pests and disease, greater food security, and various medical benefits.[7] In 2004, the global farm income benefit from GE crops, including second season soybeans in Argentina, was $6.5 billion.[8] The largest income benefit during that same year was from herbicide-tolerant soybeans, which added $4.14 billion in additional income.[9] Furthermore, from 1996 to 2004, the farm income benefit from herbicide-tolerant soybeans in the United States alone was approximately $6.4 billion.[10] While companies that hold utility patents on GE plants are often blamed for restricting farmers' rights,[11] the farmers have obviously benefited from the availability of GE crops.[12] On average, studies have shown that patent holders retain only one-third of the benefits of first-generation GE crops, whereas two-thirds of the benefits were shared "downstream" with consumers or purchasers of the GE crops.[13]

Many of the same agricultural benefits can be observed, with some minor differences, in both developed and developing nations.[17] As the world's population continues to grow,[18] farmers need advancements in technology in order to increase production levels from the same amount of tillable acres.[19] Productivity growth in agriculture has been achieved largely with technological advancements, including management, equipment, and GE plants.[20] Without the availability of GE crops, maintaining global crop production levels at 2011 levels would have required planting an additional nine percent of the arable land in the United States, including 13.3 million acres of soybeans alone.[21] While herbicide-tolerant crops have been particularly important for increased efficiency and production, development is currently underway for the next generation of GE technology.[22] These crop developments include virus and fungus resistance, cold tolerance, drought resistance, and improved seed quality through protein, oil, or vitamin content.[23]

In order to promote innovation in genetics and biotechnology,[24] developers of GE plants may obtain utility patents for plant tissue, seeds, or whole plants.[25] Seed companies who own the patent rights for GE plants use utility patents in conjunction with license agreements to restrict a farmer's use of patented GE plants.[26] These restrictions, inter alia, prevent farmers from saving

17. Qaim, *supra* note 14.

18. U.N. Dep't of Econ. & Soc. Affairs, *World Population Prospects: The 2012 Revision, Volume 1: Comprehensive Tables*, at xviii, U.N. Doc. ST/ESA/SER.A/336 (2013) ("In July 2013, the world population will reach 7.2 billion, 648 million more than in 2005 or an average gain of 81 million persons annually.").

19. ERS Bulletin EIB-88, *supra* note 1, at 65 & tbl.4.3. The agriculture industry relies on improvements in technology for growth more than almost any other section of the U.S. economy. *Id.* From 1960 to 2004, the growth in total factor productivity (TFP), which is a statistical series used to isolate the effect of changes in technology and related factors on output, accounted for 13% of growth in industrial output; however, during this period, TFP accounted for 117% of the growth in agricultural output. *Id.*

20. *Id.* at 51.

21. Miller & Brookes, *supra* note 12.

22. ERS Bulletin EIB-88, *supra* note 1, at 51.

23. *Id.*

24. *See* Diamond v. Chakrabarty, 447 U.S. 303, 307 (1980). Patent laws promote progress by offering incentives to investors for a limited time, and this "authority of Congress is exercised in the hope that '[t]he productive effort thereby fostered will have a positive effect on society through the introduction of new products and processes of manufacture into the economy, and the emanations by way of increased employment and better lives for our citizens.'" *Id.* (quoting Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 480–81 (1974)).

25. *See* J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l, 534 U.S. 124, 132 (2001); *Ex parte* Hibberd, 1985 WL 71986, at *2 (B.P.A.I. Sep. 18, 1985).

26. *J.E.M. Ag Supply*, 534 U.S. at 128; *see also* Monsanto Co. v. Scruggs, 459 F.3d 1328, 1333 (Fed. Cir. 2006).

for replanting any seed produced from patented product.[27] In *Bowman v. Monsanto Co.*,[28] the United States Supreme Court concluded that patent rights apply when a farmer plants commodity soybean seed[29] and saves and replants seeds harvested from that commodity seed.[30] Moreover, the Court concluded that the doctrine of patent exhaustion did not apply because the doctrine does not restrict a patentee from preventing the buyer from making copies of the patented product.[31] In the subsequent sections, this Note discusses patent rights and the patent exhaustion doctrine as applied by the Supreme Court in *Bowman v. Monsanto Co.* and argues that the Court correctly concluded that the patent exhaustion doctrine does not apply to self-replicating technologies in this context.[32]

In support of this argument, Part I of this Note outlines the development of patent law and the application of the doctrine of patent exhaustion as a defense in patent infringement lawsuits. In addition, Part I discusses the broadening of the scope of utility patents to include GE plants as patentable subject matter under 35 U.S.C. § 101 (2006). Lastly, Part I addresses the use of license agreements in conjunction with patented GE plants and the application of

I. HISTORICAL ANALYSIS

A. Development of Plant Utility Patents

The United States Constitution grants Congress the power to provide authors and inventors with "the exclusive [r]ight to their respective [w]ritings and [d]iscoveries" for a limited time, for the purpose of promoting science and the arts.[33] Under this constitutional power, Congress enacted the first patent statute in 1790.[34]

subject matter is whether the invention is a product of nature or man-made, not whether the product is living or inanimate.[41]

2. Utility Patents, Plant Patents, and the Plant Variety Protection Act

In 1930, Congress enacted the Plant Patent Act (PPA)[42] providing patent protection for a person who "invents or discovers and asexually reproduces any distinct and new variety of plant."[43] A new variety of plant is patentable under the PPA if it meets the requirements under § 101, except for the description requirement as outlined in § 162.[44] In addition, in 1970 Congress passed the Plant Variety Protection Act (PVPA),[45] which provided that a "breeder of any sexually reproduced or tuber propagated plant variety . . . shall be entitled to plant variety protection for the variety."[46] Under this Act, Congress authorized patent-like protection for sexually reproduced varieties, but the PVPA provides a narrower scope of protection than a utility patent.[47]

In 1986, the United States Patent and Trademark Office's Board of Patent Appeals and Interferences, relying heavily on the Supreme Court's ruling in *Diamond v. Chakrabarty*, found that plants are patentable subject matter under § 101, and the PPA and PVPA are not the exclusive forms of protection for plants.[48] Later, the Supreme Court also concluded the PPA and PVPA are not the exclusive means to obtain a right to exclude others from using, selling, or reproducing plants.[49] Therefore, utility patents may be issued for plants, provided the requirements under § 101 are met.[50]

B. The Doctrine of Patent Exhaustion

1. Initial Sale Terminates Patent Rights

A patentee has exclusive rights and may prevent a person from making, selling, or using the patented product.[51] A person who, "without authority

41. *Id.* at 313.

42. 35 U.S.C. §§ 161–64 (2006); *see* J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l, 534 U.S. 124, 133 (2001) (stating that plant patents provide exclusive protection to the asexual reproduction of the plant and also include a relaxation of the description requirement).

43. 35 U.S.C. § 161.

44. *J.E.M. Ag Supply*, 534 U.S. at 133 & n.6. *See also* 35 U.S.C. § 162 ("No plant patent shall be declared invalid for noncompliance with section 112 if the description is as complete as is reasonably possible.").

45. 7 U.S.C. §§ 2321–2582 (2006).

46. *Id.* § 2402(a).

47. *J.E.M. Ag Supply*, 534 U.S. at 138.

48. *See Ex parte* Hibberd, 1985 WL 71986, at *2–3 (B.P.A.I. Sep. 18, 1985).

49. *J.E.M. Ag Supply*, 534 U.S. at 145.

50. *Id.*

51. Van Kannell Revolving Door Co. v. Revolving Door & Fixture Co., 293 F. 261, 262 (S.D.N.Y. 1920).

farmers,[83] is not a right provided to purchasers of seed protected by utility patents.[84]

Monsanto's lineup of GE plants, including corn, soybeans, cotton, and other specialty crops, are protected by a number of patents.[85] Monsanto's Roundup Ready®

In *Monsanto Co. v. McFarling*, the United States Court of Appeals for the Federal Circuit determined that the doctrine of patent exhaustion was inapplicable to patented soybeans because the new seeds, or the copies of the original product, were never sold.[94] Since the soybeans that were harvested from the original patented product, the "copies," were never purchased from Monsanto, the doctrine of patent exhaustion did not apply.[95] Moreover, the price paid for the original patented soybean seeds "reflected only the value of the 'use' rights conferred by the patentee."[96] As a result, the original sale of the patented soybeans did not confer a right to make copies.[97] In addition, it is within the scope of the patent for Monsanto to restrict others, through the Technology Agreement, from making copies of the patented soybeans for the purposes of planting.[98]

The same principles applied when a farmer purchased patented Roundup Ready soybeans without signing a License Agreement and saved seed for planting in subsequent growing seasons.[99] The original purchase was conditioned on the farmer obtaining a license; therefore, whether a License Agreement was signed or not, the conditions still applied.[100] Consequently, since the progeny soybean seeds, or copies of the originally purchased seed, were never sold, the doctrine of patent exhaustion did not apply.[101] Self-replicating technology "does not give a purchaser the right to use replicated copies of the technology" without restriction.[102] Application of the doctrine of patent exhaustion in these situations would "eviscerate the rights of the patent holder."[103]

94. *McFarling*, 302 F.3d at 1299. McFarling purchased Monsanto patented Roundup Ready soybeans and signed the Technology Agreement. *Id.* at 1293. He then saved 1500 bushels of the patented soybeans for planting the next season, in violation of the License Agreement. *Id.* McFarling repeated this practice the next season until Monsanto filed suit for patent infringement and breach of contract. *Id.*

95. *Id.* at 1299.

96. *Id.* (quoting B. Braun Med., Inc. v. Abbott Labs, 124 F.3d 1419, 1426 (Fed. Cir. 1997)).

97. *Id.*

98. *Id.* at 1298.

99. Monsanto Co. v. Scruggs, 459 F.3d 1328, 1333 (Fed. Cir. 2006). Scruggs argued that it purchased the Monsanto soybean seeds in an unrestricted sale, so the doctrine of patent exhaustion provided that Scruggs could use the soybean seeds as it saw fit. *Id.* at 1335.

100. *Id.* at 1336.

101. *Id.* (quoting *McFarling*, 302 F.3d at 1299).

102. *Id.*

103. *Id.*

II. *MONSANTO CO. V. BOWMAN*

A. Factual Background

Defendant Vernon Bowman regularly purchased soybean seeds containing Roundup Ready technology from Pioneer Hi-Bred (Pioneer), a Monsanto-licensed seed producer.[104] In conjunction with these purchases, Bowman executed the Pioneer Hi-Bred Technology Agreement, which is similar in language and scope to Monsanto's Technology Agreement.[105] Beginning in 1999, Bowman planted Pioneer soybean seed containing Roundup Ready technology, and, pursuant to the Technology Agreement, did not save any seed from any of these plantings.[106]

In addition to the licensed product, Bowman purchased commodity seed from a local grain elevator for a second-season planting, or "double-crop soybeans."[107] After planting, Bowman applied a glyphosate-based herbicide to the commodity seeds, killing weeds and any plants not glyphosate resistant, or more specifically not exhibiting the Roundup Ready trait.[108] Following the

Monsanto's Technology Agreement authorizes farmers to sell seed to grain elevators as a commodity.[114] However, Monsanto maintained that it owns and licenses the glyphosate resistant trait, and, therefore, the technology contained in all progeny seed belongs to Monsanto.[115] While the seeds belong to the farmer, the technology belongs to Monsanto and may not be duplicated through planting without authorization from Monsanto.[116] Since the Roundup Ready trait continues with each successive crop, Monsanto argued that without this restriction, farmers could purchase commodity soybeans and receive the benefit of the Roundup Ready trait without properly compensating Monsanto for the technology, thus circumventing the patent.[117]

C. Bowman's Defense

Bowman contended that based on the doctrine of patent exhaustion, commodity seeds involve an authorized, unconditional sale from the farmer to the grain elevator, so Monsanto could no longer control the use of the soybean seeds.[118] According to Bowman's argument, when licensed soybeans containing the Roundup Ready trait are harvested and sold by the farmer to the grain elevator, the seeds are sold without restriction.[119] Therefore, when this seed is mixed with seed from other farmers and sold as commodity seed, the doctrine of patent exhaustion applies to remove the commodity seed from patent protection.[120]

Moreover, Bowman argued that Monsanto's claim for patent protection for all seeds with Roundup Ready technology effectively eliminates the low-cost commodity seed option.[121] The self-replicating nature of soybeans, which reproduces the Roundup Ready trait with each successive generation, further complicated the issue of farmers utilizing commodity seed.[122] In addition, considering the domination of Roundup Ready soybeans in the market and the lack of separation at the grain elevator between seeds containing Roundup Ready technology and those without, the grain elevator's commodity seed necessarily contains the Roundup Ready trait.[123] Therefore, commodity seed purchased from most grain elevators would contain some proportion of patented product and could not be used for planting.[124] Bowman argued that

114. *Bowman*, 657 F.3d at 1345.
115. *Bowman*, 686 F. Supp. 2d at 837.
116. *Id.*
117. *Id.*
118. Bowman v. Monsanto Co., 133 S. Ct. 1761, 1765 (2013).
119. *Bowman*, 686 F. Supp. 2d at 836.
120. *Id. See also* Monsanto Co. v. Bowman, 657 F.3d 1341, 1346 (Fed. Cir. 2011).
121. *Bowman*, 686 F. Supp. 2d at 836–37.
122. *Id.* at 836.
123. *Id.*
124. *See id.* at 836–37. *See also* Bowman v. Monsanto Co., 133 S. Ct. 1761, 1768 (2013).

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knowingly and intentionally making copies of patented product and infringing on Monsanto's patent for Roundup Ready technology.[171]

Even if Bowman had not "selected" for the patented product and instead used an alternative chemistry, Bowman was still aware that the majority of the commodity seed contained patented product that, per the License Agreement, could not be replanted.[172] Realistically, Bowman used a glyphosate-based herbicide because of its convenience and efficiency and would be unwilling to switch chemistries,[173] especially considering the remainder of his first-crop soybeans were glyphosate resistant and could be sprayed with glyphosate-based herbicide.[174]

3. Planting Commodity Seed: A Practice of the Past

Bowman raised a policy argument that Monsanto should require its patented product to be kept separate, even at the grain elevator, or otherwise Monsanto retains a monopoly to control not only its patented product but other non-patented products incorporated with the undifferentiated commodity seed.[175] Bowman used this policy argument as justification for the application of the doctrine of patent exhaustion to the situation where farmers purchase and plant commodity seed.[176] Nevertheless, purchasing and planting commodity seed as a low-cost alternative to purchasing from a seed dealer has become a relic of the past.[177] In 2013, considering that ninety-three percent of all soybeans planted in the United States were herbicide-resistant or herbicide-

B. Holding Necessary to Incentivize Innovation

The purpose of patent protection is to promote innovation, research, and scientific discovery, which ultimately benefits society economically and socially.[209] In light of these goals, the scope and applicability of patent laws have been interpreted broadly to accommodate changing technology and new and unforeseen inventions.[210] These goals provide the foundation for the application of the patent exhaustion doctrine only to the particular item sold.[211] When a purchaser copies the patented article, the doctrine of patent exhaustion becomes inapplicable to protect the rights of the patent holder.[212]

If the doctrine of patent exhaustion did apply, the patent holder would be compensated for its patent only when the first patented seeds were sold.[213] Subsequently, farmers would not need to purchase additional patented seeds but could "make" additional product without compensating the patent holder.[214] Perhaps a farmer would occasionally want to supplement his seed with new patented product.[215] However, these periodic purchases would not incentivize the patent holder, like Monsanto, to continue funding research to develop cutting-edge technology.[216] Additionally, if Monsanto were forced to price the first sale of patented product at a level to recoup its research and development costs, no farmer would be able to afford to purchase the product.[217]

Bowman's actions are even worse because he never compensated the patent holder.[218] Monsanto was compensated by the first sale of Roundup

209. J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l, 534 U.S. 124, 131 (2001).

210. *Id.* at 131, 135 ("A rule that unanticipated inventions are without protection would conflict with the core concept of the patent law that anticipation undermines patentability." (internal quotation marks omitted) (quoting Diamond v. Chakrabarty, 447 U.S. 303, 316 (1980))).

Bowman 2014 *211.*

211. *Bowman*, 133 S. Ct. at 1766.

212. *Id.* ("'[A] second creation' of the patented item 'call[s] the monopoly, conferred by the patent grant.2887E1sTm

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Ready soybeans, which were then sold to the grain elevator.[219] Yet, Monsanto was not compensated when Bowman purchased from the grain elevator the commodity seed containing copies of Monsanto's patented traits.[220] In fact, Bowman purchased this seed specifically because it was cheaper than purchasing patented product from an authorized dealer.[221]

C. Monsanto's Technology Agreement—Mutual Benefits

Monsanto, or an authorized company, sells patented seed conditioned upon the Technology Agreement, which restricts farmers to growing a crop for a single season.[231] Restrictive licenses are legal as long as the condition is reasonably within the reward the patentee expects to receive.[232] Monsanto's Technology Agreement has been found to be a valid and leqoui.9(.617(.1599 r1599 r1599n)ofth)].1(e)]TJ0 -1.2

Therefore, the grain elevator did not have the right to plant seed containing the patented trait and could not convey that right to Bowman.[243] Accordingly, both the Technology Agreement and patent law, through prohibiting a purchaser from making a patented product, restrict Bowman's ability to plant commodity seed containing patented product.[244] Bowman was free to purchase different seed from another seed dealer,[245] perhaps seed that would have been cheaper,[246] but was restricted from planting patented product without appropriately compensating the patent holder.[247]

D. Self-Replicating Technology

Self-replicating technologies complicate the application of patent law and the overall purpose of promoting innovation.[248] Formerly only a theory of science fiction,[249] self-replicating technologies are common in certain industries and, as a result of scientific advancement and innovation, are becoming more complex and dynamic than ever before.[250] The application of the doctrine of patent exhaustion for self-replicating technologies was questioned after the Supreme Court in *Quanta Computer, Inc. v. LG Electronics, Inc.*[251] held that "[t]he authorized sale of an article that substantially embodies a patent exhausts the patent holder's rights and prevents the patent holder from invoking patent law to control postsale use of the

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self-replicates still deserve the same protections afforded other products under patent law.[268] Otherwise, "[a]pplying the first sale doctrine to subsequent generations of self-replicating technology would eviscerate the rights of the patent holder."[269] Accordingly, the right to make the patented product remains with the patent holder.[270]

The Supreme Court also did not find Bowman's "seeds-are-special argument" convincing.[271] Yet, the Court limited its holding to Bowman's particular situation, refusing to apply the holding to all cases involving self-replicating technology.[272] Nevertheless, the Court clearly indicated that in certain situations the doctrine of patent exhaustion does not protect individuals from liability for infringing on patents for self-replicating technologies.[273]

The factor influencing the Court's holding in *Bowman* was that Bowman exerted a level of control.[274] Indeed, Bowman was systematically involved in selecting the patented Roundup-Ready seed.[275] Through planting commodity seed, spraying the soybeans with glyphosate-based herbicide, and harvesting the progeny or copies of the self-replicating technology, Bowman actively participated in making Monsanto's patented product.[276]

Nevertheless, one can conceive of situations that would involve replication of the technology outside the purchaser's control or incidental to the purchaser's activities.[277] Since the Court limited the holding in *Bowman*, determining the application of the doctrine of patent exhaustion to these situations and what level of "control" warrants infringement are unclear.[278] However, this issue was recently discussed in *Organic Seed Growers & Trade Ass'n v. Monsanto Co.*, a case that was dismissed for lack of a justiciable case or controversy.[279] In that case, organic farmers and other associations were seeking a declaratory judgment and Monsanto's express waiver of any claim for patent infringement against them.[280] These entities, which grow, use, or sell only conventional seed, were concerned that incidental contamination from

268. Monsanto Co. v. Scruggs, 459 F.3d 1328, 1336 (Fed. Cir. 2006).

exhaustion did not apply. Regardless of where the product is purchased, the doctrine of patent exhaustion does not protect individuals who copy the patented product. Moreover, the ability of a patented product to self-replicate does not, as a result, confer the right to a purchaser to make or copy the patented product.

Accordingly, seed companies that own the patent rights for GE plants may, in conjunction with license agreements, restrict a farmer's use of patented GE plants. These restrictions also apply when a farmer plants commodity soybean seed that contains patented product. While the Court's decision effectively removes the farmer's option to plant and save commodity seed, or save any patented seed, it consequently supports the purpose of patent law to promote innovation and ensures the patent holder receives the reward provided for under the patent. Furthermore, protection of self-replicating technologies from patent infringement will incentivize technological development in many industries, including genetics and biotechnology.

The Court limited its holding to Bowman's particular situation, refusing to apply the holding to all cases involving self-replicating technologies. Nevertheless, the Court indicated that in certain situations the doctrine of patent exhaustion may protect an individual from liability for patent infringement. The Court's holding in *Bowman*, and ultimately any other case involving self-replicating technologies, was influenced by whether the self-replication occurred outside the individual's control or was unintentional.

AMY S. BERG*

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