Seeds of Change:
An Evaluation of Intellectual Property Rights in GMOs

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Foreword

As the evolutionary process continues, human beings become more obsessed with technology. With every new invention comes a new obstacle. In essence, our attempts to make life easier often complicate it. Take for example the invention of the computer and internet. Businesses, governments and educational institutions now operate with increased efficiency; data storage and encryption technology allow rooms of documents to exist on a single disc; international communication takes place instantly at a fraction of the cost. However, the potential amount of danger has increased as well. Before computers and the internet, stealing secrets, information, or other records involved breaking into a building and finding the exact documents needed. Susceptibility to theft was limited to a geographical area. Now a hacker can sit halfway across the world and tap into resources through a cable. Viruses have the potential of shutting down business, or worse, power grids and airline traffic. Now they creep into cell phones, PDAs, and other digital devices. Society minimizes this harm by backing up our data and immunizing our machines with anti-virus software. Biotechnology, on the other hand, does not offer the same quick fixes. Genetically modified organisms (GMOs) can infect a food supply and result in havoc so great that a backup would be the only solution. Unfortunately rebooting farmland is not as simple as pushing a button or flipping a switch.

I. INTRODUCTION

The growth in popularity and use of genetically modified organisms (GMOs) sharply divides the world community, separating those who believe GMOs represent a miracle pill for curing hunger from those who think of them as a modern Pandora's Box. Unfortunately, science cannot predict the consequences that might result from the desire to tamper with nature. Nonetheless, laws in the United States, Canada and Europe now protect the ability to genetically alter living matter and secure the rights to its exclusive use. Since nature endows living matter with the ability to reproduce, these laws grant a patent holder property interest in

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something she did not create (even when it freely migrates to another's land). The Federal Trial Court of Canada recently held these patent rights superior to a farmer's right in his property; a decision affirmed by the Federal Court of Appeal and the Supreme Court of Canada.[1] This decision carries the potential of removing a stick from the bundle of rights in property once thought to occur naturally.

On the issue of genetic modification, farmers and biotechnologists often disagree on the appropriateness of creating mutant plants. This is an odd circumstance because pioneers in botany, agriculture and plant breeding created GM crops to aid the farming industry. Their purpose was to design crops that could produce a consistent yield under difficult conditions and resist pests and disease without the use of pesticides. Despite fears of mutant strains of crops resistant to any form of growth control, scientists continue to produce GM varieties of crops with few limits. An analysis of GM crops, their impact on the farming industry and the effects of genetic drift raises questions regarding the patentability of that which may naturally reproduce itself.

In order to reconcile the rights of a patent owner with the real property rights of a farmer, this paper explores the law protecting patent rights in genetically modified (GM) plants. It suggests that limits on patenting technological advancements in GM plants should exist to prevent adverse effects on real property rights of farmers. This conclusion, while plausible, seems to create a paradox. It offers to protect the farming industry through weakening patent protection for GMOs, essentially limiting an incentive for research and development. However, weakening patent protection does not have to result in disincentives for scientific advancement.

Part I of this paper provides an introduction to GMOs and the tradition of farming in order to detail the relationship between GMO manufacturers and the farming community. Part II analyzes both U.S. and Canadian laws regulating patents and explains how both systems protect intellectual property in living organisms. Part III focuses on recent court interpretations of patent protection and how other property rights yield to them. Part IV offers a different model than the current regime in an effort to preserve traditional property rights while safeguarding valuable land resources.

[1] Monsanto v. Schmeiser, [2001] F.C. 256.

II. GENETICALLY MODIFIED ORGANISMS, THE PRACTICE OF FARMING, AND THE SEED INDUSTRY

The farming industry is composed of complex relationships between the farmer, farming supplier and the market for farming goods. Time and advances in farming technology perpetually shift the roles each group performs and the balance of power between them. Accurately portraying the tension between GMO manufacturers, farmers and the consuming public, requires defining GMOs, examining specific types of GMOs, describing the controversy surrounding GMOs, and understanding the tradition of farming. This first section will lay the foundation necessary to comprehend the role that GMOs play in the farming industry and the subsequent shift in the law that this addition caused.

A. THE BASIC IDEA: WHAT ARE GMOS?

Genetic modification is one of the newest advancements in biotechnology. It allows scientists to create GMOs by isolating genes in those organisms and using recombinant DNA technology to reinsert a desired gene into the organism. [2] This modification enables the organism to exhibit certain desirable characteristics found in other living organisms. Using this technology, scientists bypass the long evolutionary process by engineering "ideal" variations of living matter. These "new" organisms then carry the label of biotech, genetically engineered, transgenic, or genetically modified.

Plant modification, in comparison to genetically modifying animals, has become an increasingly uncomplicated process. In order to create a GM plant, a scientist removes tissue samples ("explants") from a host plant. Then this tissue grows in a sterile culture while it undergoes a transformation procedure where bacteria are used to insert the desired DNA into the tissue.[3] During this process few cells actually transform, and even fewer possess the right gene.[4] After identifying the cells that successfully transformed, scientists place them in a growth medium so that differentiated plants will regenerate from transformed cells.[5] Finally, seeds are collected from the regenerated, transformed plants and examined for

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[2] Peter Goldsbrough, *Introduction to Agricultural Biotechnology*, Purdue University online *at* http://www.agriculture.purdue.edu/agbiotech/inthelaboratory.html (last visited May 12, 2006).

[3] *Id*.

[4] *Id*.

[5] *Id*.

the presence of the transgene.[6] Scientists will then study the plant to determine if the gene(s) that have been introduced actually alter the performance or characteristics of the plant.[7] If the transformation can potentially serve a useful purpose, the "creator" of the new plant may apply for a patent.

B. COMMON GMOS

In the last few decades, genetic modification produced amazing new varieties of organisms. Scientists created these organisms, which include animals and bacteria, as well as plants, for many purposes. For example, genetic engineering produced mice susceptible to cancer for research purposes[8] and new forms of bacteria that are able to clean up oil spills.[9] It also created variations of plants frequently used in the farming industry that are resistant to pests, drought and herbicide. This latter group represents the widely criticized and highly controversial group of GMOs. The most common of these plant varieties are those dubbed "Round-Up Ready," named for their ability to resist the Round-Up weed killer produced by Monsanto.[10]

Round-Up is a glyphosphate based herbicide that kills plants by inhibiting the production of an enzyme required in the production of an amino acid that is necessary for growth and survival of many types of plants.[11] Through research and development, Monsanto was able to successfully engineer a gene with a high tolerance to glyphosphate. It then inserted this gene into the DNA of various types of food crops such

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[6] *Id*.

[7] *Id*.

[8] *See* Harvard College v. Canada, [2002] C.P.R. (4th) 417. (the Harvard Mouse was genetically altered to increase its susceptibility to cancer, making it useful for research)

[9] *See Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (Genetically engineered bacterium capable of breaking down crude oil).

[10] *See About Us*, at http://monsanto.com/monsanto/layout/about_us/default.asp (last visited May 12, 2006) (Round-Up is the world's best selling herbicide and Monsanto currently owns more patents for GM crops than any other company).

[11] *See generally* Monsanto v. Schmeiser, [2001] F.C. 256.

as corn, canola and soy beans, in order to make them resistant to Round-Up.[12]

Monsanto also produces strains of crops resistant to natural pests and predators. Examples of these crops include the Bt-variety corn and cotton. Traditionally, corn and cotton crops are marked by a vulnerability to infestation of the European Borer Moth. This moth bores into the stalks of these crops, making the application of insecticide useless to control infestations. Scientists created the Bt-variety crops (dubbed YieldGard) by injecting a bacteria gene into the plants that produces an endotoxin harmful to the moths.[13] Monsanto claims that this technology limits the presence of the endotoxin to the non-edible portions of the crops; however these varieties are currently not approved for human consumption.

Aventis, another biotech company, also produces a genetically engineered variety of corn that produces a protein that is toxic to certain insects. This protein is known as Cry9C.[14] The protein in this crop mimics that of the Bt-variety, as both come from a certain type of bacteria found in soil.[15] Due to human allergy concerns, this type of corn ("StarLink") is used only for the purposes of animal feed, ethanol production and seed increase.[16] Nonetheless, traces of Starlink corn have been found in the U.S. food supply, subsequently causing the EPA, FDA and USDA to severely restrict further use of it.[17] Incidents similar to this fuel the controversy surrounding the use of GM crops by creating a fear that the spread of artificially introduced genes cannot be controlled.

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[12] *See Seeds & Traits*, at http://monsanto.com/monsanto/layout/products/seeds_genomics/traits/default.asp (last visited May 12, 2006).

[13] Nathan A. Busch, *Jack and the Beanstalk: Property Rights in Genetically Modified Plants*, 3 Minn. Intell. Prop. Rev. 1, 49 (2002). (Hereinafter Busch). *See also* Seeds & Traits – Insect Protection, at http://monsanto.com/monsanto/layout/products/seeds_genomics/story1.asp (last visited May 12, 2006).

[14] *In re Starlink Corn Prod. Liab. Litig.*, 212 F. Supp.2d 828 (N.D. I.L. 2002)

[15] *What is Starlink Corn and Why was it Used*?, at http://www.starlinkcorn.com/History/What%20is%20StarLink%20corn.htm (last visited May 12, 2006) (Bt variety crops are engineered to contain a certain gene from the strain of *Bacillus thuringiensis* (Bt) bacteria).

[16] *Id.*

[17] *Starlink—What Happened?* at http://www.starlinkcorn.com/History/What%20Happened.htm (last visited May 12, 2006) (Cry9C found in taco shells in the United States and the EPA, USDA, and FDA placed heavy restrictions governing the use of growing the corn).

C. WHY GMOS ARE CONTROVERSIAL

The science of biotechnology contributes to the production of many beneficial advances in food and health technology, allowing production to keep up with the pace of a growing population. However, not all aspects of this science are welcome. Though the purpose and application of this branch of science are benign, "genetically modified organisms have become the target of a very intensive and, at times, emotionally charged debate."[18] To the lay person, genetic modification sounds confusing and daunting. The process adopts a Frankensteinian approach to biological advancement that could eventually introduce a monster organism into the ecosystem. However, this does not mean it is all "evil".

Proponents claim that advances in genetic engineering will "help increase production and productivity in agriculture, forestry and fisheries."[19] Furthermore, it will help provide higher yields on marginal lands in countries facing food shortages.[20] Through cultivating genetically engineered rice containing beta carotene and iron, scientists and governments have been able to improve the welfare of many low-income communities.[21] Biotechnology has also contributed to improvements in health and the environment. Currently, genetic engineering helps reduce the transmission of human and animal diseases by aiding the discovery of new vaccines.[22] Genetically engineered bacteria can clean up oil spills[23] and genetically engineered crops may reduce the need for excessive use of pesticides.[24] While list of benefits is both long and impressive, many people still oppose their use.

The rise in popularity and use of genetically engineered crops resulted in protests from all over the world. In the U.S. alone there are numerous consumer groups opposed to genetically engineering nature's

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[18] Food and Agriculture Organization of the United Nations, Statement on Biotechnology, at http://www.fao.org/biotech/stat.asp (last visited May 12, 2006).

[19] *Id*.

[20] *Id*.

[21] *Id*.

[22] *Id*.

[23] *See* Diamond, 447 U.S. at 303.

[24] *Genetically Modified Plants May Still Need Pesticides, at* http://www.biotech-info.net/pesticides.html (last visited May 12, 2006).

creations.[25] The entire European Union currently imposes a moratorium on genetically engineered crops, constituting a *de facto* boycott of all U.S. agricultural products.[26] Even large companies voice strong opinions against the use of GM plants. Recently, Anheuser-Busch threatened to boycott Missouri's rice crops if the state allowed GM crops to be grown within its borders.[27]

Opponents divide the risks of genetic engineering in two basic categories: the effects on human and animal health and the effects on the environment. Humans and animals consuming food products composed of GMOs have the potential to develop increased sensitivities or allergies to common foods. Other potentially harmful consequences of consuming GMOS include the transferring of toxins from one life form to another (such as the endotoxins in Bt-variety crops), creating new toxins or transferring allergenic compounds from one species to another. This could result in serious adverse health effects such as poisoning and unexpected allergic reactions.[28]

GMOs also subject the environment to the risk of an imbalance of the ecosystem. These risks include the possibility of "out crossing," which could lead to the development of "superweeds." Superweeds are those with increased resistance to diseases or environmental stresses that may spread unnaturally and upset the ecosystem balance.[29] Crops engineered to produce natural pesticides could create "superbugs" that develop immunities to toxins that their food sources are engineered to generate. The ecosystem could further suffer from a lack of biodiversity as farmers gradually replace traditional cultivars with a small number of

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[25] *See generally* Organic Consumers Association, http://www.organicconsumers.org/ (last visited May 12, 2006)

[26] *See* Biotechnology Industrial Organization *at* http://www.bio.org/foodag/action/tradefacts.asp (last visited May 12, 2006) (European Union (albeit illegally) is boycotting American agricultural products based on the fact that the U.S. does not mandate testing and cannot ensure that GMO genes are not present in the natural food supply).

[27] Associated Press, *Beer Giant Threatens Boycott over 'Medicinal' Grain*, *at* (http://www.cnn.com/2005/US/04/12/beer.genetic.ap/ (April 12, 2005)

[28] *See Unlikely Reactions: Identifying Allergies to GM Foods, at* http://pewagbiotech.org/buzz/display.php3?StoryID=12, *also High-Tech Crops, at* http://www.pbs.org/newshour/bb/environment/july-dec99/seeds_8-12.html (last visited May 12, 2006).

[29] *See supra* note 18.

genetically modified cultivars.[30] A cultivar is a variety of an organism that occurs naturally and exhibits a certain genetic make up.[31] Normal cultivation techniques (using unmodified plants) produce many types of cultivars through cross breeding and hybridization.[32] Many scientists and researchers view the natural diversity of cultivars as an important aspect of maintaining a healthy ecosystem, because "the larger the pool of genetic resources, the greater the options farmers have to meet changing conditions."[33] Therefore, using few cultivars of food crops with pre-programmed genetic material would decrease diversity and weaken the ability of certain plants to naturally evolve to survive changing ecological conditions.

There is also a problem concerning the genetic drift of GM plant pollen and seed onto land where it is unwelcome. Genetic drift is a concept that describes the process where genes from a GM crop transfer to a non- GM crop through unknown means.[34] Genetic drift generally refers to cross pollination of breeds. However, the combination of modified and non-modified plant seeds also occurs in grain elevators and during commercial transportation.[35] This phenomenon often accounts for the controversies that come before the courts. In the usual case, patent holders of GMOs seek compensation from farmers who "obtain" these crops inadvertently and continue to grow them on their land. In other cases, farmers may sue to prevent GM crops from drifting onto their property because this risks removal or denial of organic certification.

As in most heated controversies, both sides possess credible arguments and concerns about the future of genetically modifying living

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[30] *See supra* note 18. (A cultivar is a plant variety within the same species that has a variation in its genetic material).

[31] George Van Esbroeck and Daryl T. Bowman, *Cotton Germplasm Diversity and Its Importance to Cultivar Development*, 2 J. CottonSci. 121-129 (1998). *Available at* http://www.cotton.org/journal/1998-02/3/upload/jcs02-121.pdf, (last visited May 12, 2006).

[32] *Id*.

[33] David S. Tilford. *Saving the Blueprints: The International Legal Regime for Plant Resources*, 30 Case W. Res. J. Int'l L. 373 (Spring/Summer 1998).

[34] Anthony Shadid, *Blown Profits: Genetic Drift Affects More Than Biology – U.S. Farmers Stand to Lose Millions*, The Boston Globe, Apr. 8, 2001 at G1. *See also* Preston, Hilary *Drift of Patented Genetically Engineered Crops: Rethinking Liability Theories*, 81 Tex. L. Rev. 1153 (2003).

[35] Monsanto v. Schmeiser, [2001] F.C. 256.

things. While GM crops might provide an answer to food shortages, the ability to patent GMO technology may place the power over the food supply in the hands of a few companies. This is a result that policymakers responsible for sustaining the tradition of farming in the United States have tried to avoid.

D. THE TRADITION OF FARMING

The evolution of farming offers some insight into the current form of plant variety protection. The basic premise behind farming is to find the best variety of a certain crop in order to produce the highest yield while being the least susceptible to harmful environmental effects. Before significant developments in biotechnology, farmers in the United States practiced the science of artificial selection to choose the seeds of crops exhibiting the most favorable characteristics to replant for the following season. The practice of saving seeds for replanting was an important and invaluable tradition to the common farmer because it helped guarantee the long-term survival of the farm.[36] This provided little incentive for the development of a seed industry because no laws prohibited farmers from replanting the seed from a former crop.[37] This method was effective, but limited the amount of crop variety (germplasm) because most farmers chose from domestic breeds.[38]

As domestic farming continued to grow in the United States, a division between the wealthy landowners and small-scale farmers began to develop. The small-scale farmer soon realized the disadvantages of a limited germplasm base. This realization began when a group of wealthy landowners imported exotic seeds and adapted them to domestic climates.[39] Their successful use of germplasm secured to them a large advantage in the farming industry.[40] They maintained this advantage by forming private agricultural societies where different exotic seeds were traded.[41] Inevitably, this arrangement kept the various germplasms among the privileged to the severe disadvantage of the common farmer.[42]

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[36] Busch, *supra* note 13.

[37] Busch, *supra* note 13, at 27.

[38] Busch, *supra* note 13, at 7.

[39] Busch, *supra* note 13, at 8.

[40] *Id*.

[41] Busch, *supra* note 13, at 9.

[42] *Id*.

The government responded to this problem by using ambassadors and military officers to collect seed from all over the world and distribute it free to all farmers, not just those in exclusive agricultural societies.[43] Government involvement in the seed industry centralized control over the germplasm base, a responsibility later transferred to the Patent Office in 1839 and, upon its creation in 1862, the Department of Agriculture.[44] The government's involvement in agriculture continued to provide little incentive for development of the seed industry because farmers could obtain seed free from the government.

The growth of the seed industry began upon the discovery of advances in biotechnology and the successful pressuring of the government into giving up control over the germplasm base. The rediscovery of work done by Gregor Mendel in the realm of plant breeding allowed the seed industry to produce hybrids, thereby giving it two advantages over farmers.[45] First, plant breeders could conduct research to produce plant varieties with characteristics more desirable than those existing merely through artificial selection. Second, breeders could create hybrid plants that, by nature, do not reproduce themselves. Hybrid plants by design are products of two inbred lines of plant.[46] This means that any progeny of a hybrid plant will demonstrate variations in genetic code different from that of the parent, resulting in an inferior variety less productive than the original. If farmers want to continue to benefit from a hybrid variety, they need to repurchase seed every new season. This provided a lot of incentive for the development of the seed industry.

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[43] Busch, *supra* note 13, at 10.

[44] Busch, *supra* note 13, at 11.

[45] Busch, *supra* note 13, at 30.

[46] *Pioneer Hi-Bred Int'l v. Holden Found. Seeds*, 1987 U.S. Dist. LEXIS 18286 (D. Iowa 1987) (In order to create a hybrid seed, a company typically plants four to six rows of a particular parent referred to as a female, and alongside of it two rows of a parent referred to as the male. All plants in the female rows are detassled so that no pollen from those plants can fertilize the silks on those same plants. Seed fields are usually planted in isolation from other corn. Thus, the only pollen that can fertilize the female rows is from the male rows planted alongside. The seed on the ears in the female rows is the hybrid seed. The male rows self pollinate, have no value in the further breeding process, and are either chopped out or harvested separately and fed to livestock or commingled with other corn at elevators).

The protection of the seed industry continued with the Plant Patent Act of 1930[47] and the Plant Variety Protection Act (added in 1970).[48] The introduction of these two acts does not preclude the grant of a patent for a plant under the traditional patent system, but provides more general requirements so that obtaining a patent for plant protection is easier.[49] Each type of patent offers various degrees of protection. The benefits of each are described below in section III. As this protectionist structure continues to develop, more power shifts to the seed industry. The industry, through patenting various types of plants, controls the rights to the plants' progeny. This is where the conflict between intellectual property and real property begins.

III. THE IDEA BEHIND PATENTS FOR GMOS: HOW IS IT POSSIBLE?

The legislative history of the Patent Act demonstrates that Congress intended to provide inventors patents for "anything under the sun that is made by man."[50] The United States does not stand alone in its quest to patent anything possible.[51] Conversely, some European Countries and Canada refuse to allow patents for plants and animals, essentially things that occur naturally or are considered "higher life forms".[52] The Treaty on Trade Related Aspects on Intellectual Property (TRIPS) provides specifically in article 27.3(b) that plants and animals may be excluded from patentability.[53] Nonetheless, the upward trend in

[47] Plant Patent Act, 35 U.S.C. § 161 (2005).

[48] Plant Variety Protection Act, 7 U.S.C. § 2402 (2005).

[49] *See* Diamond, 447 U.S. at 303.

[50] Id. at 309 (internal citations omitted) (Congress intended statutory subject matter to include anything under the sun that is made by man).

[51] *See generally Harvard College v. Canada*, 21 C.P.R. (4th) 417 (2002) (Countries such as France, England, Germany, Greece, etc. allow for the patent of a mouse with susceptibility to cancer).

[52] Monsanto v. Schmeiser, [2004] 1 S.C.R. 902. (Canada does allow for the patent of a gene and the process of using a vector to introduce the gene into a living thing. However, it does not allow a patent for the living thing itself.)

[53] The Treaty on Trade Related Aspects on Intellectual Property, Apr. 1994, art. 27.3(b) (does allow for the protection of plant varieties, however that protection does not necessarily have to be a patent. It includes effective *sui generis* systems of protection).

agricultural biotechnology patents has outpaced the overall trend in patenting throughout the U.S. economy.[54] "This trend reflects increased research and development, changing legal doctrine on what is patentable, and different strategic uses of intellectual property protection."[55]

A. THE U.S. APPROACH TO PLANT PATENTING

The power of Congress to grant patents comes directly from Article I, section 8 of the Constitution. Clause 8 authorizes Congress to "promote the Progress and Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." Congress codified this duty in the Patent Act under Title 35 of the United States Code, section 101 which provides the guidelines for patenting. It allows "whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, [to] obtain a patent."[56] Though the language does not explicitly provide for the patenting of living things, the Supreme Court has interpreted the Patent Act to incorporate living things created by a person under "composition of matter."[57]

The current authority for interpreting the Patent Act's applicability to living substances is the Supreme Court's decision in 1980 of Diamond v. Chakrabarty.[58] In this case, the Commissioner of Patents challenged the patent application of a microbiologist on the basis that the law did not provide for the patenting of living matter. The microbiologist applied for patent protection of a bacterium he "invented" that was capable of breaking down multiple components of crude oil. He thought the patent application was appropriate and lawful because the new bacterium exhibited a characteristic not belonging to any naturally occurring bacteria. This made the bacteria both "new" and "useful" under the requirements of the Patent Act. However, the patent examiner decided not to issue a patent for the bacteria itself because microorganisms are products of nature, and as living things they are not patentable under 35

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[54] John King and Paul Heisey. *Ag Biotech Patents: Who is Doing What?* Amber Waves, (Nov. 2003) *available at* http://www.ers.usda.gov/AmberWaves/November03/DataFeature/ (last visited May 12, 2006).

[55] Id.

[56] Patent Act, 35 U.S.C. § 101 (2005).

[57] *Diamond*, 447 U.S. at 313.

[58] *Id*.

U.S.C. § 101.[59] In a five-to-four opinion, the court held that anything "man-made" could be patentable, exempting only laws of nature, physical phenomenon, abstract ideas and things which naturally exist from the protection of a patent.[60]

In challenging the patentability of the bacteria, the Commissioner pointed to both the Plant Patent Act (PPA)[61] and the Plant Variety Protection Act (PVPA)[62] arguing that Congress had no need to pass such legislation if living things were in fact capable of being patented. The PPA allows anyone who "invents or discovers and asexually reproduces any distinct and new variety of plant, including cultivated sports, mutants, hybrids, and newly found seedlings, other than a tuber propagated plant or a plant found in an uncultivated state, [to] obtain a patent."[63] This act was designed to support the work of a plant breeder as a patentable invention.[64] Likewise, the PVPA allows protection to "the breeder of any sexually reproduced or tuber propagated plant variety (other than fungi or bacteria) who has so reproduced the variety" so long as it is new, distinct, uniform and stable.[65] Unconvinced by this line of thinking, the majority opinion stated that if Congress intended to prevent living matter from being patented, it could amend the statute to do so.[66]

Conversely, the dissenting opinion argued that Congress explicitly provided only two ways to patent living material, and that was through the PPA and PVPA.[67] Justice Brennan pointed to the specific language of the PVPA which exempts fungi and bacteria from the protection of a patent as evidence of Congress' intent.[68] However, Brennan's dissenting position was weakened in 2001 when the Supreme Court affirmed its holding that

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[59] *Id*. at 306. (note: a patent was issued for the process of producing the bacteria)

[60] *Id*. at 309.

[61] *See* Plant Patent Act, 35 U.S.C. § 161 (2005).

[62] *See* Plant Variety Protection Act, 7 U.S.C. § 2402 (2005).

[63] *See* Plant Patent Act, 35 U.S.C. § 161 (2005).

[64] *Diamond*, 447 U.S. at 312.

[65] *See* Plant Variety Protection Act, 7 U.S.C. § 2402 (2005).

[66] *Diamond*, 447 U.S. at 318.

[67] *Id*. at 319.

[68] *Id*.

the Patent Act was intended to cover patents for living things.[69] Therefore, an inventor of a type of plant is not limited to patent protection solely under the PPA and PVPA. In fact, patent protection for GM plants exists under the traditional Patent Act as a utility patent, as well as under the PVPA or PPA.[70]

B. THE CANADIAN APPROACH TO PLANT PATENTING

Unlike the United States, Canada does not allow for patents on living things. In Harvard College v. Canada, the Supreme Court of Canada faced the same question posed to the U.S. Supreme Court in Diamond v. Chakrabarty.[71] Since Canada's patent act was borrowed directly from that of the United States, the Canadian Supreme Court was obliged to make a ruling using the same statutory language.[72] The Supreme Court of Canada even analyzed Diamond v. Chakrabarty for persuasive authority; however, it sided with the dissent.[73] In interpreting the language of Canada's Patent Act, the justices held that when read as a whole, "composition of matter" excluded higher life forms like plants and animals.[74] They reasoned that if patent protection was supposed to extend to these life forms, Parliament had the responsibility of providing for this explicitly.[75]

While the Canadian Supreme Court's decision established an important precedent in patent jurisprudence, it did not eliminate loopholes. Two years after the Harvard College decision, the Supreme Court, in Monsanto v. Schmeiser, [2004] S.C.R. 902 upheld the patentability of a gene that could be engineered to modify a living organism.[76] The Court reached this decision despite the dissenting opinion focusing on the holding in Harvard College.[77] The dissent argued that the inability to patent a living organism should technically void the patent right to a gene

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[69] J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l, 534 U.S. 124 (2001).

[70] Ex Parte Hibberd, 227 U.S.P.Q. (BNA) 443 (1985).

[71] Harvard College v. Canada, [2002] C.P.R. (4th) 417.

[72] *Id*. at 437.

[73] *Id*.

[74] *Id*.

[75] *Id*. at 438.

[76] *Id*. at 437.

[77] Monsanto v. Schmeiser, [2004] 1 S.C.R. 902, 939.

within a living organism.[78] The Canadian Patent Office Manual further supported this view because it specifically states that "higher life forms are not patentable subject matter."[79] Nonetheless, the law in Canada does allow patenting a process for producing a higher life form "provided the process requires significant technical invention by man and is not essentially a natural biological process which occurs according to the laws of nature."[80]

IV. THE CURRENT TREND IN WEIGHING PATENT RIGHTS OVER OTHER RIGHTS

The rise in international and domestic protection of patents reveals a distinct trend in elevating the value of intellectual property rights over the rights of an alleged infringer. When patent rights conflict with traditional notions of physical property rights, courts face the question of which law triumphs and which law is inferior. Currently, the clearest example of the superiority of patent rights to property rights comes from the Canadian Supreme Court decision in Monsanto v. Schmeiser.[81] This decision strengthens the ability to protect a patent, and potentially serves as a source for highly persuasive authority for United States courts. Though the United States Supreme Court has no binding precedent on the subject, the jurisprudence on the federal appellate level suggests that the same result is inevitable. In order to asses the possibility of the Canadian precedent becoming binding in the United States, this section will analyze the Canadian Supreme Court's decision and compare it with current United States case law.

A. INTERPRETATION OF MONSANTO V. SCHMEISER

In 2004, the Supreme Court of Canada affirmed a decision holding that a landowner had no right to "use" a GM crop that drifted onto his land.[82] The case began in 2002 when Monsanto sued Schmeiser, a Saskatchewan farmer, for possessing Round-Up Ready Canola without first paying for a technology use agreement.[83] Schmeiser owned a farm in

[78] *Id*. at 939.

[79] *Id*. at 941

[80] *Id*. at 941.

[81] *Id*. at 902.

[82] *Id*.

[83] *Id*.

Canada where he had cultivated crops for over the last 50 years.[84] During the 1990s, many farmers, including five of Scmeiser's neighbors, switched to growing Round-Up Ready Canola because its genetic modification enabled the plant to tolerate the herbicide Round-Up.[85] By switching to canola with a high tolerance to herbicide, the farmers could control weeds more effectively. In order to obtain this canola seed, the farmers entered into a licensing agreement with Monsanto, the seed's manufacturer. Monsanto's contract licensed the canola seed for $15 per acre and prevented any farmer from saving seed to replant the following season without paying the technology use fee again.[86]

Mr. Schmeiser never purchased the Round-Up Ready Canola, nor did he take any from the nearby farms. Instead, he discovered some canola on the border of one of his fields while performing weed control, and noticed it was resistant to Round-Up after it survived being sprayed with the herbicide.[87] Unclear as to how the canola ended up on his land, Mr. Schmeiser decided to keep the seeds and use them the following year. Two years later, 95-98% of his 1000 acres worth of canola tested positive for the Monsanto gene.[88] After discovering the presence of Round-Up Ready Canola on Mr. Schmeiser's property, Monsanto sued him alleging infringement of its patent.

The issue presented to the court was whether Mr. Schmeiser infringed the patent by growing canola containing a patented cell and gene without obtaining a license or permission.[89] In order to find that he infringed the patent, the Court had to determine that he made, constructed or used the patented gene or cell.[90] Since Mr. Schmeiser did not make or

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[84] *Id*. at 912.

[85] *Id*. at 913. (weeds were easier to control because the Round-Up was an effective herbicide when it did not pose a threat to the main crops)

[86] *Id*. at 914.

[87] *Id*. at 912.

[88] *Id*. at 913.

[89] *Id*. at 910.

[90] *Id*. at 917-18

construct the gene,[91] the Court hinged its decision on the definition of the term "use."[92]

The Court found that the term "use" was implied when a defendant's commercial activities involved the patented object.[93] Though Mr. Schmeiser claimed he was using merely the plant, not the gene, the Court likened the situation to one who used zippers made from a patented zipper manufacturing machine without a license to use the machine.[94] Mr. Schmeiser offered as a defense the notion that common law provides farmers a right "to keep that which comes onto their land. Just as a farmer owns the progeny of a 'stray bull' which wanders onto his land, so Mr. Schmeiser argues he owns the progeny of the Round-Up Ready Canola that came onto his field."[95] The Court responded simply, "ownership is no defence (*sic*) to a breach of the Patent Act."[96] This response by the court continues to influence the protection the law affords to intellectual property rights.

B. UNITED STATES LAW

The result of the Monsanto v. Schmeiser case shows that intellectual property rights are superior to the rights of others. The implications of this holding raise questions as to how a property owner may protect herself from the unwanted encroachment of GM crops. Moreover, it fails to suggest what protections exist to prevent abuse of the patent holder. An analysis of U.S. case law may enlighten a landowner to potential remedies, or at least provide a foundation for a proper defense. The first analysis will attempt to find plausible defenses to a patent infringement suit involving GM crops and the second will attempt to find a suitable remedy for the unwanted presence of GM crops on a landowner's farm.

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[91] *Id*. at 917. (In order to make or construct the gene, Schmeiser would need to physically synthesize it in a lab. The fact that the plant reproduced itself did not meet the definition of "make" or "construct" under the statute.)

[92] *Id*. at 917.

[93] *Id*. at 919.

[94] *Id*. at 919.

[95] *Id*. at 937.

[96] *Id*. at 937.

Defenses - Challenging the Patent

The Supreme Court decisions affirming patents for plants and living organisms leave very little room to challenge the validity of a patent for a GM crop. The decisions in Chakrabarty and Pioneer Hi-Bred, strongly affirm the right to plant patents under the PPA, PVPA and Patent Act.[97] These decisions broaden the protection of plant varieties, allowing a patent holder to control the unauthorized reproduction of a plant. However, one may bring a defense of patent misuse to challenge a patent as being in violation of antitrust laws, [98] or attempt to use the law of strays to avoid liability.[99]

In Monsanto v. Swann, the defendant challenged a patent infringement allegation by claiming that Monsanto misused its patent in violation of antitrust laws.[100] The defendant originally purchased a use license for Round-Up Ready crops, but failed to renew it the subsequent year. Following custom, Swann saved the seed from the previous crop containing the Round-Up Ready gene and replanted it. Upon discovering this, Monsanto sued for patent infringement. In his defense, Swann claimed Monsanto had a "tying" arrangement that required him to repurchase seed from Monsanto every year because he was not allowed to save any seeds from his previous crop.[101] He attempted to show that this practice would destroy the secondary seed market as more farmers choose to buy GM crops.[102] Swann likened Monsanto's practice to a used car dealer telling a car owner that she is obliged to buy a new car every year.[103] However, the court held that Monsanto's license agreement did not constitute a tying arrangement and that Swann was "in the position of a car-lessor crying foul upon discovering he cannot retain the car after his lease expires."[104]

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[97] *Id*. at 926.

[98] *Monsanto v. Swann*, 308 F. Supp. 2d 937 (E.D. Mo. 2003).

[99] Monsanto v. Schmeiser, [2004] 1 S.C.R. 902, 939.

[100] *Id*.

[101] *Id*.

[102] *Id*. at 941.

[103] *Id*.

[104] *Id*.

In 2004, the Federal Circuit Appellate Court held in favor of Monsanto again on this issue in Monsanto v. McFarling.[105] There, the court rejected the same defense used by Swann because a market for unmodified seeds existed.[106] While this type of defense has not prevailed in the past, it may carry more weight as Monsanto gains more of the market share. In the year 2000, Monsanto provided nearly 40% of all canola grown in Canada (4.5-5 million acres worth).[107] However, waiting for one company to dominate the market is an unrealistic option for farmers. Therefore, the need to develop a more credible defense still exists.

The traditional common law principle of the law of strays could provide a credible and realistic means of avoiding patent infringement for GM plants. However, In Monsanto v. Schmeiser, the Canadian Supreme Court was quick to reject the notion that the law of strays was applicable. Schmeiser argued that Monsanto's attempt to claim rights to the plants that drifted onto his land treaded "on the ancient common law property rights of farmers to keep that which comes onto their land."[108] He reasoned that he owned the progeny of the Roundup Ready Canola that came onto his field "[j]ust as a farmer owns the progeny of a 'stray bull' which wanders onto his land."[109] The court dismissed this line of reasoning by declaring that "the issue is not property rights, but patent protection."[110] Did the court make the wrong decision? After all, Monsanto was attempting to protect its property right in the patent.

In contrast to the Canadian Supreme Court's view, ownership should be a defense to patent infringement in the context of GMOs because property rights are the real issue at stake. Consider the following set of circumstances: (1) farmer A has acquired a GM crop protected by a patent through the genetic drift phenomenon, (2) farmer B has acquired a GM crop with an expired patent (also via genetic drift), and (3) farmer C has acquired an organic crop through the normal process of pollination. According to the present law, farmers B and C may reproduce and cultivate the crops that are found on their land free of restrictions. Once

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[105] *Monsanto Co. v. McFarling*, 363 F.3d 1336 (Fed. Cir. 2004)

[106] *Id.* at 1342.

[107] Monsanto v. Schmeiser, [2004] 1 S.C.R. 902, 939

[108] *Id*.

[109] *Id*.

[110] *Id*.

patent protection expires, a GM plant no longer receives a special classification. Likewise, a naturally occurring plant found growing on a farmer's land receives no special protection of the law either. However, if a farmer "uses" a patented plant she violates the law. In essence, the law creates a fictional status exempting a product of nature from the traditional common law notions of property once the plant receives patent protection.

Offenses – Recovering for Damage Caused by GM Crops

The presence of GM plants on farmland, or even in a person's yard, may be offensive and damaging. These plants threaten organic farmers' certification and potentially subject regular farmers to patent infringement lawsuits. Unfortunately, a plaintiff seeking to recover for damages caused by GM crops have few avenues for relief. Plaintiffs allegedly "harmed" by the presence of GM crops on their lands have sought recovery under the torts of negligence, product liability and nuisance. However, in the absence of a contract between the GM manufacturer and injured farmer, product liability claims are bound to fail. Nonetheless, recovery under negligence and nuisance doctrines is possible.

Without proof of physical damage to property, plaintiffs face a difficult challenge in making a case for recovery of damages caused by GM crops. One such attempt was made by farmers in Sample v. Monsanto.[111] In Sample, non-GM farmers brought a suit for loss of revenue caused by the European Union boycott of American grain.[112] The European Union boycotted all American grain based on the presence of GM genes in the food supply.[113] The court in this case dismissed the claim because recovery for purely economic loss without physical damage to property is not allowed under the law.[114] Since the farmers could not prove actual physical damage to their property, they could not recover for the loss in value of their crops.

Though farmers cannot recover for economic loss caused by general pollution of the food supply, courts have opened the possibility of recovery for damage to non-GM crops caused by cross pollination with GM crops. The district court in In re Starlink Corn Products Liability, stated that contamination of a plaintiff's corn supply is a physical injury

[111] *Sample v. Monsanto*, 283 F. Supp. 2d 1088 (E.D. Mo. 2003).

[112] *Id*.

[113] *Id*. at 1093.

[114] *Id*.

constituting harm to property that survives the economic loss doctrine and provides a means of recovery.[115] The contamination in this case occurred when the defendant's Cry9C corn (Bt-corn) growing on neighboring farms cross pollinated with other farmers' corn, producing progeny unfit for human consumption and rendering the crops worthless.[116] In its dicta, the court noted that recovery would be appropriate in situations where the plaintiffs' crops were contaminated by pollen from StarLink corn on a neighboring farm or the plaintiffs' harvest was contaminated by commingling with StarLink corn in a transport or storage facility.[117]

The court in Starlink also stated that sufficient evidence existed to form a claim for nuisance.[118] "A private nuisance is a nontresspassory invasion of another's interest in the private use and enjoyment of land."[119] The court agreed with the plaintiffs that drifting pollen can constitute an invasion that interferes with the enjoyment of their land. Furthermore, the court stated that all parties who substantially contribute to the nuisance are liable.[120] This allows for a cause of action against the manufacturer of the GM crop, as well as the farmer who grows it.

While this method of recovery appears plausible on its face, establishing sufficient evidence to support a claim might pose a greater challenge. For example, the specific source of an "invasion" may be difficult to pinpoint with sufficient certainty. In Holden v. Lewis, the district court dismissed a nuisance claim brought by a plaintiff for the presence of bees on his land, alleged to live in his neighbor's bee hives.[121] The plaintiff alleged that his neighbor's bees caused a tremendous annoyance to his family, and resulted in a high rate of bee stings on his children. The court dismissed the claim because the plaintiff could not identify his neighbor's bees as the source of the nuisance, especially considering that many people in that area were beekeepers.[122] Though the facts of Holden relate to bees instead of GM crops, there is a similarity. A

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[115] *Id*. at 842.

[116] *Id*.

[117] *Id*. at 841.

[118] *Id*. at 847.

[119] RESTATEMENT (SECOND) OF TORTS § 821D.

[120] *In re Starlink Corn Prod. Liab. Litig.*, 212 F. Supp. 2d 828, 847 (N.D. Ill. 2002)

[121] *Holden v. Lewis*, 56 Pa. D. & C. 639 (P.A. 1946)

[122] *Id*. at 641-45.

farmer seeking to recover for damage to his crops by GM crops will have to "identify" the source of the nuisance. In a farming community with many farms cultivating GM crops, pinpointing the offending party can be difficult. However, some states do hold manufacturers liable for nuisance "long after they relinquish ownership or control over their polluting products."[123]

A landowner may also be able to recover on a strict liability theory. In Langan v. Valicopters, Inc., 88 Wn. 2d 855 (Wash. 1977), an organic farmer sued a crop dusting company for spraying part of his farm with pesticide.[124] The application of pesticide to the farmer's crops caused him to lose his organic certification.[125] As a matter of law, the court found crop dusting to be an abnormally dangerous activity because damage to neighboring property is still a risk, even when exercising the utmost care.[126] The court reasoned that the drift of chemicals is unpredictable, and such drift can only be reduced, not eliminated. [127] Thus, the court held strict liability to be appropriate.[128]

The genetic drift of GM crop pollen is similar to that of drifting pesticides during crop dusting. When crops are grown outdoors, they are susceptible to the elements and environment. This means that wind, insects, and animals can easily transport pollen from a GM crop to a non-GM crop. While the risk of cross pollination may be reduced by mandatory set back requirements for GM farms or special zoning districts, it may not be eliminated. The potential damage to a food supply is tremendous. Entire farms can lose organic certification, farmers can suffer depressed market prices and cross pollination of varieties can produce crops not fit for human consumption. The serious and unpredictable consequences of growing GM crops could easily lead to the conclusion that this constitutes an abnormally dangerous activity subject to strict liability.

While successfully making a case for liability, a plaintiff could still face difficulty in proving damages. Damage determination for loss of a

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[123] *Northridge Co. v. W.R. Grace Co.*, 556 N.W.2d 345, 352 (Wisc. Ct. App. 1996).

[124] *Langan v. Valicopters, Inc.*, 88 Wn. 2d 855 (Wash. 1977)

[125] *Id*.

[126] *Id*. at 861.

[127] *Id*. at 861.

[128] *Id*. at 861.

crop should be relatively easy since many crops are traded as commodities on a market. However, the success of a crop is not always guaranteed. In Whitmer v. Atchison, 90 F. Supp. 253 (D. Mo. 1950), the court held that damages to a farmer's from a flood created by a neighbor's negligence could not lead to monetary damages because crop success was too speculative.[129] On the other hand, in Zvolanek v. Bodger Seeds, Ltd., 5 Cal. App. 2d 106 (Cal. Ct. App. 1935), a sweet pea farmer was awarded damages for injuries to his land and sweet peas caused when another farmer flooded his land for irrigation.[130]

In the farming community, it is important to have a common standard to measure the potential success of a crop. For example, in Permanente Metals Corp. v. Pista, 154 F.2d 568, 569 (9th Cir. 1946) the defendant operated a dolomite ore plant that discharged large amounts of dust into the air.[131] The dust eventually settled over the surrounding terrain and interfered with the pollination of the plaintiff's apricot orchard, limiting production of the ensuing crop.[132] The defendant claimed a drought was the cause of the low yield for that season. However, the plaintiffs were able to show that neighboring farms affected by the drought and not the pollution produced 60% of normal yield, while the plaintiffs were producing 10% of normal yield.[133]

While solid case law has yet to develop directly on point, sufficient precedents exist to provide a means to protect property from invasions of unwanted species. The current trend in plant patent protection suggests that attempts to bring claims against GMO manufacturers and GM farmers are futile, and defenses to infringement actions are impossible. However, there are specific cases that provide a proper foundation to strengthen property law in relation to patent law. Nonetheless, the bigger problem still remains because real property rights are still subject to the rights of a patent owner of a GMO.

V. PROPOSED CHANGE IN TREND/RETHINKING IMPORTANCE OF PROPERTY RIGHTS

The current trend of valuing patent rights to living organisms that reproduce naturally above the rights of landowners is wrong. When

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[129] *Whitmer v. Atchison, T. & S. F. R. Co.*, 90 F. Supp. 253 (D. Mo. 1950)

[130] *Zvolanek v. Bodger Seeds, Ltd.*, 5 Cal. App. 2d 106 (Cal. Ct. App. 1935)

[131] *Permanente Metals Corp. v. Pista*, 154 F.2d 568, 569 (9th Cir. 1946)

[132] *Id*.

[133] *Id*. at 570.

Congress sought to grant patents for "everything under the sun made by man," it did not intend sole ownership of living matter with the ability to exclude the use of others. The current system promotes harmful practices by granting large companies the ability to impose monopoly controls on farmers. Potential solutions to this problem exist in redesigning the patent system for living organisms or extending strict liability to GM crop manufacturers and regulating the use of their products.

A. DOES THE CURRENT APPROACH CONTAIN POTENTIAL HARM?

Without proper safeguards in place, the current system of granting patents for living matter can be harmful. This system can create incentives for companies to try and dominate the food supply market. Furthermore, allowing a patent holder to maintain a property interest in an organism that naturally reproduces could lead to unethical cultivating practices that unfairly infringe on the property rights of others.

The ability of a company to design a crop resistant to its own herbicide creates a conflict of interest that advances a desire for profit over improving the well being of society and contributing to technological advancement. For example, suppose company A sells herb-A-cide to the farming community as an effective tool to prevent weed growth. Company A has also genetically engineered A-ok corn, a crop resistant to it herb-A-cide. With patents on both the crop and herbicide, the company now markets its products in a package to farmers. As company A begins to dominate the market, it is guaranteed a near monopoly position for the life of the patent. Monopoly profits create little incentive for the company to develop new technology or improve its current technology. This drives smaller seed manufacturers out of the market, limiting the amount of germplasm available to create different varieties of crops. Soon society will pay higher prices for fewer varieties of crops, and lose the benefits of having a greater variety of food production.

There is an inherent problem in a patent system that allows for a utility patent on a living organism, granting exclusive ownership rights for twenty years. Since living organisms reproduce naturally and have the ability to drift onto other areas of land, a patent holder can benefit from a large number of potential infringement actions. For instance, a company merely has to plant seeds on a plot of farmland and wait until the genetically engineered crops pollinate neighboring crops and produce second generation varieties with the patented gene. Under the current system, infringement of a patent does not require intent.[134] Furthermore,

[134] Monsanto v. Schmeiser, [2004] 1 S.C.R. 902.

courts have interpreted the term "use" to include mere possession.[135] Therefore, numerous farmers could unknowingly grow GM crops and still be sued for unauthorized "use."

This system also contains the potential to weaken the property rights of farmers. As the majority of farmers decide to grow GM crops, they will lose ownership in their enterprise. While the farmer will still own her land, she loses the traditional right to save and replant seed from previous harvests. Furthermore, the non-GM farmer will lose the traditional right of cultivating that which naturally grows on her land. Farmers subject to the inadvertent presence of GM crops will face higher costs in testing for the existence of patented genes in their crops, which could weaken a landowner's right to exclude others.

B. WILL A SYSTEM OUTSIDE PATENT LAW PROVIDE A BETTER REMEDY?

There are three potential proposals to modify the current system to allow for the protection of real property rights, the protection of scientific research, and the protection of farmers. First, a firm definition of real property rights based on the common law concept of usufruct will allow a landowner to benefit from the products of her land. Second, the elimination of plant patentability under the Patent Act will permit plant breeders to maintain their rights under the PPA or the PVPA while allowing farmers to continue their traditional practices. Third, imposing strict liability on GMO manufacturers to encourage additional safety steps will prevent contamination of the food supply.

The first modification would define real property to include all rights to the consumables on a property, especially those naturally occurring as reproduced by nature. This idea borrows core concepts from the law of usufruct. The common law concept of usufruct grants a land occupier the ability to use the fruits of the land for his own benefit so long as the land itself it not harmed.[136] If the thing on the land is "consumable," then the usufructuary has full ownership rights, including "the right to consume, alienate or encumber the thing."[137] The State of Louisiana is the only state in the Union to recognize such a right. Thought this right has not been tested against intellectual property rights to GM plants, its foundation supports the idea that what grows on the land for the

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[135] *Id*. *See also SmithKline Beecham Corp. v. Apotex Corp.*, 365 F.3d 1306, 1329 (Fed. Cir. 2004).

[136] *Kennedy v. Kennedy*, 683 So. 2d 720 (La. 1996).

[137] *Id*. at 722.

purpose of consumption or harvest belongs to the one rightfully in possession of the land.

The concept of a usufructuary in Louisiana promotes the idea that there can be two owners to a piece of land. The naked owner is the one holding the fee simple interest, while the usufructuary holds an estate interest for some determined period of time, typically a life estate.[138] The rights of the usufructuary are only limited in terms of her relation to the naked owner and relevant state law.[139] Adopting this concept of landownership would prevent a conflict between patent and property law, and secure to the landowner that which customarily belongs to the land.

The second modification would have Congress remove the ability of an organism and/or gene to receive patent protection under the Patent Act. Instead, Congress should define the PPA and PVPA in order to make each statute the only possible manner of patenting living material. This change in law would still afford a plant breeder ample protection. The PPA provides sufficient protection to new varieties of plants because it prevents asexual reproduction without the authorization of the patent holder.[140] Since the person applying for the patent has developed the only plant variety of its kind, a true-to-type copy of the plant is only available through asexual reproduction.[141] Thus, when a patent holder finds another reproduction of her plant, the case for infringement is obvious.

The PVPA provides supplementary patent protection for those plants, such as hybrids, that fall outside the scope of the PPA. The PVPA provides a mode of plant variety protection that benefits both the farmer and the seed manufacturer. Provisions in the PVPA prevent a farmer from competing directly with a seed manufacturer, because a farmer may only reuse seeds for growing his own crops. The act prohibits a farmer from selling them to other farmers for profit.[142] This arrangement allows a farmer the customary opportunity to save seeds for replanting. This process also allows seed manufacturers to derive a profit from their research because subsequent offspring do not contain the same valuable combination of traits as the first generation plants. The purity of the

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[138] *Id*.

[139] *Id*..

[140] 35 U.S.C. § 161 (2005).

[141] Sexual reproduction of a unique variety will produce a hybrid with different characteristics, thus the only way to copy a unique variety is through asexual reproduction.

[142] 7 U.S.C. § 2543.

plant's genetics decreases with each new generation, making the progeny less valuable over time. This incentivizes farmers to repurchase seeds every couple of years in order to replant the most productive variety of a crop. It also encourages seed manufacturers to keep producing better and new varieties instead of exploiting their patents until their expiration. The combination of these outcomes creates a benefit that inures to all of society.

Finally, the production and cultivation of GM crops should be subject to a strict liability regime, as well as increased regulation. Due to the nature of plants, GM crops will naturally reproduce through pollination. Since cross pollination is difficult to control on large scales for different types of crops, the responsibility for preventing the genetic drift should belong to the seed manufacturers and GM farmers. Placing the burden of preventing GM contamination on the shoulders of non-GM farmers makes no sense. Allowing GM farmers to reap certain benefits because of the genetic qualities of their crops should not include the generation of negative externalities, the costs of which are borne by the rest of society.

The potential harm genetic engineering could cause to the environment requires application of the same type of strict liability set out in Rylands v. Fletcher. Though not as inherently life-threatening as a boiler, GM crops have the potential to strip non-GM farmers of organic certification. Since most of these GM crops are herbicide resistant, permanently removing them from farmland can be an expensive procedure. Viewing GM crops in this manner will give rise to increased forms of protections. Zoning laws would be an effective remedy for separating GM farms in order to minimize their impact on other farmland. Seed manufacturers would also have incentives to develop "terminator genes" that only allow a plant to produce a single generation, or completely eliminate its ability to reproduce.[143] Such genes would remove the liability of the manufacturer regarding the "pollution" of non-GM crops.

VI. CONCLUSION

United States law should be wary of embracing strong patent protection for GMOs because their impact on the well being of society has not been determined. The rise in use and popularity of Round-Up Ready and similar GM crops creates legitimate causes for concern. While the

[143] *Terminator Genes: Fertility Right*, THE ECONOMIST, (Oct. 7, 1999), *at* http://www.economist.com/PrinterFriendly.cfm?Story_ID=247458

potential adverse health effects of GMOs are the major focus of international controversy, farmers and other landowners stand to lose some of their traditional and well known property rights. Despite these problems, the U.S. Supreme Court maintains its position that living matter is patentable outside the PPA and PVPA.

Though the law continues develop regarding the degree to which patent protection is afforded to the patent owner, the current trend works to the disadvantage of the property owner. The implications of this trend are disturbing, and what is currently precedent in Canada may soon become the law in the United States. However, the law in the courts suggests there is a potential for defending property from the presence, and even use, of GM crop pollen that inadvertently drift onto the land of others. If case law fails to protect traditional property rights, there is a need to reform the law. By codifying traditional notions of property use, revising the Patent Act, and creating strict liability for damage caused by GM crops, society will be protected from the dangers that the current system poses. This modified system will continue to encourage research and development in biotechnology while securing to the farmer the right to practice traditional farming techniques.