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Sowing Innovation: The Role of IP in Agricultural Growth

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Introduction

"A sustainable agriculture is one which depletes neither the people nor the land"

- Wendell Berry

Through technological advancements, this growth has been able to acknowledge intellectual property rights (IPR) as a means of providing innovators with the opportunity to protect their inventions and enhance technological advancement paving way for sustainable development in today's growing world. By 2050, the world population is projected to increase from 8 billion to 9.7 billion[1] such that in addressing this growth, agricultural systems will have to blend traditional knowledge and modern technology stressing not only on quantity but on quality improvement to guarantee food security. For this development, intellectual property rights in innovations arising from both traditional knowledge practices and digital technology ensure sustainable agriculture achieves comprehensive food security goals. Patents, copyrights, and trade secrets are important for protecting new ideas in digital farming. These legal rights are called Intellectual Property rights. They help make sure that new technology is made in a safe way. This contributes to sustainable farming methods. IP rights allow the sharing of new farming technology over time. IP rights make agriculture more resilient. New farming ideas need to be- protected. IP rights contribute to responsible innovation. Innovation helps agriculture be viable for many years.

Indigenous Wisdom and Intellectual Property

India, being the most diverse nation which is reflected in its ethnicity, customs and knowledge, is a subcontinent home to over 100 languages, over 700 different tribes and every major religion in the world.[2] Traditions in India contribute a sense of comfort and belonging which also reinforces integrity. "Traditional knowledge " embracing national identity, which is an archaic notion, refers to the knowledge of the innovations and practices being followed continuously and passed down through generations within the indigenous peoples and communities. Some of this knowledge often pertains to agricultural implementation. Intersection of intellectual property

[1] India's Population Expected to Rise Till 2050 And Then Decline: UN, NDTV, (Apr. 11, 5:56 PM), https://www.ndtv.com/india-news/indias-population-expected-to-rise-till-2050-and-then-decline-un-3961880
[2] Understanding India: A Vast and Richly Diverse Country with Students from Many Different Cultures and Backgrounds, AIRC Education (Apr. 10, 2024, 11:23AM),https://www.airc-education.org/news-and- blog/understanding-india-a-vast-and-richly-diverse-country-with-students-from-many-different-cultures-and- backgrounds

over traditional knowledge facades plays a consequential role. About 2/3 of the population depends upon the sector[3] of agriculture because of its exceptional diversity in agriculture and here indigenous peoples and groups provide a repository of traditional information about conservation and sustainable use with their traditional knowledge. “Res communis a thing common to all”, Traditional knowledge empowers under this doctrine as TK is common to all which is sculpted by groups of people and owned by them for a long period of time. Article 8(j) of the convention on biological diversity specifically marks out the cardinal values of traditional knowledge by Indigenous communities. The fortification of traditional knowledge should be nourished to eschew unauthorized acquisitions of indigenous people's knowledge without their consent. This protection is showered by the IPR, especially in agricultural aspects, which highlights bio- piracy is the unlawful appropriation or commercial exploitation of genetic resources for farming which leads to unethical and intimidation of the existence of Indigenous Knowledge. Exclusively focusing on Intellectual Property and agriculture along with traditional knowledge in India, some notable case studies which show the interface between these two areas:

1. **Neem Patent Feud**: "AZADIRACHTA INDICA", a tree originally from India.[4] This case isn't about a small patent issue but about patent awareness which spotlights the Traditional Knowledge significance in Indian agriculture were the European Patent office confessed a patent to the US Department of agriculture and Multinational Corporation WR. Grace in year 1995, which triggered a rage among Indians the man who stood up for this issue is G. Nammalvar a dedicated farmer and an agricultural scientist, India secured a landmark victory by availing the neem benefit and revoked the patent as it opened the eyes for many and highlighted of the concept of traditional patenting.

2. **Rice Patent 484 Dispute**: In late 1997, the US patent and Trademark office granted a patent to Ricetec Inc., where the basmati long grain is changed to several versions, such as Jasmati or kasmati in the international market. This patent was opposed by an Indian NGO and research foundation because Ricetec are transgressing traditional knowledge by committing the crime of bio-piracy after being examined in 2000. This became as a challenging patent claim and geographical indications. This case vends consequentially infringement of Intellectual Property rights but also the cultural theft of traditional knowledge. The importance of the emergence of a statute to protect the geographical indicators pertaining to Indian heritage and the subcontinent has been realized.[5]

3. **Turmeric wrangle:** This case also marks the traditional or indigenous knowledge this practice had its own menacing name "bio-piracy". USPTO'S decision to grant patent for turmeric as a wound healing technique to the University of Mississippi was strictly condemned by the Indian council for scientific and industrial research availing the benefit of Turmeric powder is widely used in India as a medicine, a food ingredient. The traditional knowledge belonging to India is safeguarded in this Turmeric case.

[3] Press Information Bureau, Achieving Aatmanibharata in Agriculture, pib(Apr. 10,2024, 10:19AM), https://pib.gov.in/FeaturesDeatils.aspx?NoteId=151185&ModuleId%20=%202
[4] Jorge E. Moreno-Cuevas, An Overview of Neem (Azadirachta indica) and its potential impact on health, ScienceDirect,(Apr. 11,2024,11:07AM),https://www.sciencedirect.com/science/article/pii/S1756464620303959
[5] Shazam Krishna Balganesh, System of Protection for the Geographical Indicators of Origin: A Review of the Indian Regulatory Framework, JOURNAL OF WORLDINTELLECTUAL PROPERTY REVIEW, Vol.6(1) (2003) 191.

4. **Ashwagandha disputes:** The case highlights traditional knowledge. The European patent office decided to withdraw an American MNC patent application[6] challenged to bio-piracy. In addition to that, an amla patent case when a German company tried to avail the benefit of Amla. India revoked the patent by submitting the evidence of traditional use in India. A British pharmaceutical company filed a patent application GB2436063[7] use of "Zingiber officinale" for treatment of some diseases, but India submitted evidence that ginger was a traditional medical knowledge and in 2011 that patent was struck down.

These series of case laws flawlessly describe the concept of traditional knowledge and one of the pioneering initiatives taken by India that was TKDL, which was established in 2001 to evade wrongful patent claims associated with the access to databases of traditional Indian knowledge. They provide valuable insights into the complex dynamics between traditional agriculture and horticulture over Intellectual Property Rights in India. Prevention of traditional knowledge in agriculture and horticulture diffuses the sustainability " Rooted in the past, growing for the future" as Indigenous peoples pass down traditional knowledge through generations and thus developing and conserving it to future generations that is done through IPR and also promotes Intergenerational equity.

Twain Intellectual Property and Modern Agriculture

When considering the IPR and modern agriculture, this IPR affects mainly two types of agricultural factors. The One is seed which is acting as a basic agricultural input and the other is chemical based products which include fertilizers, pesticides which are being artificially manipulated. During the colonial period, Indian agriculture was predominantly traditional and subsistence oriented and IP over agriculture claimed limited attention and access and, post-independence, the field of agriculture had showered a phenomenal development during the 20th century and the beginning of the 21st century has seen an explosion in technology which turned into Modern Agriculture.

Plant Patronage under "IPR"

As per Article 27.3 of the TRIPS agreement, plant varieties have to be eligible for patent protection or a system[8] and member countries need to introduce an effective system for plant protection and India adopted the "Sui generis" system for protection of varieties.[9] India enacted PPV& FR Act in 2001-To guard and protect the plant varieties and to register it through IPR, which is a protection of plant varieties and farmers' right authority, which is an integrated protection and obligation coming under the TRIPS agreement. PVP is a form of IPR which is specifically intended

[6] Kounteya Sinha, India beats back US firm's bid to patent Aswagandha formulations, THE TIMES OF INDIA,(Apr. 10,2024,9:45PM)https://timesofindia.indiatimes.com/india/india-beats-back-us-firms-bid-to- patent-ashwagandha-formulations/articleshow/5728923.cms
[7] TNN, British firm's bid to patent ginger foiled, THE TIMES OF INDIA,(Apr.10,2024, 10:35PM), https://timesofindia.indiatimes.com/india/british-firms-bid-to-patent-ginger-foiled/articleshow/11357780.cms
[8] Background and the current situation, WORLD TRADE ORGANIZATION,(Apr.14,2024, 12:11 PM),https://www.wto.org/english/tratop_e/trips_e/art27_3b_background_e.htm
[9] Maithli Jha, The Sui Generis Protection To The Plant Varieties: Farmer's Rights V. Breeder's Rights, Corpbiz,(Apr. 14,2024, 3:35PM),https://corpbiz.io/learning/sui-generis-protection-to-the-plant-varieties- farmers-rights-v-breeders-rights/

to protect new-fangled plant varieties and also bestows exclusive rights to the plant breeders. There are four criteria laid down in the act of plant protection. These are novelty, distinctiveness, uniformity and stable (NDUS) along with that, four varieties of plants can be registered, including transgenic plants, New varieties-which have not been in the public domain for a year before filling.

"*Extant variety*" - A sort of variety which comes under Seeds act 1966 and is a variety of common knowledge, "*Farmers Variety*"-Traditionally cultivated by farmers, "*EDV- Essentially Derived variety*" is a form of plant variety derived from other plants from the combination of genotypes this EDV must be clearly distinguishable from the other plants with some commuted characteristics entertaining EDV is to ensure innovative plants are acknowledged. When they are not idiosyncratic from other varieties, then it is forgery or someone's other innovative made with the intention of curtailing plagiarism.

Prime rights coming under this act are, "*Breeders Rights*" Exclusive right to protect, sell, export and import overprotected things. Researchers' Rights: use of any registered species for further study and experimentation for developing another variety of continuous and repeated research needs the prior permission of registered breeders. "*Farmers' Rights*" Farmer varieties can be registered under the extant variety; they can savour the privileges mentioned undersection 39(1)(I)-(iv) the acts and rewards from the national gene fund. This act also ensures stringent penal provisions which encompass penalties and imprisonment for applying false denominations, false selling and false representations laid down in section 70, 71, 72[10] of the act. Ensuring PVP amplifies agricultural development and also preserves genetic diversity.

Chemicals and Patents

The artificially manipulated chemicals which include fertilizers, pesticides and insecticide which are widely used in today's modern agriculture in India. Fertilizers and pesticides themselves do not come under the umbrella of IPR. Certainly, their production and formulation may come under patent protection. Likewise, the government has granted patents to two major insecticides in India, Novel Miticidal Benzylamide and Novel Dithiolane[11] compound for the term of 20 years, which will be widely used for horticultural and agricultural uses. Rallis India, a leading enterprise in the Indian agri inputs, is strengthening farming practices with NAYAZINC,[12] a unique patented zinc fertilizer designed for soil application which will boost sustainable farming practices beneficial to both farmers and the environment through its inventive crop nutrition solutions.

[10] The Protection of Plant Varieties and Farmers Rights Act, 2001, ADVOCATE KHOJ,(Apr.14,4:23PM),https://www.advocatekhoj.com/library/bareacts/protectionofplantvarieties/index.php?Title=Protection

[11] SUTANUKA GHOSAL, Insecticides India granted patents for two compounds, THE ECONOMIC TIMES, (Apr.14,6:32PM),https://m.economictimes.com/industry/indl-goods/svs/chem-/-fertilisers/insecticides-india- granted-patents-for-two-compounds/articleshow/91591203.cms

[12] Rallis India launches patented zinc fertilizer NAYAZINC designed for soil application, Agribusiness,(Apr. 14, 6:56PM),https://agrospectrumindia.com/2023/12/11/rallis-india-launches-patented-zinc-fertilizer-nayazinc- designed-for-soil-application.html

Succor of IP to Horticulture

Horticulture is the agronomic science, a sub-branch of agriculture which deals with art growing or development of plants, flowers and other aromatic ornamental crops with the infusion of technologies which foster visual enjoyment and sustainability. India's Horticulture though it covers compact scale production but it manifests a prime role in economic output, which contributes 30.4% of the agriculture GDP[13] and also about 33% to the GVA, making a very significant contribution to the Indian economy.[14] This horticulture deals with pomology and olericulture, arboriculture and many more. The triumph of horticulture prosperity and patronage, which affiliates many factors. One of the extensive contributing factors is Intellectual Property, especially Geographical Indications. The salient of GI status increases in price on the international market and depicts the indirect contribution to sustainability. One of the noteworthy case studies is: "Alphonso Mango", which is also known as Hapus due to its exclusive flavour profile which is primarily grown in Ratnagiri, Devgad and districts of Maharashtra. The Indian government granted the GI status under "*Geographical Indications of goods(Registration and Protection) Act 1999"* in class 31[15] and section 2(e)[16] of the GI Act, 1999.GI tag is offered to this mango due to its unique quality which is specifically grown in a particular region and can be marketed and sold as " *Alphonso Mango*"not any other can use this Tag. Another case study Kannauj a historical town in Uttar Pradesh, the land of Kannauj and it's climatic and soil surroundings. Bestows to distilling rose essential oil, which is also aided in perfumery. Its significance is due to its aromatic and quality. "*Kannauj Rose oil*" its idiosyncratic recognition it avouched for the GI tag in 2009. Beyond the recognition of basic factors for GI tag. This rose oil underscores the cultural heritage and traditional knowledge associated with the distillation and eccentricity of rose cultivation in the specific regions. These case studies focus the GI status ensures protection and reputation for the specific horticultural contrivance which is grown exclusively in one region and also to avoid any misrepresentation. GI tags assure consumers of the authenticity of specific things and also enhance trust. It also encourages sustainability by conservation of unique Agro- climatic characteristics and also promotes environmental stewardship and long-term viability for future generations.

Providence of IPR and Sustainability

PVP showers exclusively many advantages and rights which lead to the creation of many new innovations, discoveries with disease combat and stress thwarting which will contribute more and more agricultural productivity and sustainability by enhancing productivity and resilience. Along with that, farmers' rights in modern agriculture led to conservation and sustainable use of plant genetics and its resources. It also aims to traditional farming which will foster cultural heritage

[13] The Horticulture Sector of India, IAS PARLIAMENT,(Apr.15,10:11AM), https://www.iasparliament.com/current-affairs/gs-iii/gs-iii-agriculture/the-horticulture-sector-of-india#:~:text=Contribution%20%2D%20Horticulture%20contributes%2030.4%25%20of,13.1%25%20of%20gross%20cropped%20area

[14] Horticulture , DEPARTMENT OF AGRICULTURE & FARMERS WELFARE,(Apr.15,11:21AM), https://agriwelfare.gov.in/en/Hirticulture

[15] Rastnagiri Alphonso Mango, Geographical Indications,(Apr.15,11:57AM),https://search.ipindia.gov.in/GIRPublic/Application/Details/497

[16] The Geographical Indications of Goods(Registration and Protection) Act,1999, Indian Code,(Apr.12:08PM),https://www.indiacode.nic.in/handle/123456789/1981?view_type=browse

along with sustainability. Striking a balance between PVP and FR ensures sustainable agriculture practices. Some of the GM crops are more resistant to many things for instance, GM crops have reduced chemical pesticides use by 37%,increased crop yields by 22% and increased farmers profit by 68%[17] and it's long lasting which will aid the future food needs and demand which will reduce the pressure on natural ecosystems and promoting sustainable intensification of agriculture some of the GM crops are even drought tolerant likewise India farmers may soon take hold of new chickpeas varieties with improved drought tolerant and disease resistant traits[18] which can help to truncate water supply contributes to sustainable water management. The Intellectual property of over modern agriculture helps to maximize its potential benefits while minimizing its potential risks and fostering sustainable agriculture.

Enforcing IP in **Digitalagri**

The term digital means which often refers to the avail of computer technology and other electronic devices, digitisation of agriculture which includes the use of sagacious advanced technologies for agricultural endeavours. Digital agriculture data, which includes miscellaneous information relating to crop production, soil conditions and monitoring of moisture and wind patterns to gather accurate weather conditions. All these which acts as an innovative aid tool in agriculture to make a precise decision over production and to manage agricultural risk. Embracing modern advancement in agriculture has transformed, focusing on sustainability, productivity and farmer's welfare.[19] The term "Digital Agriculture" which also paves over the section 2 of the Patent Act 1970,[20] section 13 of the copyright Act 1957 and trade secrets. The linkage between these intellectual property rights and digital agriculture portrays a significant role. The patent plays an exclusive position for granting privileges for the certain creation and innovation such as sensor technology and many more in digital farming, allowing them to prevent others who use them without permission. Copyrights pertaining to the digital software which is used in digital agriculture which help creators to protect their investment and the trade secrets may also plays a role in protecting proprietary information to guard the confidential data and algorithms used in digital farming .IPR in digital farming is essential for protecting innovation in digital agriculture which also fosters sustainability.one case study involves agricultural app and IPR which is said in the case of *FARMOBILE.V.FARMERS EDGE*[21] which highlights the importance of patent and trade secrets management and also the mitigate the potential of IPR in digital farming. While we specifically focus on copyrights and digital farming one important aspect have to be considered is plant protection and genetic materials and in case of *BOWMAN.V.MOSANTO.CO*[22] where this case

[17] Dr Ananda Kumar, Genetically modified(GM) crops-the need of the hour, TOI, (Apr.14,7:42PM),https://timesofindia.indiatimes.com/blogs/voices/genetically-modified-gm-crops-the-need-of- the-hour/
[18] India Develops Drought Tolerant and Disease Resistant Chickpeas, ISAAA Inc.,(Apr.14,8:12 PM),https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=17865
[19] Anshu Jha, Technological Renaissance Revolutionizing Bihar's agriculture for sustainable and prosperity, TOI,(Apr.15, 2:04PM),https://timesofindia.indiatimes.com/blogs/mithila-note/technological-renaissance- revolutionizing-bihars-agriculture-for-sustainability-and-prosperity/
[20] The Patent Act, 1970, INTELLECTUAL PROPERTY INDIA,(Apr. 15, 2:48PM),https://ipindia.gov.in/writereaddata/Portal/ev/sections/ps2.html
[21] Farmobile LLC v. Farmers Edge Inc., Casetext,(Apr.15, 4:17PM),https://casetext.com/case/farmobile-llc-v- farmers-edge-inc
[22] Theresa M. Bevilacqua, In the Courts: Monsanto v. Bowman: Supreme Court upholds patent holders' rights,

study stresses the "*Exhaustion Doctrine"* which limits the right of a copyright or patent and touches the copyright protection of seeds and genetic materials[23] this case study highlights the complexity of IPR protection in agriculture. IPR encourages responsible innovation in digital farming, adhering to those innovations are safeguarded and contribute to sustainable farming practices which conserve natural resources and promote the well-being. Intellectual Property in digital farming is driving sustainability by promoting technology transfer contributions to long-term viability and resilience of agriculture.

Food Security and "IPR"

As human beings, we all need food to survive. We deserve to have sufficient access to safe and nutritious food every day. The biggest challenge of achieving sustainable future is the area of food security. Based on a study by the Food and Agriculture Organisation of the United Nations, over 712 million people in the world who are suffering from extreme poverty and for them the cost of food is an essential consideration. If this current trend continues to rise, the number of people affected by hungry could reach 840 million by 2030.[24] Thus, one of the sustainable development goals established by the United Nations in 2015 is to achieve 'End hunger, achieve food security and improve and promote sustainable agriculture". The issues of food security spans from individual household to global systems. Indeed, the National Food Security Act, (NFSA) was enacted in 2013, which was a significant milestone in India's approach to food security. The term food security is outlined in this act as to ensure the access to adequate quantities of food at affordable prices to people. Climate change can have significant effects on food security and nutrition both directly and indirectly. Here theIPR plays an iconic and a major role on food security, thereby increasing the yields and enhancing food production. This can be seen in the evolution of Intellectual property rights, that is;

1. *Patents: Patents Act of 1970* aimed to stimulate domestic innovation but excluded methods of agriculture and horticulture from patentability and didn't grant product patents for food, drugs, or medicines. However, the ratification of the TRIPS Agreement in 1995 necessitated amendments to align with global standards, leading to the introduction of process and product patents in sectors like pharmaceuticals and agrochemicals.[25]

2. *Biological Diversity Act of 2002:* It focused on asserting sovereign rights over natural resources and introduced measures to regulate access to biological resources, linking biodiversity management with IPRs. While India's legal framework attempts to balance international obligations with domestic priorities, challenges remain in areas like farmers' rights and the protection of traditional knowledge. The need for further development and harmonization of the legal framework

WIPO,(Apr.15, 5:42PM),https://www.wipo.int/wipo_magazine/en/2013/03/article_0007.html

[23] James B. Kobak,Jr., Exhaustion of Intellectual Property Rights and International Trade, World Scientific,(Apr. 15, 6:02PM),https://www.worldscientific.com/doi/abs/10.2202/1524-5861.1050#:~:text=The%20exhaustion%20doctrine%20in%20intellectual,authority%20of%20the%20IP%20O wner

[24] Blaise Hope, UN's Zero Hunger Sustainable Development Goal at risk, Sustainability MAGAZINE (Apr. 16, 3:55 PM), https://sustainabilitymag.com/sustainability/sustainable-zero-hunger-sdg-united-nations- development-undernourishment-goals

[25] History of Indian Patent System, Department for Promotion of Industry and Internal Trade,(Apr.16, 6:09 PM),https://ipindia.gov.in/history-of-indian-patent-system.htm

persists to address the complexities of food security and IPRs effectively.

Conclusion

Intellectual Property in agriculture evolved in India a years ago. But in 2005, when India became an endorser with the TRIPS agreement, the cardinal cynosure of the IPR was mandated to clinch the full protection for the plant varieties through patents and also aimed to balance the farmers' rights. Amalgamation of intellectual property with agriculture elevates nutritional sovereignty and sustainability by incentivizing innovation in the digital agricultural field. Intellectual property frameworks and strategies can facilitate the fabrication of more resilient crops and plants which could withstand environmental stresses. A holistic approach that integrates intellectual property with many subdivisions of agriculture which showcases extensive bash to revamp sustainability, food security and social equality is indispensable for acknowledging the agricultural potential in fostering resilience and nutritional sovereignty on a global scale.