnam to both expand domestic protection coverage and enhance the global value and impact of its agricultural intellectual property assets.

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