Patents, Plant Breeding, and the Politics of Preservation: Analysing Global Legal Frameworks for Protecting Plant Varieties

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Abstract

The intersection of intellectual property rights (IPR) and plant variety protection has become a critical issue in global agricultural policy, biodiversity preservation, and innovation. The International Convention for the Protection of New Varieties of Plants (UPOV)[1] and the WTO TRIPS Agreement[2] provide the foundation for protecting plant varieties through patents or sui generis systems. However, disparities between global patent frameworks—especially between the U.S., Europe, and developing countries—have raised complex legal, ethical, and political questions. This article evaluates the legal architecture surrounding plant variety protection across authorities, focusing on UPOV 1991, U.S. patent law (including landmark cases such as *Monsanto v. McFarling*),[4] and European restrictions under Article 53(b) EPC. It discusses how patents for genetically modified or "climate-ready" crops have led to market concentration among a few biotech companies, threatening open innovation and food security. The article also explores the controversial balance between breeders' rights and farmers' rights, especially concerning seed-saving and the potential erosion of traditional agricultural knowledge. Through an analysis of recent jurisprudence (including the Broccoli and Tomato cases), policy statements (e.g., Plantum NL), and civil society activism (e.g., Greenpeace, ETC Group), the paper reveals how patent law is increasingly politicised, affecting the research priorities and biodiversity goals of developing nations. The conclusion highlights the need for harmonising legal interpretations and integrating sustainability and food sovereignty considerations into IPR systems. It advocates for stronger breeder exemptions, transparency in patent licensing, and inclusion of marginalised crops vital to the Global South. This review bridges scientific advancement and socio-legal dynamics, emphasising the urgent need to balance innovation with fair access and biodiversity protection.

Preservation of plant species

The International Convention for the Protection of New Varieties of Plants (UPOV) protects the production of new plant varieties as an intellectual property right (IPR) in most nations. The WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) says in Article 27.3(b) that member countries must "provide for the protection of plant varieties

either by patents or by an effective sui generis system or by any combination thereof." Most of the 153 WTO members have passed laws based on the 1991 version of UPOV, but the TRIPS Agreement does not say which "sui generis system" will meet its standards. UPOV allows you safeguard novel plant varieties that are stable, consistent, and unique. A variety is new in the country where it is protected if it has not been sold for more than a year. It is considered unique if a variety has one or more major botanical traits that set it apart from all other known varieties. If all the plants in a variety share the same traits, then it is uniform. If the traits of a plant variety are genetically fixed and do not change from one generation to the next, or in the case of hybrid varieties, after a cycle of reproduction, then the variety is stable. The 1991 version of UPOV stipulates that protected varieties can be used by breeders to produce new types. This exclusion only applies to new varieties that are not "essentially derived" from any protected types. This rule was developed so that second-generation breeders could not just change the way current kinds look to say they were protecting a new variety. The part of the 1991 Act that says farmers cannot save seed to grow the crop they got by planting a protected variety "on their own holdings," "within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder," is the most controversial for farmers. In earlier versions of UPOV, farmers could trade or sell seeds with each other to grow more plants. The law has compromises to deal with public policy issues, such as the right to save seeds and the right to produce new types that do not derive from protected material in a major degree. People who bought food agreed that allowing them to keep their own types of food could put food security at risk since it would hinder farmers from conserving seeds for future harvests and locking up breeding material. But for plant breeders, any new species that came from previously protected ones, whether they were needed or not, were bad for business. Farmers who saved seeds missed sales that may have happened. They employed patent law to protect their new types because patent law does not have these exceptions.

Patenting diverse types of plants in US

Patenting plant varieties and other biological materials has always been legal in the United States. In the US, plant varieties can be protected by the Plant Variety Protection Act (PVPA), a system of utility patents, or a system of plant patents. The Plant Patent Act declares that plants that do not have sex and are produced in a unique way can now get patent protection. This proposal needs a plant variety that is unique and unusual, and it should not be easy to see how it was formed, found, or grown again. One issue with this method is that each application can only have one claim that covers the plant variety. In the case of Pioneer Hi-Bred International Inc. v. J.E.M. Ag Supply Inc,[3.] , the Federal Court of Appeal made sure that patent protection and protection under the Plant Variety Protection Act (PVPA) did not conflict with each other. Pioneer's patents included Plant Variety Protection Act certifications for the same corn varieties grown from seeds, as well as the making, selling, and offering for sale of the company's inbred and hybrid corn seed products. The defendants said that the Plant Variety Protection Act meant that plants grown from seeds could no longer be patented under the Patents Act. The Supreme Court saw, "When two laws can coexist, it's the duty of courts to treat each as valid." This is why the Federal government turned down this claim. The case of Monsanto Co. v. McFarling showed this. It has to do with the patent that Monsanto has on plants that are resistant to

glyphosate, the genetically modified seeds for those plants, the exact genes that were changed, and the process used to manufacture the genetically modified plants. Monsanto made buyers of the patented seeds sign a "Technology Agreement" that said they would not "save any crop produced from this seed for replanting or supply saved seeds to anyone for replanting." The seeds could only be used "for planting a commercial crop only in a single season." Mr. McFarling, a farmer from Mississippi, signed the Technology Agreement and bought Roundup Ready soybean seed twice, in 1997 and 1998. Instead of selling the 1500 bushels of patented soybeans he had collected in one season as a crop, he decided to plant them as seed the next season. The next growing season, he did the same thing again. This rescued seed still had the genetic modifications that made the Roundup Ready seed possible. McFarling didn't deny that he had broken the Technology Agreement, but he did say that he had broken the PVPA's seed saving provision because the contract indicated he couldn't utilise the patented seed to manufacture new seed for planting when he only made enough new seed for himself the next season. The Court said that the PVPA could not be used to limit the patent law, and it found that Mr. McFarling had broken Monsanto's patent.

Patenting distinct types of plants in Europe

The European Patent Convention (EPC)[5] which looks at UPOV, makes things more problematic in Europe because Article 53(b) stipulates that "plant or animal varieties or essentially biological processes for the production of plants or animals" cannot be patented. It also says that "this provision shall not apply to microbiological processes or the products thereof." Rule 23(b) (5) of the EPC says that a plant and animal production process is fundamentally biological "if it consists entirely of natural phenomena such as crossing or selection." Article 4.1 of the EU Biotechnology Directive says the same thing: it says that patentability is not allowed for (a) plant and animal varieties; and (b) biological processes used in the production of plants or animals. Article 2.2 says that a process for making plants or animals is biological "if it consists entirely of natural phenomena such as crossing or selection." Article 4.2 says that "Inventions which concern plants or animals shall be patentable if the technical feasibility of the invention is not confined to a particular plant or animal variety." This means that the Biotechnology Directive allows the patenting of plant types. The Novartis/Transgenic Plant case was looked at by the Technical Board of Appeal at the European Patent Office (EPO). The case was about a patent application that included claims for transgenic plants having foreign genes in their genomes that, when expressed, created compounds that were anti pathologically active. It also talked about how to breed these kinds of plants. The Technical Board of Appeal agreed with the EPO's decision to reject registration because Article 53(b) specifies that an innovation that may involve changes to plants is not patentable. The EPO's Enlarged Board of Appeal (EBA) says that a plant defined by a single recombinant DNA sequence "is not an individual plant grouping to which an entire constitution can be attributed." This is different from the definitions of plant variety in the UPOV Convention and the EC Regulation on Community Plant Variety Rights, which refer to "the entire constitution of a plant or a set of genetic information." It was also noted that the transgenic plants in the earlier application had specific traits that stopped plant pathogens from spreading. No one said that anything was a type of plant. The Enlarged Board of Appeal held that for plant variety rights, an applicant had

to develop a plant group that was stable and homogeneous. This is different from a normal genetic engineering idea, which let individuals add a gene to a plant's genome to give it a certain trait. People say that the people who produced genetic engineering did not always wish to develop specific things.

What patenting means for preserving the rights of plant varieties

A plant breeder could be breaking a patent when they produce a new variety since patents protect plant variants. When a breeder cannot get or utilise a plant variety right without breaching an existing patent, Article 12 of the EU Directive on Protection of Biotechnological Inventions specifies that they must cross-license it. In these situations, the breeder might petition for a mandatory license to utilise the patent without having to pay a price. A forced license is also a possibility when a patent holder cannot use an innovation without breaking a plant variety right. Plantum NL (2011),[9] the Dutch group that breeds, cultures tissue, makes, and sells seeds and young plants, made its position on the link between patents and plant breeders' rights public on May 6, 2009. It noted-

"i) It should be easy to get to biological material that is protected by a patent so that new cultivars can be made."
(ii) The UPOV Convention's "breeders' exemption" specifies that these new varieties should be free to use and exploit.
(iii) Patent rights should not be allowed to hinder the previously mentioned free access, use, and exploitation in any way, whether directly or indirectly.

It argues that modern plant breeding uses a variety of advanced techniques, including as EMS mutagenesis, gene mapping, embryo rescue, double haploidization, and selection based on DNA markers, to make the selection process better and/or faster. It is hard to breed with patented kinds or those developed with a patented process since patent laws do not usually have a clause that is distinct from the breeders' exception. Planum NL says that there has been a considerable increase in the number of plant-related patent applications. Also, although though France and Germany's national patent laws provide an exception for plant breeding, several corporations with a lot of patents have been urging since 2004 that this exception should be changed to stop breeding children that have a copyrighted trait. The report says that this unrest "has led some companies to ask their competitors to stop plant breeding programs that they claim infringe on their patent applications." This makes it much harder for companies to produce innovative ideas and threatens those that are trying to create new competitive varieties. Plantum NL claims that "these changes put the established system of open innovation in the plant breeding sector at risk."

Getting a patent for ways to breed plants

European Patent Law specifies that you cannot patent "essentially biological processes for the production of plants or animals." The Biotechnology Directive stipulates in Article 2.2 that these processes are made up of "entirely natural phenomena such as crossing or selection." But

the EPO Enlarged Board of Appeal has investigated this in two cases. One was about whether it was possible to patent a procedure that used broccoli crossing and choice. Another source talked about a similar idea that had to do with crossing and choosing tomatoes. Plant Bioscience Ltd. (Norwich, UK) applied for a patent on broccoli for a "method for selective increase of the anti-carcinogenic glucosinolates in brassica species[6]." The Israeli Ministry of Agriculture applied for a patent on tomatoes for a "method for breeding tomatoes having reduced water content and product of the method." People who were interested in both patent applications challenged them. The EPO's Technical Board of Appeal heard these concerns and brought up other issues that the EBA would deal with. There were some questions concerning the broccoli patent:

(i) Does Article 53(b) EPC not apply to a non-microbiological method of growing plants that makes up crossing and choosing plants only because it has an extra technical step or part of any of the crossing and selection steps?

(ii) If the answer to question 1 is no, what are the requirements for recognising the difference between plant production methods that are not covered by patent under Article 53(b) EPC and those that are? Does it matter where the claimed invention's core is found, and does the technical feature offer anything to the claimed invention that goes beyond the bare minimum?

There were questions about the tomato referral, such as:

(i) Is a non-microbiological method of plant production that only involves crossing and selecting plants not allowed under Article 53(b) EPC only if these steps are like and connected to natural events that could happen without human intervention? **(ii)** If the answer to question 1 is no, does a non-microbiological method of growing plants that includes crossing and choosing plants get around the exclusion of Article 53(b) EPC just because it has an extra technical step in any of the crossing and selection steps? **(iii)** If the answer to question 2 is "no," what criteria are used to discern the difference between plant production methods that are not protected by Article 53(b) EPC's patent protection exclusion and those that are? It is critical to consider about the core of the claimed invention and if the technical improvement adds anything important to it beyond what is strictly necessary.

The EBA's answers to the queries are as follows: -

(i) Article 53(b) EPC specifies that a method of growing plants that does not employ microbiology and incorporates or involves the procedures of sexually crossing whole plant genomes and then choosing plants is not patentable because it is "essentially biological."

(ii) Just because a method like this holds a technical step that makes it easier to do the steps to sexually cross the full genome of plants or to choose plants later does not mean it is not covered by Article 53(b) EPC.

(iii) But if the procedure involves a technical step that adds or changes a trait in the genome of the plant generated, and that step does not result from mixing the genes of the plants chosen for sexual crossing, then Article 53(b) EPC does not prohibit the technique from being patentable.

(iv) It does not matter if a technological step is new or known, small or big, or if it happens in nature or is the main part of the innovation when assessing if a method is "essentially biological" and so not eligible for a patent under Article 53(b) EPC.

The EBA thought that the following things were important in figuring out if a process is not inherently biological:

(i) It is important to know how much human involvement there was in total and how it affected the outcome.
(ii) The content of the invention must be the foundation for this decision.
(iii) The effect needs to be clear.
(iv) The contribution must be more than a small one.
(v) Nature does not have the intact set of steps or the sequence in which they are done. They also do not follow the conventional ways of breeding.
(vi) The process's characteristics, its parts, or, if it is a multistep process, the unique order of the process phases may reveal that a basic change is needed to increase plant production.

During the trial, several people said that crossover and selection should only be considered as things that happen in nature. The only thing "selection" meant was natural selection, which is something that people cannot control and that selects which plants live in the wild. It did not incorporate the choice that people make when they breed. The EBA said that you could not just look at the words themselves to find out what they meant when you were following the norms of treaty interpretation. You must look at them honestly and in a way that was consistent with how they are used in their context. It was pointed out that a definition that did not consider that the EPC's words "crossing" and "selection" refer to actions taken by the breeder and that the plant production processes give these words their meaning. The fact that the breeder is involved in the methods used to reach the intended result makes these different. So, crossover and choice are actions that need to be done by individuals most of the time, not merely happen organically in that situation.

The technical requirement for a patentable new thought

The EBA's findings over broccoli and tomatoes bring up the main question of whether patent law allows for the patenting of plant discoveries. The answer to this query will rely on the patent rules in your nation now. People say that the USA has the easiest patent rules. The Supreme Court had to consider in 1980 if a genetically modified microorganism that could break down specific portions of crude oil could be protected by copyright. The name of this case was Diamond v. Chakrabarty[8,] the patent examiner in that case denied the application because bacteria are "products of nature" and living things, hence US patent law does not allow them to be patented. The Supreme Court did not listen to these worries. They said that Congress's main goal was to make the patent statute cover "anything under the sun that is made by man." The Court figured out that the microorganism could be patented because of this. The Court did say, though, that the patent claim in question "was not to a hitherto unknown natural phenomenon, but to a non-naturally occurring manufacture or composition of matter—a

product of human ingenuity." This meant that a biological innovation needed some human involvement to be eligible for patent protection.

The main task of the European Patent Office is to check that an invention is "technical" in character. Rule 27 of the Implementing Regulations to the Convention on the Grant of European Patents says that biotechnological inventions can be patented if they meet the following criteria: (i) biological material that is separated from its natural environment or made by a technical process, even if it has already happened in nature; (ii) plants or animals if the invention's technical viability is not limited to a specific plant or animal variety; and (iii) a microbiological or other technical process, or a product made by such a process other than a plant or animal variety. When considering whether plant breeding methods might be copyrighted, the EBA believed that the requirement that advances be technological was an important aspect of the Broccoli and Tomato determinations. Before the EPC was formed in 1960, the EBA looked at historical documents and concluded that the people who wrote the EPC were worried about making sure that the plant breeding methods that were used at the time could not be patented. This was because new types of plants were being produced that would get a certain property right under the UPOV Convention, which would start in 1960. One of the most important traditional approaches was to pick plants with the proper traits after they had been sexually crossed with plants that were good for the job at hand. One thing that set these methods apart was that the features of the plants that arose from the crossing were decided by the natural processes of meiosis. The breeder chose plants with the right traits or features to obtain the breeding result they wanted. This is what made the plants' genes what they are. It was even clearer that things like irradiation, which changes plant DNA, should not be included because they were offered as instances of patentable technical processes. The EBA also agreed with the grounds presented in the Committee of Experts' Secretariat document for adopting "essentially" instead of "purely" biological. The law shows that just using a technical item in a breeding process is not enough to make it patentable. The EBA said that the claimed invention will still be excluded if the technical step just concludes the steps of the breeding process, even if it is not specified. This is true whether the technical step is part of a procedure that includes plant sexual crossover and later selection.

Conclusion

Article 53(b) EPC says that the EBA concluded that a procedure for making plants that involves crossing whole genomes and then picking plants with the help of people (including giving them technical tools) is not patentable because it is biological. The EBA said again that you cannot patent normal plant breeding. If a process of sexual crossing and selection includes a technological step that adds or changes a trait in the genome of the plant that is made, then that trait is not the consequence of mixing the genes of the plants that were chosen for sexual crossing. This regulation only applies when the extra step is done as part of the sexual crossing and selection procedure, no matter how many times it is done. If not, it would be possible to get around the rule that sexual crossing and selection processes can't be patented by adding steps that aren't appropriate for the crossing and selection process, like steps that deal with

getting the plant or plants ready to be crossed or steps that deal with what happens to the plant after it has been crossed and selected.

It is vital to remember that the EBA makes it against the law to patent ways to breed plants. People have said that you can still patent products that help with plant breeding (Then and Tippe, 2011). A look at the inspection reports for past patent applications at the EPO suggests that the plants themselves—sunflowers (see note 18) and core-less tomatoes—could be copyrighted but claims about plant breeding would need to be removed. Because of this, people who work for civil society cannot legally get patents on plants and animals, ways to breed them, biological materials that are important to them, or the food that derives from these. This lawsuit shines a light on the political side of plant breeders' and botanists' work, which used to be thought of as a technical field. "No Patents on Seeds" was started by the environmental group Greenpeace, which has been striving to spread the information about the issue. This is like what the non-profit group ETC [10] Group has been doing for years in their battle against "patenting of life." People feel quite strongly about this issue, as shown by the fact that Greenpeace protesters damaged a genetically modified wheat crop that was being cultivated at a government research station in Australia in July 2011. The attack happened after a request for more information about the proceedings was denied. The GM trials were part of the search for and development of crops that could live through a drought. The ETC Group undertook a study in 2008 that found that several biotech businesses throughout the world have applied for and/or been granted 55 patent "families" (532 patent docs in all) on genes that are supposed to be "climate-ready" (ETC, 2008). The 2010 version of this study looked at patent claims for abiotic stress tolerance, which includes traits that help plants deal with environmental stressors such drought, salinity, heat, cold, chilling, freezing, low nutritional levels, high light intensity, ozone, and anaerobic stressors (ETC, 2010). It found 262 patent families and 1663 patent documents for genetically modified crops that are "climate ready." This shows that the number of patents published (both applications and issued patents) climbed rapidly between June 30, 2008, and June 30, 2010 (ETC, 2010, Appendix I). The ETC's 2010 report claims that 91% of all patent families are owned by the commercial sector and 9% are owned by the governmental sector. The report from 2010 notes that "two-thirds (173 or 66%) of the total are accounted for by just three companies: DuPont, BASF, and Monsanto." This level of market concentration makes some worry about the kind of biotechnological research being done and the benefits of competition. For instance, how much will the fact that most agricultural and biomedical research is done by private companies affect the focus of that research from difficulties in the South to those in the North? (Alston et al., 1998). Some estimates claim that just 1% of the money that multinational firms spend on research and development goes to crops that could aid people in developing nations (Pingali and Traxler, 2002). The five most essential crops for the poorest desert countries are sorghum, millet, pigeon pea, chickpea, and peanut (Ziegler, 2008, para. 44). These firms do not pay much attention to them at all. This debate over whether plant breeding goods and methods can be patented illustrates that experimental botany is taking place in a more political setting. Increasingly, research on how climate change affects weeds, crop diseases, and insect pests, as well as how plants might be altered to live in dry and salty environments, will be done in a political setting.

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