

RESEARCH PAPER

Role of Intellectual Property Rights on Agricultural Startups and their Innovations

Wajith Afrith¹. Lakshmanan Archana Devi². Subbiah Selvarani², Subbiah Padmapriya³. Kasthuri Santira Kumari⁴. Sundarasamy Dhanapal^{1*}. Krishnagowdu Saravanan^{1*}

¹Post Graduate and Research Centre in Biotechnology, School of Life Sciences, Arignar Anna College (Arts & Science), Krishnagiri – 6351 15, Tamil Nadu, India (Affiliated to Periyar University, Salem – 636 011, Tamil Nadu, India).

²Post Graduate and Research Department of Zoology, Thiagarajar College (Autonomous), Madurai – 625 009, Tamil Nadu, India.

³Department of Marine and Coastal Studies, Madurai Kamaraj University, Madurai – 625 021, Tamil Nadu, India.

⁴Department of Advanced Zoology and Biotechnology, Jayaraj Annapackiam College for Women (Autonomous), Periyakulam – 625 601, Tamil Nadu, India.

^{1*} **Corresponding Author(s):** dhanapalu@gmail.com, saravanankrishnagowdu95@gmail.com

Abstract

Intellectual property rights (IPR) have a substantial influence on the development and novelty of agricultural businesses by providing legal protection for unique technology, plant varieties, and biotechnological advancements. Patents, plant variety protection, copyright, trademarks, and trade secrets help businesses raise capital, build market credibility, and drive investment and expansion in precision agriculture, climate-resilient crops, and sustainable farming techniques. Intellectual property rights provide a competitive advantage and encourage technical discoveries by ensuring independence. Despite these benefits, strict intellectual property rights restrictions offer problems, particularly for small-scale farmers and nascent enterprises. High patent prices, lengthy regulatory processes, and legal complexities can all stymie technology adoption, limiting access to better seeds, biofertilizers, and intelligent agriculture solutions. Furthermore, the monopolization of agricultural modernizations by huge corporations raises questions regarding price and reasonable access, potentially widening the divide between industrial agribusinesses and small farmers. This study investigates the dual effect of intellectual property rights on agricultural entrepreneurs, examining their function in encouraging innovation while also addressing accessibility concerns. A balanced intellectual property rights foundation, including participation in open-source models, public-private partnerships, and regulatory reforms, is critical for guaranteeing sustainable agriculture practices and productivity. Creating notable relationships between research institutions, startups, and policy makers can drive inclusive creative ideas that benefit both entrepreneurs and farmers while also contributing to global food and nutritional security.

KEYWORDS:

Intellectual Property Rights (IPR), Agricultural Startups, Innovation in Agribusiness, Patent Challenges in Agriculture, Public-Private Partnerships in Agriculture

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1. Introduction

The Intellectual Property Right department encourages the development of new technologies to enhance the plant growth and development, increased yield for better benefits to enable the better contribution towards the society and grants rights to the

owner to control or prevent the use of their licensed innovation by external parties [1]. By protecting intellectual property, IPRs offer incentives for scientists, companies, and farmers to develop and adopt new technologies and improved crop varieties. Protecting a technology or an innovation under IP facilitates the creation of favourable agricultural trade, by encouraging investment into the project research and development and making it accessible to farmers by introducing to the market under the regulations and standards. This helps to attract the trade partners to exchange goods globally contributing to the farmers and economic growth [2]. Indian policies like Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) promote sustainable farming, attract investment in agricultural innovations and technologies. In government policies the biotic and abiotic resistant plant varieties and organic farming received more focus [3]. There is a need for the advancements and bringing new technologies and solutions to improve agricultural practices and turn farming practices completely sustainable and the agricultural startups are in an emerging state. In today's scenario the complete use of the intellectual property is fully utilized by the monopoly corporations to replace it, the adaptation to new innovations and patenting to the young businesses and startups focusing on agriculture is considerable.

2. Types of Intellectual Property Rights in Agriculture

The many forms of intellectual property rights are favoured to the agricultural sector, each and every form of IP serves a different protection and benefits to their specific innovation. The invention has to be novel, non-obvious, and useful. Patents grant the holder restricted rights to make, use, sell, and significance the original origination for a specified period of 20 years from the filing date. Patents protect inventions like agricultural technologies, machinery, and GMOs [4]. Plant Variety Protection (PVP) is a form of Intellectual Property that protects new and distinct plant varieties. It grants breeders exclusive control over the propagation of a new variety, including the right to sell, reproduce, and distribute the plant which enables the exclusive right to commercialize. GIs are the signs that represent the specific geographical origin with quality, reputation, and characteristic inheritance to a specific location. These are owned by the group of producers, community or associations as a community trademark. For example Mysore silk, Nasik grapes, etc.,. Trademarks are essential for building brand recognition and consumer trust. For example, an agricultural startup producing organic fertilizers may use their specific logo and brand name which represents their unique message. Registering these as trademarks ensures that no other company can use identical or confusingly similar marks, protecting the brand's identity. Copyright is to protect the work of authorship, including literature, music and art. In agricultural sector it can be used to protect the specific scientific studies on any agricultural technologies, innovations and software's, etc.,.

3. IPR as a Catalyst for Agricultural Innovation

In agriculture the researchers research work and the farmers unique IP can be protected in many forms including patents, copyright, design, trademarks, trade secrets and for a group of traditional associations can also protect as a geographical indications (GI tag) for a specific IP [5]. It is critical to protect the intellectual property rights in the agricultural sector to safeguard their created goods or service within the industry. For example, a new technology or a product to create a meaningful impact on the farmers to increase their yield by minimizing the plant disorders, controlled irrigation and biotic and abiotic stress resistance or tolerance in the crops [2, 6]. Patents provide an assurance and protection to the researchers, corporates, academicians, associations and the individuals for their unique intellectual property on a new patentable technology, plant varieties, and biotechnological innovations. Which leads to providing a significant role to protect and monetize their innovations. In India, the safety of Plant Varieties and Farmers' Rights Act of 2001 ensures the protection of plant varieties and crops [7]. The research and development can be facilitated for the advancement in the agricultural sector into public after the publication of the documents by the individuals or the institutions or organizations [8].

4. Attracting Investment and Market Growth

IPR, patents and plant variety protection enable a legal and exclusive right to the scientist who develop new agricultural technology, solutions, goods or a plant varieties and investors to get grants. Also, the protection of IP encourages the investment into the project research and development to drive innovation in the agricultural sector [9]. This can attract investment, as investors are more likely to fund startups with strong IP portfolios, which reduce risk and promise potential returns through licensing or commercialization. Additionally, IP can generate revenue through licensing agreements, sales, or strategic partnerships, creating additional revenue streams [10]. By extending the intellectual property rights in the field of agricultural science by research and development enhances and acts as an incentive to attract the investments into the research project and or the startup which focuses on sustainable agriculture. There is the increased participation of the private sectors into the research and development and commercialization of new technologies into agriculture [11]. In developed countries it is witnessed that increased involvement of private research and development may contribute to the commercialization of agricultural inputs [12]. The collaboration and inter linkage between the scientific organizations like Indian Council of Agricultural Research (ICAR), Department of Biotechnology (DBT), Department of Science and Technology (DST) and Council of Scientific and Industrial

Research (CSIR) largely provides and encourages the externally funded projects as the part of core funding that contributes towards the national importance for the innovations. In India, International funding agencies (donors) show a significant interest in funding and empowering agricultural research and education in India. There is a substantial growth in securing funding towards the agricultural research sign indicates it will boom to create a meaningful impact on contribution towards sustainable agriculture innovations [13]. Recent years the interest of startups in India have shown a gradual development towards sustainable agricultural practices and working on the research by securing external funds.

Enhancing Competitive Advantage for Agricultural Startups

There are government initiatives to promote start-up in the agriculture sector which includes modernization and agricultural entrepreneurship development programme, this scheme was hurred under the restored Rashtriya Krishi Vikas Yojana-Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) to promote innovation and entrepreneurship in the agriculture sector. Under this scheme financial support is extended to the individuals and the incubation ecosystem is nurtured. The components of this scheme include, Agricultural entrepreneurship orientation:

Firstly, at this stage a two-month orientation program organised for the participants with a regular remuneration of Rs. 10,000. Here at this stage mentorship in the areas of financial, technical and Intellectual property are provided.

Secondly seed stage funding of RAFTAAR Agribusiness Incubators (R-ABI) incubatees: Funding uptoRs. 25 lakhs (85% grant & 15% influence from the incubatee).

Thirdly Idea/Pre-Seed Stage, Subsidy of agripreneurs up to Rs. 5 lakhs (90% grant and 10% contribution from the incubatee) [14].

List of some schemes that supports agricultural startups

NIDHI PRAYAS scheme

ASPIRE

Biotechnology ignition grant

Start-up India

Venture capital scheme for agribusiness development

The startup ecosystem facilitates the various resources and policies that enable the promotions, facilitations, exemptions and incentives for the research needs of the individuals. The incubators and accelerators initiative for the seed funding and or scale up funding access with network and mentorship with the industry experts. In India there's a specific incubator that serves to innovate and equip agri startups are

Pusa Krishi Incubator (ICAR-IARI)

iHub (ICRISAT)

a-IDEA (NAARM)

CradLE (EDII, Ahmedabad)

ISEED (IRMA)

CIIE (IIM, Ahmedabad)

Agri startups help to innovate, research and develop the new technologies that help to tackle the challenges in plant stress. Developing bio fertilizers, bio pesticides and bio solutions to adapt to sustainable agriculture [15]. National Agriculture Innovation Fund: consists three components,

- **Section I:** Creative thinking Fund (based on the XI Plan Framework for Intellectual Property Administration, Transferring, and Commercialization of Agricultural Technologies).
- **Section II:** Development Fund (to support Agri-business Incubation Centers in institutions focused on developing agricultural innovation).
- **Section III:** ARYA (Attracting and Retaining Youth in Agriculture), carried out by ICAR's Extension Division [16].

5. Challenges and Barriers Posed by IPR

5.1. High Patent Costs and Legal Complexities

Intellectual property patent systems have their specific limitations that leads to the complication where the inventor is forced to apply the immature draft-under first to file which leads to a major disadvantage over competition and incomplete innovation [17]. A rising interest in IPRs is mostly considered by the researchers, biopreneurs, undertakings and specialists to systematically reflect the steps desirable to defend, succeed, and implement their ideal business results from their proprietorship [18]. Compulsory certifying in patent law qualifies the Government to decriminalize authorizations for creations in certain environments. While this provision aims to ensure access to indispensable innovation, product or technology, it makes reservations for patent containers and incumbers funds in research and development [19]. Due to the high cost of patent filing individuals and small-scale farmers and startup founders lack draft/file registration. Small farmers or marginal farmers lack to access the new emerging technologies due to the limited access of the registered technologies and their protection by large

corporations. Whereas, the patenting of agricultural biotechnology has elevated worries due to the expropriation of vital resources, predominantly seeds, which are important to food and nutritional invention [20]. The farmers are forced to purchase the seeds each season, because saving and reusing (replanting) of their own produced seeds is prohibited by the IP laws. The dependency on multinational corporations that hold the patents. The enforcement of patent rights has also been contentious, with companies suing farmers for alleged patent infringement when patented seeds are found in their fields, even if the presence of those seeds was unintentional. The private sector company made significant contributions to the research and development which led them to focus on the profitability which holds the small and marginal farmers to afford [21].

Risk of Corporate Monopoly and Innovation Restrictions

The biotechnology for agriculture sector has resulted in a small number of multinational businesses dominating the worldwide seed market. Companies such as Bayer (which purchased Monsanto), Syngenta, and Corteva dominate the market for genetically modified seeds and agricultural pesticides. The prohibitive price of patented seeds, as well as the licensing expenses required by biotechnology corporations, make it virtually impossible for smallholder farmers to compete in the global market. The regulatory structures that govern intellectual property rights in biotechnology must strike a balance between innovation and guaranteeing equal access to new technologies. While patents provide the financial incentives necessary for companies to invest in R&D, farmers in developing countries are unable to acquire patented seeds or pay license fees, forcing them to rely on enterprises [21].

Case Studies of Agri-Startups Leveraging IPR

5.1. Successful Agri-Tech Startups Using IPR for Growth

Agri-startups and agri-businesses are developing new technologies, processes, and products that address the challenges faced by the agriculture industry. Improving crop yields and resistance to pests to developing sustainable farming practices, agri automation tools and innovative food products, IP protection is crucial for safeguarding these research advancements [22].

6. Impact of Patents on Agri-Biotechnology Startups

Enables innovation by granting creators exclusive rights to their inventions and creations, the investments and funds for further research and development. For agri-businesses, IP protection can encourage innovation by providing a legal framework that protects new inventions, motivating researchers and entrepreneurs or research individuals to invest time and resources into developing innovative solutions. It enhances competitiveness by preventing others from copying or using the protected inventions without permission, allowing businesses to establish market leadership. The commercialization of IP within the agriculture sector plays a role in driving innovation and economic growth and commercializing IP in agriculture is through licensing agreements. Agricultural companies or individual inventors can license their innovative solutions and technologies by patents, such as novel crop varieties, agricultural machinery, or biotechnological innovations, to other businesses or farmers. These licensing agreements allow for the widespread adoption and utilization of these innovations, leading to increased productivity, improved crop yields, and enhanced sustainability practices in agriculture [22].

7. Policy Recommendations for an Equitable IPR Framework

7.1. Strengthening Public-Private Partnerships in agricultural innovation

The partnerships enable the sharing of resources, expertise, and infrastructure, leading to the faster commercialization of innovative agricultural solutions like effective commercialization of IP in the agriculture sector drives business growth and profitability with contribution addressing global challenges such as food security, environmental sustainability, and agricultural resilience [22].

8. Balancing IPR Protection with Accessibility for Small Farmers

IPR enables the transfer of technology between countries and industries. Through licensing agreements, partnerships, and joint ventures, intellectual property rights allow innovations to be shared and it can be commercialized worldwide [23]. Rural areas are the backbone of the agricultural sector, many communities relying on farming as their primary source of income. Investing in rural development leads to addressing challenges and unlocking the potential of the agricultural communities. Rural development initiatives can promote development of agro-processing industries and agri startups which enables new employment opportunities and reduce dependency on farming alone. Farmers' new innovation and traditional knowledge have been instrumental in the development of new crop varieties, conservation of biodiversity, and for the advancement in sustainable agricultural practices. IP rights, plant varieties protection and geographical indications enable farmers to legally protect their farm-level innovations and traditional knowledge, preventing unauthorized use and ensuring fair compensation for their efforts [24].

9. Promoting Open Innovation and Knowledge Sharing

The climate and changes to ecosystems, commercial and political regulations, and a variety of societal demands all contribute to agricultural objectives for sustainability and transitions. Addressing to these difficult challenges necessitates changes in the roles and behaviours of farmers, input suppliers, technology developers, researchers, agricultural consultants, governments, citizens, and consumers [25]. Farming make judgments based on their own perspectives and production systems, which frequently results in mono-disciplinary advice that are irrelevant to the numerous difficulties that farmer face [26].

10. Conclusion

The studies investigate the consequence of intellectual property rights in inspiring novelty and growth in agricultural businesspersons. Patents, plant variety protection, trademarks, and geographical indications (GIs) are examples of intellectual property rights (IPR) that contribution creativities in procurement legal safety, interesting savings, and hopeful sustainable agriculture research and expansion. The learning highpoints the benefits of intellectual property rights in acquisition a inexpensive benefit and supportive expansions such as meticulousness farming, biofertilizers, and climate-resilient crops. Still, it addresses the issues provided by intellectual property rights, predominantly luxurious patent costs, complex laws, and huge firms' monopolization of agricultural technologies. These limitations may boundary small-scale farmers' access to sophisticated seeds, bio-based inputs, and agri-tech breakthroughs. The study advocates for a balanced IPR framework through public-private partnerships, open-source models, and policy reforms to ensure that innovations benefit both entrepreneurs and farmers, contributory to global food and nutritional security.

Declaration of Competing Interest

The authors declare that they have no competing financial or personal interests that could have influenced the work reported in this paper.

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