Agriculture and Biodiversity: Protecting farmers seeds

Anjali Yadav

School of Law,

VIT-AP University

Vijayawada, India

Potluri Sri Harshitha

Department of Computer Science and Engineering

VIT-AP UNIVERSITY, Amaravati

Vijayawada, India

potlurisriharshitha@gmail.com

ABSTRACT

A complex and divisive topic is the requirement for international laws governing intellectual property rights (IPRs) in relation to genetically modified organisms (GMOs) and traditional knowledge in developing nations. It entails striking a balance between the interests of several parties, including multinational corporations, developing countries, indigenous groups, and the general public. Developing nations frequently have a wealth of traditional knowledge and biodiversity, which are crucial for sustainable development in the fields of agriculture and medical. However, without adequate safeguards, this knowledge may be misused without providing any benefits to the communities who retain it. When traditional knowledge holders' knowledge is utilized in the production of GMOs, global norms can provide frameworks for recognizing and compensating them.

Access to technology may be hampered by intellectual property laws, particularly in underdeveloped nations. Global regulations that are fair and balanced can aid in the transmission of GMO-related technologies to underdeveloped countries, allowing them to better their agricultural methods and increase food security. Due to the technology and research required, farmers who acquire GMO seeds frequently pay higher prices compared to normal seeds. Making sure there are clear guidelines for farmers' rights enables fair pay for innovators and encourages them to spend money on additional R&D.

Concerns over access to GMO technology, particularly for farmers in underdeveloped nations, can be addressed by international regulations. It is possible to balance the interests of farmers and breeders by setting up systems for technological transfer and licensing agreements.

INTRODUCTION

Farmers and breeders are likely at odds over GMOs due to concerns about intellectual property rights and seed saving practices. Genetically Modified Organisms (GMOs) frequently involve patented genetic material that has been modified to exhibit desirable traits such as pest or herbicide resistance. Biotechnology companies can patent these modifications. Farmers who use genetically modified seeds are frequently bound by contractual agreements that limit their ability to save and replant seeds from their harvest, forcing them to repurchase seeds for each planting season. This contradicts traditional agricultural practices in which farmers save seeds from one harvest to replant the following season.

Breeders, on the other hand, may be perceived as favoring more stringent intellectual property rights for GMOs. They may argue that strong intellectual property protection is required to incentivize additional agricultural research and development and to ensure that companies invest in developing new and improved plant varieties.

This dispute between farmers and breeders exemplifies the tension between private intellectual property rights and the broader public interest in food security, sustainable agriculture, and traditional farming practices [1]. The dynamic landscape of farmers' and breeders' rights in the context of Genetically Modified Organisms is explored, as are the intricate national and international frameworks that both advocate for and challenge these rights, all while attempting to strike a harmonious balance between innovation, sustainability, and the greater good.

I.INTERNATIONAL FRAMEWORKS FOR FARMER'S AND BREEDERS RIGHTS:

A. Convention on Biological Diversity (CBD):

The 1992 Rio de Janeiro, Brazil–hosted United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, saw the ratification of the Convention on Biological Diversity (CBD). The CBD is one amongst the most important international agreements, with the goal of addressing issues related to biodiversity preservation, the sustainable use of biological

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Susan K. Sell, Private Power, Public Law: The Globalization of Intellectual Property Rights (The Cambridge University Press)

resources, and the equitable distribution of profits from the use of genetic resources. A bacterium that has been genetically modified to be capable of degrading crude oil.

The CBD places an emphasis on the preservation of biological diversity, including ecosystems, species, and genetic resources. In order to meet current demands and ensure that biological resources are still available for future generations, the treaty promotes their appropriate usage. In order to meet current demands and ensure that biological resources are still available for future generations, the treaty promotes their appropriate usage.

Case study of Diamond v. Chakrabarty vs United States Patent and Trademark Office (1980)

The United States Supreme Court made its decision on the patentability of a genetically altered microbe in this significant case. A bacterium that has been genetically modified to degrade crude oil was created by Ananda Chakrabarty, a microbiologist who works for General Electric, and might potentially help with oil spill cleaning. The genetically altered bacterium was the subject of a patent application by Chakrabarty, however the United States Patent and Trademark Office (USPTO) rejected the patent application on the grounds that living things were not subject matter for patents.

In the end, the Supreme Court decided that genetically modified microorganisms qualified as patentable subject matter. With this ruling, living things made by humans are now included in the purview of patent law. It had a significant effect on biotechnology businesses and research facilities, as a result of which the number of patent requests for genetically altered creatures and other types of life.

Modifications in law: The Diamond v. Chakrabarty case set a standard for the patenting of living things in the US. It paved the way for the patenting of genetically altered plants, animals, and other living things and had a big impact on global biotechnology patent rules. Other nations and international organizations reviewed their patent rules in the wake of the ruling to adapt to the evolving nature of biotechnology and genetic engineering.

B. World Trade Organization (WTO):

Aiming to address trade difficulties in agriculture, the WTO's Agreement on Agriculture was negotiated during the Uruguay Round of trade negotiations and went into effect in 1995. To maintain fair and predictable commerce in agricultural products, it establishes laws and regulations regarding agricultural subsidies, market access, and domestic support measures.

The creation and spread of agricultural technology, notably those associated with the Green Revolution, may be indirectly impacted by the WTO's Trade-Related Aspects of Intellectual Property Rights Agreement (TRIPS). The agreement governs intellectual property rights protection, which includes plant varieties, as well as new agricultural technologies. The impact of patenting on genetic resource access, farmer and indigenous community rights, and the consequences for food security and environmentally sustainable agriculture, however, have been the topic of ongoing debates and concerns. Farmers' rights and agricultural biodiversity may be negatively impacted by patents on agricultural discoveries, particularly seeds and plant types. Some contend that the intellectual property regulations of the TRIPS Agreement may limit farmers' access to seeds, their use of traditional methods, and the sharing of genetic resources.

Concerns are expressed by activists over TRIPS' effects on farmers' rights and agricultural biodiversity. Patents on plant types and seeds may impede the interchange of genetic resources, access to seeds, and customary behaviors.

C. Trade-Related Aspects of Intellectual Property Rights (TRIPS) [2]**:**

The World Trade Organization is in charge of enforcing the TRIPS Agreement, which stands for Trade-Related Aspects of Intellectual Property Rights. It was negotiated as part of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), and it became effective on January 1st, 1995. The agreement establishes baseline requirements for different types of intellectual property (IP) regulation that WTO members may enact.

The primary goal of the TRIPS Agreement is to achieve worldwide intellectual property rights protection while also fostering innovation. These rights include patents, trademarks, copyrights, industrial designs, and trade secrets. The agreement intends to level the playing field for trade in knowledge-based products and services, encouraging technological advancement while facilitating the transfer and diffusion of knowledge and technology across borders. The TRIPS Agreement's main clauses farmers' and breeders' sights include:

- **Right to Save Seeds:** The agreement contains a clause allowing farmers to save, use, trade, and sell seeds as long as they comply with local laws and rules. The preservation of agricultural biodiversity and the ability of farmers to use conventional farming methods depend on this right.

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TRIPS agreement,1995,available at:

https://www.e-ir.info/2013/12/23/the-arguments-for-and-against-the-trips-agreement/

- **Protection of Plant Breeders' Rights:** Under the TRIPS Agreement, member nations are obligated to grant intellectual property protection for plant breeders, enabling those who create new plant varieties to acquire exclusive rights to those types for a predetermined amount of time. The goal of this protection is to promote financial support for agricultural innovation and research.
- **Exceptions and Limitations:** According to the agreement, member nations may impose a few restrictions and exceptions on the use of intellectual property in the agriculture industry. These exclusions can include initiatives to prevent intellectual property rights misappropriation and to make information and technology available for projects that serve the public interest, including safeguarding food security or advancing public health.

It's crucial to remember that the TRIPS Agreement has generated discussion and controversy, especially in relation to its effects on developing nations and their access to crucial agricultural resources. Others contend that robust intellectual property protection is required to encourage agricultural innovation, whilst some claim that strict intellectual property rights may restrict farmers' access to seeds and impede conventional farming methods.

Case of Africa to access medicinal plants:

TRIPS adoption has resulted in pharmaceutical patents, which have made it difficult for several African nations to obtain affordable medications. Local communities found it challenging to take advantage of their traditional medicinal resources as a result of these patents, which restricted the use of medicinal plants and expertise.

Traditional medicinal herbs have long been used by many African groups to cure a variety of diseases and health issues. This accumulated traditional knowledge has been a crucial component of regional healthcare systems for many years. However, with the adventor exploited to create patented pharmaceuticals without giving the communities who retain that knowledge enough credit or remuneration.

III.MULTI LATERAL AGREEMENTS OF FARMERS' AND BREEDERS RIGHTS BY UNITED NATIONS:

A. Food and Agriculture Organization (FAO) [3]:

The United Nations' Food and Agriculture Organization is referred to as FAO. It is a global organization whose goals include eradicating hunger, enhancing nutrition, increasing food security, and advancing sustainable agriculture. The headquarters of the FAO are in Rome, Italy, where it was founded in 1945. It is one of the United Nations' specialized agencies and is run by its 194 member nations and one additional member entity, the European Union. Key functions of FAO include:

- FAO works to ensure that people have regular access to adequate nutritious food so they can live active, healthy lives. It addresses problems with food accessibility, usage, and stability, especially in areas that are vulnerable and have a food shortage.
- The FAO encourages smallholder farmers to have better access to resources and inputs, more effective farming methods, and sustainable agricultural practices. It promotes greater agricultural productivity and profitability while reducing negative environmental effects.

To accomplish its objectives, FAO works in partnership with governments, international organizations, civil society, and the private sector. It is essential for coordinating global initiatives to fight hunger and malnutrition, advance sustainable agriculture, and advance global food security.

FAO for farmers and breeders:

- The FAO supports programmes aimed at protecting and responsibly using plant genetic resources for food and agriculture (PGRFA). Preserving ancient crop varieties and encouraging breeders to share genetic material would help increase crop variety and resilience.
- In order to increase the value of their agricultural goods and help farmers and breeders get access to markets, FAO provides support. FAO contributes to the improvement of farmer incomes and means of subsistence by fostering value chain development and market connections.
- Breeders and farmers can access agricultural knowledge, data, and best practices through FAO's role as a knowledge hub. FAO promotes information exchange and technology transfer through publications, online tools, and workshops.

B. World Intellectual Property Organization (WIPO):

With its main office in Geneva, Switzerland, the World Intellectual Property Organization (WIPO) is a specialized UN agency. It was founded in 1967, and by 1974, it was a fully operational company. The goal of WIPO is to stimulate the use of intellectual property (IP) for the advancement of economic, social, and cultural development. Specifically, in the context of the Convention on Biological Diversity (CBD) and the World Intellectual Property Organization Intergovernmental Committee on Intellectual Property

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FAO information, available at: https://www.wipo.int/wipo_magazine/en/2006/04/article_0004.html

and Genetic Resources, Traditional Knowledge, and Folklore, WIPO is involved in discussions and negotiations regarding the protection of traditional knowledge, genetic resources, and traditional cultural expressions.

The International Union for the Protection of Novel Varieties of Plants (UPOV), an intergovernmental body that creates global norms for the protection of new plant varieties, is administered by WIPO. Breeders' rights are granted under UPOV's legislative framework, giving them temporary exclusive control over the commercial exploitation of their novel plant varieties. These rights encourage breeders to spend money on R&D, which results in the process of development of novel and enhanced varieties of plants.

The WIPO is active in negotiations about genetic resource access and benefit-sharing (ABS). ABS refer to the fair and equitable distribution of gains derived from the genetic resource exploitation as well as related traditional knowledge. For agricultural research and breeding efforts, ensuring fair and equitable access to genetic resources is essential. WIPO activities also include

Increased Efficiency and Productivity: Increased productivity and efficiency in farming can result from patented agricultural advancements. For instance, GM agricultural types with improved drought or insect resistance may generate larger yields, require less pesticide use, and make better use of available resources.

Encouragement of Farmers' Rights: Laws governing intellectual property, such as those that preserve plant varieties, can coexist with those protecting farmers' rights while also considering their customary farming methods, particularly when it comes to sharing and preserving seeds. This makes sure that the contributions made by farmers to agricultural knowledge and genetic resources are recognized and safeguarded.

IV.INTERGOVERNMENTAL ORGANIZATION:

A. Union for the Protection of New Varieties of Plants [4]:

An independent international organization, the International Union for the Protection of New Varieties of Plants (UPOV), is situated in Geneva. Its goal is to encourage the creation of new plant varieties for societal benefit by offering and promoting an efficient system of plant variety protection. The UPOV Convention is administered by UPOV, and its goal is to make sure that its members recognize the accomplishments of plant breeders by awarding them an intellectual property based on a set of precisely stated requirements. Successful plant breeders have a higher chance of recovering their expenditures and building up the money needed for additional investments if they have the chance to gain certain exclusive rights in relation to new varieties.

Benefits:

a) By encouraging the creation of numerous plant varieties, UPOV helps the preservation of genetic resources, enhancing the resilience and biodiversity of agriculture.

b) UPOV promotes the growth of new and enhanced plant varieties by granting breeders' rights and encouraging private investment in research and innovation.

c) By promoting the exchange of plant varieties and technology, UPOV helps breeders collaborate internationally and share information.

V.ACTS SUPPORTING FARMERS AND BREEDERS:

A. PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS ACT,2001:

It has been determined that it is vital to acknowledge and defend farmers' rights in light of their ongoing efforts to preserve, enhance, and create plant resources, genetic resources available for the creation of novel plant varieties in order to aid in the creation of a system that effectively protects plant varieties, farmer rights, and plant breeders. The Indian government adopted a unique approach when it passed "The Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001." Not only is Indian law compliant with the International Union for the Protection of New Varieties of Plants (UPOV), 1978, but it also has enough protections for the public's interests.

Objectives of PPV & FR Act [5]:

i) To develop a strong framework for plant variety protection, farmer and plant breeder rights, and to encourage the development of new plant varieties.

ii)Protecting plant breeders' rights will aid the country's agricultural development by promoting

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[4] UPOV information, available at:

https://www.wipo.int/wipo_magazine/en/2006/04/article_0004.html

[5] The Protection of Plant Varieties and Farmers' Rights Act, India,2001

both public and private sector investment in research and development to produce novel plant species.

iii) Recognize and uphold farmers' rights in their continued efforts to safeguard, improve, and make accessible genetic resources for new plant species development.

iv) Encourage the development of the nation's seed business, which will guarantee that farmers have access to high-quality seeds and planting supplies.

Rights under PPV &FR Act:

Plant breeders that create novel and distinctive plant varieties that meet specific requirements may apply for protection of their intellectual property rights under the PVP Act. If approved, the breeder is given exclusive rights to create, sell, and transfer seeds or other forms of propagation of the protected variety for a set amount of time, usually 20 to 25 years.

i) Breeders' Rights: The protected variety may only be produced, sold, marketed, distributed, imported, or exported by breeders. Breeder may name an agent or licensee and seek a civil remedy if their rights are infringed upon.

ii) Researchers' Rights: Any registered variety under the Act may be used by researchers for experiments or research. This includes using a variety as the basis for the development of another variety, although repeated use requires consent from the registered breeder.

iii) Farmers' Rights: Farmer's Rights recognizes farmers' contributions as the agricultural biodiversity's stewards and permits them to continue using and trading traditional seeds without violating the rights of plant breeders. Similar to a breeder of a variety, a farmer who created or produced a rare variety is entitled to registration and protection:

- Farmers' varieties may also be listed as existing varieties;
- In the same manner as he was permitted prior to the effective date of this Act, a farmer may save, use, sow, re-sow, exchange, share, or sell his farm products, including seed of a variety protected under the PPV&FR Act, 2001; however, a farmer shall not be permitted to sell branded seed of a variety protected under the PPV&FR Act, 2001;
- Farmers are entitled to praise and benefits for protecting the genetic resources of domesticated and wild relatives of commercially important plants;
- Additionally, Section 39(2) of the Act of 2001 has a mechanism for farmers to be compensated for varieties that do not perform as expected.
- In any Act-related case before the Authority, Registrar, Tribunal, or High Court, the Farmer shall not be required to pay any fees.

Relation of PPV&FR with UPOV:

Within the framework of agricultural laws and international agreements, there are connections between Protection of Plant Varieties (PPV), Farmer's Rights (FR), and the International Union for the Protection of New Varieties of Plants (UPOV). Through PPV systems, UPOV, a global organization, offers a framework for the defence of plant breeders' rights. UPOV encourages its member nations to adopt PPV laws based on the international standards it sets for the protection of novel plant varieties. The UPOV Convention specifies the minimal requirements, including standards for novelty, distinctiveness, consistency, and stability, for granting plant breeders' rights.

While acknowledging the significance of farmer's rights, UPOV offers a global framework for the protection of plant breeders' rights through PPV systems. Members are encouraged to explore preserving and promoting farmer's rights in their national agricultural legislation and to connect their PVP laws with UPOV ideals. The inclusion of PPV and FR provisions in national legislation aids in striking a balance between the interests of farmers, plant breeders, and the larger agricultural community.

Case study of Monsanto's Patent vs USA (1996)

The patent on genetically modified (GM) seeds held by Monsanto, specifically the patent on Roundup Ready soybeans, is one of the most noteworthy cases. The herbicide glyphosate, also known as Roundup, was resistant to the genetically modified soybean seeds that Monsanto created. Through the use of this technology, farmers could spray Roundup herbicide on their fields, eliminating weeds while protecting GM soybean plants. This invention provided important benefits for weed control and farming simplicity.

Farmers who used Monsanto's patented seeds were compelled to sign a contract promising not to store and replant seeds from the harvested crop. Monsanto, however, also enforced tight intellectual property rights over its GM seeds. Instead, they had to pay Monsanto for fresh seeds every year. The business used legal action to impose these limitations on farmers' seed-saving techniques.

Monsanto vs. Bowman [6]:

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Bowman v. Monsanto Co. Et Al. (Supreme Court of the United States, 13 May 2013)

Bowman v. Monsanto Co. was a well-known case involving Monsanto's patent on genetically modified seeds. In this instance, Indiana farmer Vernon Hugh Bowman used Roundup Ready soybean seeds that he had originally bought from a registered seed vendor to plant. Bowman, however, opted to save seeds from the harvested crop and replant them in succeeding seasons rather than purchasing fresh seeds every year. Bowman was sued by Monsanto for patent infringement, according to the company, who claimed that the farmer's conduct infringed on their Roundup Ready technology patents. The case's main contention was whether Monsanto's patent rights included seeds that farmers later reproduced and planted.

The Supreme Court Decision:

The matter ultimately came before the US Supreme Court, which decided in favor of Monsanto in a unanimous ruling in 2013. The Court determined that Bowman had used Monsanto's proprietary technology without permission when he planted saved Roundup Ready seedlings. The Court's decision made clear that growers must respect Monsanto's intellectual rights and license agreements and that the replicated seeds were covered by patent protection. The rationale for the ruling was that enabling farmers to save and replant copyrighted seeds would impair the patent holder's ability to recuperate R&D expenditures and hinder innovation in the biotechnology industry.

Change in law:

In the field of agricultural biotechnology, the Monsanto v. Bowman decision established a major precedent and clarified the scope of patent protection for genetically modified seeds. It has since been cited in numerous agricultural patent cases and strengthened the protection of intellectual property rights for seed producers and biotechnology firms. The case, however, also sparked broader questions about the ramifications of patenting living things and the potential restrictions it would have on conventional agricultural methods, seed sovereignty, and seed collection. It generated discussions about how to strike a balance between safeguarding intellectual property and ensuring that farmers all across the world have access to seeds and agricultural advancements.

B.THE BIODIVERSITY ACT,2002:

A law called the Biodiversity Act, also called the Biological Diversity Act, was passed by some nations to control and preserve biodiversity on their soils. Typically, the act attempts to ensure fair and equal distribution of benefits resulting from the use of genetic resources, encourage the conservation and sustainable use of biological resources, conserve traditional knowledge linked with biodiversity.

Its key features include [7]:

- The legislation lays out guidelines for the preservation and sustainable utilization of biological diversity, including flora, fauna, and microbes. It may create conservation zones, protected areas, and management tools for biodiversity-rich places.
- The act establishes guidelines and processes for gaining access to genetic resources found in living things like plants, animals, and microorganisms. It frequently necessitates securing prior informed consent (PIC) from the communities and indigenous groups that have provided the genetic resources.
- This law may also protect traditional knowledge pertaining to biodiversity, particularly that which is held by indigenous peoples and local groups. The management and use of biodiversity may involve traditional practices, which should be acknowledged and respected.

C.ACCESS AND BENEFIT SHARING ACT(ABS),2014:

The Access and Benefit Sharing (ABS) [8] Act is the legislative framework that controls access to genetic resources and the distribution of gains made from using them. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilization, as amended, is normally implemented at the national level by countries (part of the Convention on Biological Diversity).

The Act establishes guidelines and methods for gaining access to genetic resources from living things, including as plants, animals, and micro-organisms, that may be used for both commercial and academic purposes. It ensures that genetic resource owners are compensated in a fair and equitable manner for the use of their resources. This often entails exchanging monetary rewards or non-monetary benefits with local communities and indigenous peoples who have a wealth of traditional knowledge about these resources, such as technology transfer or capacity building.

Prior Informed Permission (PIC) Act frequently contains provisions that demand securing the nations and communities that are in possession of the genetic resources' prior informed consent before access is provided. It ensures that genetic resource owners are fairly and equitably compensated for the use of their resources. The ABS Act makes it easier for consumers and providers of genetical resources to bargain and create terms for access, usage, and benefit-sharing arrangements that are accepted by both parties.

VI.ISSUES THAT LED TO FARMERS' RIGHTS AND PATENTING OF GMO's

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[7] The Biological Diversity Act, India, 2002 and

[8] Access and Benefit Sharing Act, India,2014

A. World Wars impact:

The World Wars had a big impact on how modern agricultural practices were developed, especially the usage of chemical fertilizers, which affected farming and food production. The goal of boosting agricultural output during the wars led to the introduction of techniques that increased productivity and efficiency, including the use of fertilizers. While implementing modern agricultural techniques during the wars and the immediate post-war period helped meet immediate food demands, it also had long-term effects. Concerns regarding the negative environmental effects of intensive agriculture, such as soil erosion, water pollution, and biodiversity loss, have grown over time.

II)International Monetary Fund (IMF):

With the goal of promoting monetary cooperation, stable exchange rates, and economic growth, financial assistance the International Monetary Fund, also referred to as the IMF, was established in 1944. It has 190 members and its offices are in Washington, D.C. The IMF may suggest structural reforms as one of its requirements for financial assistance in order to advance economic efficiency and growth. These reforms might comprise sectoral modifications, trade liberalization, and changes to agriculture policies.

The IMF may advise nations to create fiscal policies that support rural economies and agricultural development. This can entail putting money into services and infrastructure for agriculture, or it might entail specific subsidies. Encouraging financial support for agricultural research and development to boost output, create drought-tolerant crops, and advance sustainable farming methods.

IMF conditionality mandates that nations reduce or do away with agricultural subsidies. This would result in less support for farmers, which would harm their income and make it challenging for them to compete with heavily subsidized agricultural imports from other nations. IMF policies have occasionally pushed nations to switch to export-oriented cash crops, which could result in the neglect of traditional agriculture and food crops. Food instability and the extinction of traditional agricultural knowledge and methods may arise from this. The IMF has come under fire from environmental activists for not giving environmental sustainability enough consideration in its agricultural policy. They contend that the pursuit of high-input, intensive agricultural production may result in the environmental degradation and natural resources depletion.

III)Green Revolution:

In the middle of the 20th century, population growth on a global scale reached previously unheard-of levels. There were worries that the population expansion might outpace food supply, resulting in widespread famine and malnutrition. Low crop yields were the result of traditional agricultural techniques' low productivity in many regions of the world. To fulfil the growing demand for food, agricultural output needed to be increased.

The process of boosting agricultural output using contemporary methods and instruments is the "Green Revolution." Norman Borlaug began the Green Revolution initiative in the 1960s. Agriculture output is linked to the Green Revolution at that time, high yielding seed varieties, tractors, irrigation systems, herbicides, and fertilizers were introduced, revolutionizing the country's agriculture. into an industrial system. Up until 1967, the government's main focus was on enlarging the agricultural areas. In contrast, the rapidly growing population demanded drastic and quick effort to enhance yield, which manifested itself in the form of the Green Revolution.

Research in plant breeding, genetics, and agronomy, in particular, has opened up new possibilities for creating high-yield crop varieties (HYV) and enhancing farming techniques. In comparison to conventional kinds, HYV seeds have the genetic potential to produce better yields. This rise in production made it easier to meet the world's rising food demand and enhanced food security across many regions.

One of the main forces supporting the Green Revolution was the Rockefeller Foundation. It gave agriculture research and development significant financial support, especially in the fields of plant breeding and genetics. The Ford Foundation made a considerable contribution to the funding of Green Revolution-related research and development initiatives, particularly in South and Southeast Asia. The United States Agency for Foreign Development (USAID), among other international development organizations, played a vital role in supporting the Green Revolution financially and technically. Farmers played a crucial role in the Green Revolution by adopting and modifying new agricultural techniques and technology to fit their regional needs.

These corporations funded for genetically modified organisms (GMO) research and productions. HYV’s are a part of GMO. The rules that currently control food production around the world have undergone a major change as a result of the usage of GMOs. Farmers in regions where some crops were formerly unfavorable are now able to harvest a copious number of such crops thanks to kinds that have been genetically modified to resist the climate. Given that they are increasingly frequently utilized in the development of medications, GMOs have an impact that extends well beyond food production.

On the other hand, new researches has identified possible risks that GMOs may bring to the environment and human health, despite the immense promise of this technology to improve human quality of life. Many countries and groups are vocally opposed to GMOs because of these harmful effects. Outcrossing is the risk of GMO food genes contaminating other crops and wild plants. Animals, including insects, suffer as a result. Other plant species are declining, resulting in biodiversity loss.

Case study example:

Bt. cotton in India

The introduction of Bt. cotton in India is among the most well-known examples of GMO-related problems. The cotton used in Bt has undergone genetic modification to create a toxin that is particularly effective against the cotton bollworm. When it was first introduced in India in the early 2000s, it initially enhanced yields and decreased the use of pesticides, but difficulties quickly surfaced. The use of chemical pesticides grew as a result of some pests' long-term development of resistance to Bt cotton. Additionally, the patented nature of Bt cotton creates high seed costs and other financial difficulties for small-scale farmers who find it difficult to pay for the pricey seeds.

V)BILL AND MELINDA GATES FOUNDATION:

The Bill and Melinda Gates Foundation, one of the largest private philanthropic organizations in the world, was established in 2000 by Microsoft co-founder Bill Gates and his then-wife Melinda Gates. With a focus on poor countries in particular, the foundation's objectives are to enhance global health, reduce poverty, and increase educational possibilities. The foundation has received accolades for its efforts to address global health issues and end poverty, but it has also faced criticism and raised concerns on a variety of fronts from activists and civil society organizations. Criticism has also been levelled about The Gates Foundation's engagement in agricultural development. Agribusiness and genetically modified organisms (GMOs) are promoted, according to some activists, who claim that this marginalizes small-scale farmers and conventional farming methods.

Research to create genetically modified crop types that are more resilient to pests, diseases, and environmental challenges has been financed by the foundation. These enhanced crops are designed to boost agricultural output and lower crop losses. To improve GMO research and technology, the foundation works with a variety of organizations, including public institutions of higher learning, international agricultural centers for research, and private-sector enterprises. The establishment of science-based regulatory frameworks for GMOs in developing nations, sponsored by the Gates Foundation, will make it easier for these nations to utilize and approve genetically modified crops.

Indian environmental activist and academic Vandana Shiva has been a prominent opponent of philanthrocapitalism and its effects on food systems, agriculture, and the environment. According to Shiva, who wrote "Who Really Feeds the World: The Failures of Agribusiness and the Promise of Agroecology," major philanthropic institutions like the Bill and Melinda Gates Foundation play a significant role in determining agricultural laws and practices around the world.

Shiva criticizes [9] the Gates Foundation's approach to agriculture, particularly its support of industrial agriculture and genetically modified organisms (GMOs). She thinks that the foundation's emphasis on high-tech, corporate-driven agricultural solutions may not be appropriate for small-scale farmers' varied requirements and ecological surroundings, particularly in the Global South. Vandana focuses on the value of seed sovereignty and the freedom of farmers to store, trade, and use heirloom and regionally appropriate seeds. She critiques the constrictive intellectual property laws relating to GMOs that may restrict farmers' rights to their own seeds.

Case study example:

Alliance for a Green Revolution in Africa (AGRA)

The Gates Foundation has been a key backer of AGRA, a program designed to encourage the development of agriculture in Africa. Encouragement of the use of genetically modified crops in the area has been one of AGRA's strategies. Critics contend that this strategy may result in problems similar to those seen in other areas, such as the emergence of monocultures, reliance on pricey proprietary seeds, and potential harm to biodiversity and conventional agricultural methods.

VI)PHILANTHROCAPITALISTS:

i)The Bill and Melinda Gates Foundation's approach to the agricultural industry and its engagement in the patenting of life are frequently referred to as "philanthrocapitalist." The foundation's generosity is distinguished by its enormous financial resources, calculated bets, and business-like procedures geared toward resolving global difficulties, notably those involving agricultural and intellectual property rights.

The foundation approaches its philanthropy in the agriculture sector strategically and with an eye toward results. It provides funding for programmes and projects with specific objectives and quantifiable results, with a focus on data-driven decision-making and practice-based research. The organization funds agricultural technology research and development, including work on genetically modified organisms (GMOs), drought-resistant crops, and biofortified varieties.

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Vandana Shiva's opinion, available at:

https://www.newyorker.com/magazine/2014/08/25/seeds-of-doubt

Given that many GMO seeds are trademarked and under the authority of a small number of multinational firms, concerns about how the promotion of GMOs may affect seed sovereignty are being raised. This may reduce the amount of control farmers have over their seeds and conventional farming methods. Agroecology and conventional farming methods may be overlooked in favor of market-driven solutions, according to some activists, who contend that the philanthrocapitalist strategy may be used to advance sustainable agricultural growth.

ii) The Rockefeller Foundation, a philanthropic organization, was established in 1913 by John D. Rockefeller, Sr. It ranks among the largest and oldest private foundations in the world.

In the middle of the 20th century, the Rockefeller Foundation promoted the Green Revolution as part of its long history of involvement in agricultural growth. The foundation's funding of agricultural methods and research focused at boosting crop yields has transformed agricultural production and reduced food poverty in a number of developing nations.

The philanthrocapitalist foundations involvement in the privatization of life and the commodity of nature raises moral concerns regarding these practices. Such actions can result in monopolies and obstruct developing nations' and small-scale farmers' access to vital agricultural resources and technology.

CONCLUSION:

The evidence made clear that there have been occasions where corporations have engaged in actions that raise questions regarding the potential exploitation of biodiversity and traditional knowledge. The findings suggest that certain firms have used intellectual property rights to establish exclusive control over agricultural inventions while also attempting to patent biological forms, including genetically modified organisms (GMOs). Such efforts have brought up moral concerns about the monetization of environment and the possible harm to indigenous populations and small-scale farmers.

But it's important to understand that not all corporations use exploitative tactics. Some corporations are actively pursuing cooperative relationships with neighborhood residents and farmers, honoring conventional wisdom, and recognizing the significance of biodiversity preservation.Even while the research shows that exploitative practices occur, it is also clear that responsible and ethical approaches to traditional knowledge engagement and the patenting of living forms are being taken. In the end, promoting innovation, preserving cultural heritage, and defending the rights and well-being of communities whose knowledge and traditions serve as the cornerstone of sustainable agriculture and biodiversity preservation call for a balanced and comprehensive approach.