Article

How Gene Ownership Affects Seed Markets and the Various Effects of Gene Patents on the Seed Supply

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Abstract

As food consumers increasingly call for tighter controls on the food system and increased knowledge of the productions chains involved, the cultural practices of agriculture and techniques are gradually meeting these new demands of localized sustainability. However, in addition to restructuring how crops are grown, consumers are demanding changes in the genetic manipulation of the crops themselves. Genetically modified organism (GMO) technology presents an additional aspect to agriculture: a new realm of intellectual property. The patenting of life presents an issue in maintaining seed sources for these changes in consumer preference and the markets for seed, both GMO and non-GMO. Upon further investigations of industry, academic, and legal literature, biological action and current property rights structure create a regulatory environment that complicates the seed production landscape. This impedes seed production on both sides of the GMO fence.

Introduction

According to present United States patent law, "[a] living plant organism which expresses a set of characteristics determined by its single, genetic makeup or genotype, which can be duplicated through asexual reproduction, but which cannot otherwise be "made" or "manufactured."," qualifies for a plant patent. While many GMOs are first genetically altered and then bred to create a seed crop, "utility applications" still qualify the organism for patenting despite the organism being a product of replication through procreation (The United States Patent and Trademarks Office, 2014). These patents can also apply to non-GMO seed but in a different legal format. The patented seed is sold with a specific contractual obligation for use in only one season but prohibits saving seed; yet, some farmers enter into seed production agreements to produce the seed for companies to market for the next growing season. In addition to these limitations on the seed, technology use agreements often demand farmers, "to implement an Insect Resistance Management ("IRM") program," and limits seed production to those who have, "entered into a valid, written Seed production agreement." (Burrus Seed, 2014). Seed production of GMO seed is limited by technology agreements and the deliberate and undeliberate theft of intellectual property: altered genes. Seed production of non-GMO and organic seed is limited by undeliberate intellectual property theft and the contamination of seed supply sources.

Body:

The biological disregard to human delineations of fields and crops meddles with

these agreements through a process known as GMO contamination. Pollen spreads across crops without respect to the technology agreements. As noted by Mercer and Wainwright in the study of corn gene pools in Mexico, contamination regularly occurs between fields following an edge gradient (Mercer and Wainwright, 2007). Additionally, the centralized seed supply often finds various patented strains mixed in as for farmer use, inadvertently breaking patent law and driving some seed companies towards legal action, also known as litigation. The legal risks of GMO contamination make scarce "clean seed," which is seed safe for growing for seed, while contamination itself limits the supply of quality seed for breeders to develop. Haslberger points out that, "EU Scientific Committee on Plants states that contaminations are inevitable," (Haslberger, 2001). Despite the stringent standards to reduce the effects of cross pollination, contamination may be inevitable; the cost on producers currently to mitigate genetic contamination to this level even presently raises seed prices (Hallauer, 2013). Farms trying to breed GMO hybrid seed under contract must work to prevent other farmers from contaminating their crops while also preventing their own crop's genes to travel by pollen the other way.

Legally, many biotech firms, such as Monsanto, regard any contamination as a patent violation. Even farmers who are not growing Monsanto seed, but find Monsanto contamination, risk litigation for any contamination that appears in their crops. Monsanto justifies this in three reasons, citing that compensation is due for the technology, research in and of itself deserves remuneration via the final product, and that this would not be fair to the farmers honoring present technology agreements (Monsanto 2014). In Monsanto's case, nine of 145 lawsuits over patent infringement went through complete trial and the biotech firm won every time (Monsanto, 2014). In contrast to these worries of patent infringement, the Queen Mary Institute—a United Kingdom intellectual property research group—acknowledges, "in its report on EC Regulation of Genetic Modification in Agriculture (1998) the Select Committee of the British House of Lords also warned of the problem of cartels and monopolies in the agrochemical/seed sector, pointing out that the degree of consolidation was already much greater than in the pharmaceutical sector," (Queen Mary Intellectual Property Research Institute, 2004). In fear of legal reprimand for contamination, farmers trying to secure seed must either pursue seed directly from biotech companies and subsidiary seed dealers, or purchase seed from a small market share of non-GMO plant breeders. GMO contamination extends to grain as well. The Ohio-based agricultural corporation, Cargill, is currently suing the Swiss company Syngenta over the release of a transgenic seed corn not yet approved for importation into China. (Pearson, 2014). Pearson notes that MIR 162 presented a market liability to the export grain market, and when released across the American grain production chain without Chinese approval grain containing the trait would cause shipment rejections and market losses (Pearson, 2014). In the courts, the biotechnology firms hold monetary and representative power over smaller seed production firms and the legal process regarding biotech intellectual property as a consequence of legal precedence and the industry trend towards consolidation; this financial power far outweighs the resources of the average producer.

Organic firms face the issue of finding pure seed supplies that are both non-GMO and meet organic standards. Even in 2004, researchers from the Netherlands noted that, "for various crops the supplies of organic produced seeds are still insufficient," despite the limited availability of GMO seed sources at that time. "A consequence of the omission of chemicals in the organic production system is the increased risk of the occurrence of diseases during production of some crops, as long as disease resistant varieties are not available. This holds also for seed production, especially, for biennial crops, which are exposed to various diseases during two subsequent seasons," (Groot, van der Wolf, Jalink, Langerak, and van den Bulk, 2004).

Methods:

Google Scholar was consulted for technical and academic articles from the database there as well as from the "Science Direct" journal, in addition to the publication, "Seed Testing International". Seed technology agreements were consulted as they were available to the public. In arranging resources, a thorough review of the rulings of the Supreme Court, and a chronological sequencing of literature, the other derived the following results and conclusions per-

taining to the seed market and the GMO preference. The author searched the seed technology agreements available to the public, while also searching the following keywords through a general Google Scholar search: "GMO contamination," "cross pollination," "agricultural intellectual property," "seed technology," "biological patent law," "trait discovery," and "gene ownership." Individual company websites and similar investigations came at the recommendation of Dr. C. Filson (Ohio State University, Dept. of Agricultural Communication).

Results:

The study produced a mixed opinion of current gene ownership. Legally, biotechnology companies hold intellectual property over any and all seed that contains their specific gene sequences, even when the gene sequences exist in contaminated seed on another plot of land (Burrus 2013; Haslberger 2001; U.S. Patent Office 2014). Contamination and the legal damages often lie on unintentional cross-pollination between populations (Hallauer 2013). Seed technology agreements also limit the supply of GMO seed crop available in a season, as companies limit GMO seed production to contract farms (Pearson 2014). Non-GMO seed contaminated with GMO transgenes therefore threatens the non-GMO seed producer with legal action even though the producers don't desire this GMO pollination (Mercer and Wainwright 2008; Groot et. al. 2004). Economically, the wholesale elimination of gene ownership would harm both GMO and non-GMO seed producers and marketers, as the gene material would easily replicate and no single entity could secure their proprietary claim to the seed with explicitly contract farming all seed and instigating draconian isolation distances impractical to small and large producers alike (Groot et. al. 2004; Mercer and Wainwright 2008). Without any reward for maintaining specific seed lines, the biotechnology firms would not invest as heavily in improving crop yields and current GMO strains. This would slow and ultimately stop the advancements of GMO seed as well as the accompanying pest and weed management technologies (Pearson 2014). This tragedy of the genetic commons would limit the current proprietary rights of non-GMO seed and also limit the development of these seed strains (Monsanto 2014; Groot et. al. 2004).

At the same time, seed GMO and the regulatory apparatus accompanying it threatens the end product, namely grain sales (Monsanto 2014). Given that most grain now moves through an international import-export system, GMO technology without regulatory approval threatens sales when mixed with non-GMO and approved GMO product, and thereby creates another commons situation that harms all economic actors (U.S. Patent Office 2014; Queen Mary Intellectual Property Research Institute 1998; Pearson 2014).

Conclusion:

Currently, national and international law recognizes the right of biotechnology firms and researchers to genetically modify then patent seed technology (U.S. Patent Office 2014). These companies can sell seed to farmers through contracts that prohibit the direct theft of the genetic intellectual property, but can also use litigation to protect intellectual property that spreads through biological happenstance (Groot et. al. 2004). Unlike a patented television or other consumer product, seed replicates and spreads copies of transgenes that cost firms millions of dollars and years of research to develop (U.S. Patent Office 2014). Contamination harms non-GMO seed producers, as biotech firms often sue for patent infringement but the contamination itself also threatens the value of the non-GMO seed crop (Haslberger 2001).

Without intellectual property rights on the seed, biotech firms lose the desire to invest in seed technologies while non-GMO producers lose the limited rights to develop non-GMO strains (Monsanto 2014; Haslberger 2001).

Solutions to this property rights issue include allowing biotech firms to own the modifications of the seed genetics they produce while restructuring the way that GMO contamination proceeds through the judicial system. Intentional and unintentional contamination cases deserve different legal actions, as the former harms biotech firms more than the latter, which actually harms farmers and non-GMO seed producers (Groot et. al. 2004). As these patents apply to genes modified in a strain at present, limiting patents to the specific gene modifications would alter the patents currently active domestically and abroad.

Future works should include additional research into the international recognition of the genetic intellectual property and a study of transgenes in animal systems and the contamination inherent in animal genetic modification. Additionally, property rights framework that protect biotechnology property rights while preventing overextension onto non-GMO producers might improve relations between these industry sectors and allow better market interactions to take place.

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