SUPREMO AMICUS

VOLUME 37 | April, 2025 ISSN 2456-9704

THE GLOBAL AGRICULTURAL ECONOMY AND INTELLECTUAL PROPERTY RIGHTS: A COMPREHENSIVE ECONOMIC IMPACT ANALYSIS

By *Deeksha Chettri*
From *Law College Dehradun, Uttaranchal University*

ABSTRACT

This article examines the interplay between intellectual property rights IPRs and the global agricultural sector focusing on their impact on food security, market access, and agricultural innovation within IPR framework. It examines the financial implications of copyrights, patents, and plant variety protections in both industrialized and developing nations. The study assesses the impact of intellectual property rights on agricultural productivity, the distribution of benefits, and the legal complexities encountered by governments, enterprises, and the farmers. This text underscores the significance of balanced policies that provide equitable access, foster innovation, and address global food issues, while also analysing the role of intellectual property rights in either facilitating or hindering sustainable agricultural practices.

Keywords: Intellectual Property Rights, Agriculture, Plant variety protections, Sustainable agricultural practices, Global food issues.

INTRODUCTION

The legally recognised rights that people or organizations are awarded for their creative or intense works are known as intellectual property IP. Through the protection and reward of creators and inventors, these rights grant exclusive control over the use, dissemination, and financial exploitation of intellectual property, which encourages more innovation and creativity. Intellectual property rights (IRPs) encompassing literary, artistic, and musical world, performances and broadcasts; and industrial rights, which comprise patents, trademarks, geographical indications, and industrial designs. Furthermore there are sui generis rights outside of these categories, especially those that apply to plant breeders and are intended to safeguard recently created plant varieties. Intellectual Property Rights (IRPs) primarily aim to foster an environment conducive to innovation by providing incentives for individual and organisations to invest time, capital, and resources in the development of novel ideas, technologies, and artistic works. In recent years, intellectual property rights have become more and more important in the global agriculture industry. Among the many issues facing the agriculture industry today are the need for quick innovation, effective technology transfer, sustainable practices, and genetic resource protection. Consequently a more thorough analysis of the function and consequences of intellectual property rights in agriculture has been conducted. Analysing the diverse effects of intellectual property rights on the state of agriculture worldwide is the goal of this extensive study. For a number of reasons, the agriculture industry depends on intellectual property rights. First and foremost scientists and researchers are greatly encouraged to conduct agricultural research and development (R&D) by intellectual property rights IPRs. By preserving safeguards for discoveries like this , intellectual property rights IPRs enable innovators to claim exclusive rights and possible financial rewards as new plant species and biotechnology techniques, therefore encouraging ongoing investment in agricultural R&D. This process is essential for fostering innovation, enhancing productivity, and addressing global challenges such as food security, climate resilience, and agricultural sustainability. Numerous enterprises across diverse sectors heavily depend on the protection their copyright, copyright, and patents, thereby ensuring the safeguarding of their intellectual property rights. Simultaneously, consumers can also derive assurance regarding the

quality of products they acquire that are supported by intellectual property[1].

The relationship between intellectual property rights and the agricultural business is complex and multifaceted. While IPR protection undeniably fosters innovation and investment, it simultaneously endangers significant concerns regarding equitable access, particularly for farmers in undeveloped regions. The availability and cost of seeds, access to genetic resources, and the concentration of market power within giant agribusiness have all contributed to concerns about the wider societal implications of intellectual property rights in the agriculture industry. The concept of intellectual property plays a crucial role in the generation and sustenance of well-compensated employment opportunities[2].

This study aims to provide a comprehensive analysis of the potential advantages of the intellectual property rights on the trajectory of the global economy. Here is a refined and succinct version of your work maintaining the essential concepts while enhancing flow and clarity . Intellectual property rights (IPRs) grants breeders and innovators exclusive rights over their creations, such as innovative plant varities or agricultural technology. These regulations may restrict the availability and cost of seeds, especially for smallholder farmers in developing nations, even as they encourage innovation and give agricultural businesses a competitive edge. The main difficulty is striking a balance between the rights of innovators and providing farmers, who are crucial to the worlds agricultural output, with fair access to genetic resources. Large firms can retain monopolistic control over their advances because to intellectual property laws, which is why the agricultural industry has highly competitive dynamics. While this could promote economic growth and technological improvement it can also alienate small scale farming communities, worsen inequality, and make it more difficult for smaller businesses to enter the market. This study examines the challenges, conflicts. And broader implications of intellectual property rights in agriculture. This review combines scientific papers, studies, and case analysis to provide insights for lawmakers, scholars, and stakeholders seeking to understand the wide ranging implications of intellectual property rights on the agricultural sector. It addresses questions about costs, sustainability, accessibility to innovation, biodiversity conversation and both local and global social and economic effects. Agriculture is one of the industries most severely affected by the negative effects of intellectual property rights. The agriculture sector, essential for human existence and economic development, has seen significant transformation in recent years due to the application of intellectual property rights across laboratories, fields, and global markets, thereby altering its scope. Intellectual property rights currently shape agricultural innovation, trade ties, and global economic advancement, occasionally inciting trade disputes on the distribution of agricultural products. This study examines the historical evolution of intellectual property rights in agriculture, starting with early modifications in patent laws, to understand how these legal frameworks have influenced agricultural practices throughout time. This comprehensive study seeks to identify solutions that reconcile sustainable development, equitable access to genetic resources, and agricultural innovation, ensuring that the benefits of intellectual property protection are equitably dispersed across the agricultural sector

WHAT IS IPR

Intellectual property rights (IPR) are legal protections that society acknowledged as a type of property that applies to concepts, innovations, and artistic expressions.. These rights confer solely advantages to

[1] "Ahlawat & Associates - Tanya Nair, *Types of Intellectual Property Rights in India*, LEXOLOGY (2022), https://www.lexology.com/library/detail.aspx?g=7045cf52-4a2c-465f-980b-b5af034e2064".

[2] "St Francis School of Law, *Intellectual Property Rights: Definition and Examples*, ST FRANCIS SCHOOL OF LAW (2021), https://stfrancislaw.com/blog/intellectual-property-rights/ .

creators and inventors, facilitating their management and monetization of the utilization of their ideas. Intellectual Property Rights are necessary for the advancement of technology and the dissemination and transfer of information and the growth of the industry. The primary objective of the IPR is to promote innovation by ensuring that producers and inventors can reap the rewards of their endeavours. By safeguarding intellectual property, IPR fosters investment in research and development (R&D), promotes technological advancement, facilities the commercialisation of innovative products and processes across all sectors, including agriculture. The commercialisation of ideas and the advancement of sectors such as agriculture through technological innovations rely on this protection. Our fundamental international framework controlling intellectual property rights IPR is the World Trade Organization's (WTO) Trade Related Aspects of Intellectual Property Rights (TRIPS) . On January 11995, the TRIPS agreement which is thought to be the most extensive multinational convention on intellectual property went into force. By establishing essential standards for IPR protection and enforcement across member countries, it has a substantial impact on international practices and value of intellectual property. The most complete intellectual property regime is now offered under the TRIPS agreement. It encompasses a wide range of intellectual property types and establishes uniform standards for their protection, enforcement, acquisition, and upkeep at both national and international levels. Fundamental ideas from the General Agreement on Tariffs and Trade (GATT) are combined with elements from other important international treaties pertaining to intellectual property. While intellectual property rights might seem to offer a limited level of safeguarding, their strategic utilization can optimize the advantages and worth of an innovation, facilitating the development, protection, and commercialization of transformative technologies[3].

TYPES OF INTELLECTUAL PROPERTY RIGHT

PATENT

A patent typically grants an inventor exclusive right to a new invention for 20 years. The invention may be a beneficial product, service, or method that offers a naval solution to a problem or an enhancement of existing technology. Patents are crucial in pharmaceuticals, manufacturing, and electronics sectors, where innovation drives economic growth. Patent holders can prohibit anyone from developing, utilizing, or commercializing their invention without permission. The patent system promotes technological advancement by incentivizing inventors for their creativity and investment. In addition to patents in general, the UK Hargreaves Study (2011) suggests the establishment of a digital rights exchange in order to facilitate the process of obtaining clearance for the use of content that is protected by intellectual property rights[4]

Trademark

A trademark is distinctive symbol, term, or indicator that differentiates a good or service from others, thereby identifying it unique packaging designs. They are essential for preserving corporate reputation and ensuring clients can rudely locate the original product. Trademark protection is often awarded for lifetime, contingent upon the mark's use in commerce and its defence against infringement. A trademark has the potential to manifest itself in several forms, such as textual elements, phrases, symbols, sounds, smells, or colour schemes. In contrast to patents, trademarks have the ability to safeguard a group or category of

[3] "Types of Intellectual Property Rights, DMU. AC.UK (2019), https://www.dmu.ac.uk/research/research-support/intellectual-property/types-of-intellectualproperty-rights.aspx".

[4] Zúñiga, M. P. and D. Guellec (2008), Survey on Patent Licensing: Initial Results from Europe and Japan , internal working document, OECD, Paris .

items or services, rather than being limited to a single product or procedure[5].

Copyright

Copyright safeguards original works of authorship, including literary, artistic, musical and dramatic compositions. It grants the author exclusive rights to reproduce, disseminate, perform, and publicly display the work. Typically, copyright endures for the duration of the author's life plus seventy years.
This form of intellectual property rights ensures monetary benefits for creators, hence promoting artistic expression. Copyright safeguards the expression of ideas, not facts or expertise.

GI

Geographical indicators safeguard the nomenclature of products form specific regions when a particular quality, reputation, or characteristic is linked to their geographical provenance. Champagne is protected geographical indication (GI); hence, only sparkling wine produced in the champagne indications ensures that local producers can benefit from their unique product characteristics and prevent misuse of regional designations.

PLANT VARIETY RIGHTS

Plant variety rights protect new plants varieties that are distinct, uniform, and stable. These right grant breeders exclusive control over the propagation and sale of their new plant varieties for a certain period. This encourages investment in agricultural research and development, especially in areas such as crop improvement. Plant variety rights are particularly important in sectors like agriculture and horticulture, where new varieties can lead to improved productivity and resilience.

- United states patent and trademark office (USPTO)
- International chamber of commerce (ICC)
- International union for the protection of new varieties of plants (UPOV)

TRADE SECRETS

A trade secret refers to confidential and proprietary information that provides a competitive advantage to a business or organization[6]. It encompasses a wide range of Trade secrets refer to confidential information that is crucial to the success and competitive advantage of a business. The aforementioned entities encompass proprietary systems, calculations, strategies, as well as other classified information, which are explicitly intended for exclusive utilization and are not intended for inappropriate commercial exploitation by external parties. The aforementioned protective measure is of paramount importance as it enables organizations to acquire a competitive edge.

THE APPLICATION OF IPR In AGRICULTURE

Since IPR has transformed the creation, preservation, and sharing of inventions, technologies, and resources worldwide, it has emerged as a key component of the modern agricultural economy. The application of Intellectual Property Rights (IPRs) in agriculture has seen a significant expansion in recent years[7].The legal safeguarding of intellectual property has gained significance as agriculture evolves from traditional faring to a research-oriented, technologically sophisticated sector. While TRIPS requires member

[5] "Will Kenton, *What Is Intellectual Property, and What Are Some Types?*, INVESTOPEDIA (2023), https://www.investopedia.com/terms/i/intellectualproperty.asp".
[6] "St Francis School of Law, *Intellectual Property Rights: Definition and Examples*, ST FRANCIS SCHOOL OF LAW (2021), https://stfrancislaw.com/blog/intellectual-property-rights/".
[7] Campi M and Nuvolari A. Intellectual Property Rights and Agricultural Development: Evidence from A Worldwide Index of IPRs in Agriculture (1961-2018). The Journal of Development Studies. 2021;57(4):650-668.

nations to offer patent protection for inventions in all technological sectors, including biotechnology, it also allows alternative systems, such as plant variety rights understanding the role of intellectual property rights in agricultural necessities an examination legal implication for consumers, corporations, farmers, and researches.

Patents are among the most potent forms of intellectual property rights in agriculture. A patent grants the creator exclusive rights to develop, utilize and commercialize a novel and non-obvious invention for specified duration, often 20 years. Patents are frequently employed in agriculture to protect biotechnological innovations such as genetically modified crops that are resistant to pests, diseases, or herbicides. Patented items developed using advanced genetic engineering, such as but cotton and Roundup processes soya beans by reducing crop inputs, such advancements have revolutionized agricultural has generated ethical and legal issues.

Due to patent licensing stipulations, farmers purchasing patented seeds may encounter challenges in saving or replanting seeds, hence raising concerns about dependence on large agribusiness corporations and the decline of traditional agricultural practices.

Plant variety rights (PVR), also referred to as plant breeder rights, constitute a crucial category of intellectual property rights (IPR) in agriculture. Typically for a specified period of 20 to 25 years, these rights grant breeders' exclusive authority over the multiplication and commercial utilization of novel, distinctive, consistent, and stable plant varieties. As many commentators and critics have precisely observed that the expansion of IPRs into plant varieties runs contrary to the profound historical roots of traditional farming practices[8]. PVR is legally regulated internationally by the international union for the protection of new varieties of plants (UPOV). PVR stimulates agricultural innovation, leading to higher yields, improved nutritional quality, and greater resilience to climate change by encouraging breeders to develop superior crop varieties. PVR systems must balance the rights of farmers and breeders especially in improvised areas where farmers traditionally conserve, trade, and replant seeds as integral to local food systems. Benjamin Franklin had once said that agriculture was the only honest way for a country to acquire wealth, "wherein man receives a real increase of the seed thrown into the ground, in a kind of continual miracle.."'[9] .Legal provisions such as the "farmers" fair distribution of benefits and access to superior plant materials continue to exist.

A trademark is a distinctive symbol, logo, or brand name employed to differentiate a company's products or services from those of competitors. Trademarks allow agricultural enterprises to build consumer trust and brand recognition, thereby protecting the reputation of the products such as fertilizers, seeds, and agricultural machinery. Prominent agricultural companies like Syngenta, John Deere, and pioneer utilize trademarks to safeguard their market dominance and signify quality to consumers. While trademarks primarily serve marketing purposes, they indirectly promote innovation by enabling businesses to recoup their investment in product development through brand loyalty. Another significant form of intellectual property rights in agriculture is geographical indications (GIs) designates a product as originating from a specific locale, when the quality, reputation, or characteristics of the id teem are intrinsically linked to its geographic origin. Included are Indian and Pakistani basmati rice, Italian Parmigiano-Reggiano cheese, and Indian Darjeeling tar. By protecting GIs, the unique characteristics and cultural heritage of agricultural products are maintained, thereby averting the misuse or misinterpretation of local designations. This not only offers manufactures elevated market pricing but also protects customers from deceptive labelling. Small-

[8] For examples of how this history has been used by farmer advocacy groups, see Rural Advancement Foundation International (RAFI), '' Frequently Unmasked Questions about the International Undertaking on Plant Genetic Resources,'' RAFI Communique. No. 69, March (2001).

[9] Annie Zaidi, ''Seeds of Despair'', Frontline, August 12, 2005, p.88.

scale farmers and ruler communities particularly benefit from geographical indications, as they enable participation in niche markets and support local enterprises.

In agriculture, trade secrets hold significant importance. Trade secrets protect confidential firm information that confers a competitive edge, in contrast to patents, which necessitate public disclosure of the innovation. This includes proprietary processing methods, specialised apparatus designs, and exclusive pesticides formulas. Companies that proficiently protect their trade secrets can maintain their competitive advantage without disclosing confidential information. To uphold trade secret protection, businesses must implement stringent confidentiality practices, as unauthorized disclosure could jeopardize this protection.

This application of intellectual property rights in agriculture is significantly influenced by international agreements and legal frameworks. . For thousand of years, India's civilization has been built and has grown on the foundations of its agricultural economy" [10].The agreement on trade-related aspects of intellectual property rights (TRIPS), administrated by the world trade organisation (WTO), establishes basic standards for intellectual property rights protection, including provisions for agricultural patents and plant variety protections. While TRIPS requires member nations to offer patent protection for inventions in all technological sectors, including biotechnology, it also allows alternative systems, such as plant variety rights.The convention on biological diversity (CBD) and its Nagoya Protocol address access and benefit equitable compensation for indigenous peoples and nation of origin when their biodiversity is utilized for agricultural research or commercialisation. These multilateral instruments create a compels legal landscape that governments must navigate to align national laws with global obligations while addressing local needs and objectives.

The application of intellectual property rights in agriculture entails extensive ethical and financial implications. Intellectual property rights (IPR) promote research, innovation, and development, hence enhancing food security, sustainable agriculture practices, and crop improvement. Decreased pesticide application, enhanced soil vitality and augmented resilience to climate change are among the significant outcomes of investments in agricultural biotechnology by both public and private sectors. Nonetheless, challenges regarding equity and access persist. In developing areas, smallholder farmers sometimes have challenges in acquiring patented seeds or protected plant varieties due to the prohibited costs of licensing fees and royalties. Moreover, a concerning prospect is that excessive reliance on a limited number of patented or protected cultivars may diminish biodiversity, so heightening the susceptibility of global agriculture to environmental stresses, pests, and diseases.

Policymakers, legal professionals, and agricultural stakeholders advocate for equitable intellectual property rights frameworks that honour the rights of inventors while addressing the needs of farmers and society to resolve these challenges. This entails ensuring that legal frameworks integrate exceptions and limitations permitting farmers to save, utilize, and exchange seeds under specific conditions; fostering public-private partnerships that facilitate technology transfer and affordable access; endorsing germplasm without restrictive intellectual property rights claims; and thereby enhancing systems for benefit-sharing with local communities in accordance with international biodiversity agreements. Implementing these measures will enable the agriculture sector to optimize intellectual property to foster innovation, enhance living standards, and attain global food security while simultaneously ensuring social equity and environmental sustainability.

[10] K.S.GI, "Foreword in B.S. Hansra and A.N.Shukla (eds.), Social, Economic and Political Implications of Green Revolution in India, (New Delhi: Classical Publishing Company, 1991), p. V.

The implementation of intellectual property rights in agriculture is a complex issue encompassing significant legal, financial, and ethical dimensions. While intellectual property rights systems are crucial for safeguarding innovation and fostering grown, they must be meticulously designed to ensure equitable distribution of agricultural advancements and to preserve the interests of farmers, especially in undeveloped regions. Equitable, inclusive, and progressive intellectual property rights systems are more vital as global agricultural challenges intensity due to climate change, populations growth, and food insecurity. The agricultural sector can achieve equilibrium between innovation and accessibility by aligning legislative safeguards with broader societal objectives, thereby enhancing a more resilient and sustainable global food system.

ROLE OF IPR IN AGRICULTURAL INNOVATION AND TRADE

Intellectual property rights (IPR) establish the legal framework enabling inventors, corporations, and breeders to safeguard their ideas. In agriculture, this encompasses patents for genetically modified organisms (GMOs), plant variety rights (PVR), trademarks for branded products, and geographical indications (GIs) for region specific commodities. In the absence of intellectual property rights (IPR), numerous ideas may fail to enter the market, as inventors would be disinclined to spend in research and development (R&D). In international commerce, products covered by intellectual property rights transform into valuable commodities, with licensing agreements, export contracts, and market access frequently dependent on the acknowledgement of these rights across nations. For instance, patented genetically modified seeds such as but cotton and herbicides resistant soyabeans are extensively traded on a global scale. The legal protection guarantees that firms may regulate the usage and distribution of these seeds, frequently via licensing agreements that specify which nations or producers are authorized to utilize them.

1. THE LEGAL FRAMEWORK: TRIPS AGREEMENT

The agreement on trade-related aspects of intellectual property rights (TRIPS), overseen by the world trade organisation (WTO), is the principal international instrument governing intellectual property rights in agricultural trade. International trade agreements, such as the complex and multifaceted.

Intellectual Property Rights (TRIPS Agreement), have had a significant impact on intellectual agricultural economy: property rights (IPRs) in the context of global agricultural trade [11].TRIPS establishes minimal international standards for the protection of patents, plant varieties, trademarks, geographical indications, and trade secrets. Under TRIPS, WTO member states must guarantee patent protection for agricultural inventions and implement either a patent system or a subgeneric regime, such as plant breeders' rights, to safeguard new plant varieties. TRIPS seeks to standardize intellectual property rights regulations, migrate trade conflicts, and foster innovation y guaranteeing uniform recognition and enforcement of IPR protections among nations. For example, disputes have arisen when patented G crops unintentionally cross into neighbouring fields or countries, raising questions about liability, farmers rights, and trade compliance.

2.PLANT VARIETY RIGHTS AND GLOBAL SEED TRADE

Patents are one of the most powerful IPR tools in agricultural trade. They grant exclusive rights to inventors over novel inventions, including genetically engineered crops, specialized machinery, or new agrochemical formulations. Multinational

[11] Dhanjee R, De Chazournes LB. Trade-Related Aspects of Intellectual Property Rights (TRIPs): Objectives, Approaches and Basic Principles of the GATT and of Intellectual Property Conventions. Journal of World Trade; 1990;24(5).

companies that develop patented seeds and technologies often dominate international markets, using patent protection to control production, distribution and sales. The implementation of IPRs in agriculture can have implications for access to genetic resources[12] .While patents incentivize innovation, they also raise concerns about market concentration particularly when a few large corporations hold extensive patent portfolios. Farmers in importing countries may become dependent on expensive patented technologies, and they often face legal restrictions on reusing seds due to licensing terms.

Plant variety rights (PVR), often known as plant breeder's rights, are regulated globally by the international union for the protection of new varieties of plants (UPOV). PVR provides breeders exclusive authority over the propagation and sale of ovel plant varieties that are distinct, uniform, and stable.

PVR systems promote the advancement of superior agricultural varieties characterised by enhanced yields, improved quality, or increased resilience, which are subsequently distributed internationally. International seed firms utilize plant variety rights (PVR) to safeguard their breeding initiatives and secure financial benefits from licensing agreements in international markets.

Many smallholder farmers and emerging nations contend that PVR systems excessively favour commercial breeders, marginalizing indigenous knowledge and restricting farmer's capacity to conserve and share seeds. To mitigate these challenges, certain national legislations integrate farmer's rights or exceptions yet conflicts between breeder rights and indigenous practices continue in international commerce.

3.TRADEMARKS AND BRAND RECOGNITION IN AGRICULTURAL PRODUCTS

Intellectual property rights frameworks, particularly patents and plant variety rights, facilitate agricultural research and development. Intellectual property rights grant exclusive rights to innovators, enabling corporations and organisations to secure financial returns on innovative technologies, such as genetically modified crops, pest resistant seeds, and climate-adaptive varieties. This legal protection encourages private investment, fosters technological progress, and ultimately improves agricultural productivity and global food security without such constrains, many concepts may stay commercialized due to the risk of free-riding and reduced profitability.

IMPACTS OF INTELLECTUAL PROPERTY RIGHTS ON THE GLOBAL AGRICULTURAL ECONOMY

1. STIMULATION OF INNOVATION AND INVESTMENT

Intellectual property rights systems, especially patents and plant variety rights, promote agricultural research and development. By conferring exclusive rights to innovators, intellectual property rights facilitate firms and organisations in obtaining financial returns on novel technology, including genetically modified crops, pest-resistant seeds, and climate-adaptive kinds. This legal safeguard promotes private investment, stimulates technical advancement, and eventually enhances agricultural output and global food security. In the absence of such restrictions, numerous ideas may remain uncommercialized due to the threat of free-riding and diminished revenue.

[12] Butler LJ. Conflicts in Intellectual Property Rights of Genetic Resources: Implications for Agricultural Biotechnology. In Economic and Social Issues in Agricultural Biotechnology. Wallingford UK: CABI Publishing. 2002;17-29.

2. MARKET CONCENTRATION AND FARMER DEPENDENCY

A significant issue associated with intellectual property rights is the consolidation of market dominance along a limited number of multinational agribusinesses possessing vast patent portfolios. These corporations frequently monopolize the seed, agrochemical, and machinery sectors, constraining competition and affecting global pricing. Smallholder farmers, especially in developing nations, may encounter elevated input costs, stringent licensing requirements and limitations on traditional practices such as seed saving and exchange.

This dependency diminishes farmers autonomy, hammers local innovation, and may exacerbate the economic disparity between industrialized agribusiness sectors and resource-constrained agricultural comities.

3. IMPACT ON INTERNATIONAL TRADE

The organisation of international agricultural trade under legal frameworks like the WTOs agreement on trade related aspects of the intellectual property rights (TRIPS) depends heavily on intellectual property rights (IPR).

By standardizing intellectual property rights across member nations, TRIPS promotes international trade and investment, guaranteeing legal protection or patented inventions, plant varieties and brand items in global market nonetheless, these standardized safeguards present obstacles for underdeveloped nations, who may struggle to buy protected technology or manage intricate licensing and compliance requirements, thereby impacting their positiveness in the global agricultural market. Nonetheless, these standardized safeguards present obstacles for underdeveloped nations, who may struggle to buy protected technology or manage intricate licencing and compliance requirements, thereby impacting their compositeness in global agricultural market.

4. EFFECT OF BIODIVERSITY AND SUSTAINABILITY

The proliferation of patented high-yielding or genetically modified crops ay result in the extensive acceptance of homogenous plant species, hence diminishing genetic diversity on agricultural lands. The decline in biodiversity heightens the susceptibility of agricultural systems to pests, diseases, ad environmental alterations, presenting concerns to log-term sustainability. Moreover, several contemporary agricultural breakthroughs depend on genetic resources or traditional knowledge from local communities and indigenous people; nonetheless, these groups frequently receive minimal acknowledgement or benefit-sharing receive minimal acknowledgement or benefit sharing within existing intellectual property rights frameworks. This prompts ethical considerations regarding biopiracy and the equitable utilization of biological resources.

5.ETHICAL AND EQUITY COSIDERATION

The disproportionate allocation of intellectual property rights advantages and disadvantages incites ethical and legal discussions on fairness and global parity. Innovators and companies in rich nations usually reap significant benefits in low-income areas sometimes encounter access restrictions, restricted technology options, and exclusion from decision making processes. International accords such as the convention on biological Diversity (CBD) and the Nagoya protocol seek to rectify these inequities by advocating for equitable benefit sharing and protecting farmers rights; however, execution is inconsistent.

POSITIVE IMPACT OF IPRS ON GLOBAL AGRICULTURAL ECONOMY

Intellectual property rights (IPRs) substantially contribute to the advancement of the global agricultural sector by legally safeguarding inventions, fostering research, and facilitating international trade. Intellectual Property Rights(IPRs), encompassing

patents, plant variety rights (PVR), trademarks, and geographical indications (GIs), establish a legal framework that fosters agricultural research laboratories, and breeders can recover the substantial costs incurred in developing innovative seeds, biotechnology products, agrochemicals, and machinery costs that may otherwise be economically unfeasible without exclusivity rights through this protection. Patents and PVRs significantly aid in the development of high yielding, pests-resistant, and climate-resilient crop varities, hence enhancing global food security and promoting sustainable agricultural practices. These advancements enhance agricultural productivity, reduce the necessity for chemical inputs, and empower farmers to adapt to contemporary changes. By providing market exclusivity, intellectual property rights facilitate the transfer of innovations across nations and enterprises, hence promoting worldwide collaboration and the dissemination of advanced agricultural tool expertise. Furthermore, by enhancing consumer trust and preserving the worth of regionally distinctive products, trademarks and geographical indications contribute to the advancement of agricultural commerce. Brands and regional names, safeguarded by intellectual property rights, command premium prices in global markets, thereby bolstering riral economies and supporting local producers. The geographical indication protection of the products such as Darjeeling tea and Parmigiano Reggiano cheese enhances of their global desirability and market worth.

Intellectual Property Rights serve as legal instruments that promote innovation, enhance competitiveness, and progress agriculture globally.

Meticulously calibrated with public interest factors, these rights ensure that innovation serves not only creators but also farmers, consumers, and the broader global society.

NEGATIVE IMPACT OF IPR ON THE GOBAL AGRICULTURAL ECONOMY

Undoubtedly, intellectual property rights IPRs have stimulated innovation in agriculture; nevertherless, they also impose significant adverse effects on farmers, biodiversity, and global economic equity. Intellectual Property Rights IPRs, encompassing patents and patents and plant variety rights, provide exclusive control over seeds, technologies, and biological advances, frequently consolidating market dominance into a limited number of large multinational agribusinesses. This concentration particularly affects smallholders in improvised nations, who struggle to buy expensive patented seeds or agrochemicals, so hindering competitiveness, inflating costs, and fostering dependency among farmers. Legal restrictions on IPR protected commodities may hinder farmers from preserving, reusing, or exchanging seeds practices that have sustained agricultural cultures for millennia. Instead, they are constrained by licensing agreements mandating annual repurchase, so jeopardizing their autonomy and increasing their financial risk. Moreover, the focus on commercially viable crops inside IPR frameworks fosters genetic uniformity, thereby diminishing on-farm biodiversity and heightening risks from pests, diseases, and climate change. This inadequate protection under international intellectual property frameworks jeopardizes traditional knowledge and local agricultural varities. Biopiracy occurs when enterprises patent genetic resources or indigenous knowledge without providing appropriate compensation or acknowledgement to the originating communities.

International agreements like the TRIPS framework of the WTO impose standardised rules that may not aligh with the legal capabilities or development needs of less developed countries, hence exacerbating inequalities in agricultural trade and access to technology. Intellectual Property Rights may prioritize corporate profits at the expense of food security, sustainability, and farmers rights without appropriate

equilibrium, so engendering significant ethical and legal dilemmas for the trajectory of global agriculture.

Conclusion

In the global agricultural sector, Intellectual Property Rights IPRs serve as a double-edged sword. In developing nations, they create issues related to market concentration, farmer dependency, biodiversity depletion and inequitable access, notwithstanding their legal promotion of innovation, productivity enhancement, and global trade expansion. Legal frameworks must equilibrate the rights of inventors with the requirements of farmers, communities, and ecosystems to ensure that intellectual property rights facilitate sustainable agricultural development. An equitable and inclusive strategy for intellectual property rights will help ensure that rural livelihoods, global food security, and enterprises all benefit from agricultural advancement.

*****