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**SEED SAVERS V. MONSANTO:
FARMERS NEED A VICTORY FOR WILTING
BIODIVERSITY**

“It is miserable for a farmer to be obliged to buy his Seeds; to exchange Seeds may, in some cases, be useful; but to buy them after the first year is disreputable,” George Washington.¹

I. INTRODUCTION

Corn, rice, wheat, and soybeans make up 75% of calories consumed by the world’s population.² These crops were derived from wild varieties that are in danger of extinction.³ The world’s food supply is hanging on by a delicate thread of remaining genetic resistance. Increasing genetic uniformity of these crops could lead to a world food crisis. One disease strain or type of pest could severely devastate a large population of any of those four crops. Without genetic diversity, resistance may be impossible to locate, and 75% of the world’s food supply would not recover. At the same time, farmers are increasingly losing sovereignty over their own seeds. Because of utility patent protection on seeds of major crops, such as soybeans, farmers are restricted from saving genetically engineered (GE) seeds.⁴ Without farmers saving seeds, agriculture is steadily losing a source of genetic diversity that it cannot afford to lose.

1. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *SEED GIANTS V. U.S. FARMERS* 2 (2013) (citing Letter from George Washington to William Pearce, Farm Manager (Nov. 16, 1794)).

2. Sara Reardon, *Climate Change Already Hurting Agriculture*, *SCIENCE NOW* (May 5, 2011, 4:01 AM), <http://news.sciencemag.org/sciencenow/2011/05/climate-change-already-hurting.html>.

3. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 20.

4. As used in this paper, the term “genetically engineered seeds” refers to seeds with inserted genetic seeds. Other terms, such as genetically modified seeds and transgenic seeds, are used in the same manner and are used interchangeably throughout this paper. Seeds without GE traits are commonly referred to as “conventional seeds.”

Industrial agriculture corporations, such as the Monsanto Company (“Monsanto”), do not see it that way. They argue that agricultural biotechnology is “vital to meeting the world’s growing food needs,”⁵ and utility patent protection on seeds is necessary to develop future “solutions for the issues we face in agriculture today.”⁶ However, Monsanto has used its combination of seed utility patents, licensing arrangements, and patent infringement litigation against farmers to restrain competition in the seed industry. Antitrust law has failed to combat Monsanto’s anti-competitive practices. Therefore, patent misuse should be used as a defense for prosecuted farmers to curb Monsanto’s patent enforcement.

Part II of this article will provide background on the practice of seed saving, as well as Monsanto’s products, patents, licensing arrangements, and patent infringement litigation. Additionally, Part II will discuss the evolution of intellectual property protection on seeds. Part III will explore how Monsanto’s patent enforcement practices are leading to a dangerous loss of biodiversity. This section will explore how seed utility patents spurred the restructuring and consolidation of the seed industry. Finally, this section will show that farmers, because of the seed industry consolidation, lack choice when purchasing seeds and have no available option besides signing Monsanto’s restrictive technology agreements. Farmers are consequently prohibited from saving seed, which has led to a decrease in genetic variety. Part IV will discuss the consequences of the decreasing biodiversity. Part V will discuss how the Federal Circuit and the Supreme Court have treated Monsanto’s patent litigation against farmers, and Part VI will discuss how farmers can use patent misuse as a defense. Part VII will conclude by examining whether patent protection is necessary for seed industry innovation, productivity, and creation

5. Anna Lappé, *The Battle for Biodiversity: Monsanto and Farmers Clash*, ATLANTIC, Mar. 28, 2011, <http://www.theatlantic.com/health/archive/2011/03/the-battle-for-biodiversity-monsanto-and-farmers-clash/73117/>.

6. *Improving Agriculture: What is Monsanto Doing to Help?*, MONSANTO, www.monsanto.com/improvingagriculture/Pages/what-is-monsanto-doing-to-help.aspx (last visited May 4, 2013).

of new varieties, as well as whether Monsanto's practices have helped or harmed American farmers.

II. BACKGROUND

In order to understand the problem presented by this paper, one must first understand the legal battle at its center. The debate regarding intellectual property protection of seeds has largely revolved around two groups of players: individual farmers and large industrial agriculture corporations. Namely, the traditional practice of seed saving, practiced by farmers for centuries, is at direct odds with protecting agricultural corporations' investments in genetically engineered traits for those seeds. Those two interests have been at odds throughout the development of seed protection, with a trend of increasing patent protection of seeds to the exclusion of farmers' interests.

A. Seed Saving

Saving seed has been a practice of farmers for centuries. Some even estimate that this tradition stretches back 12,000 years.⁷ Farmers select plants from which to save seed for the next year's planting based on favorable traits of the plant. These farmers' efforts have steadily created crop diversity adapted to different regions, soil types, climates, local pests, diseases, and cultures by the process of phenotypic selection, where seeds from the healthiest and most productive plants were selectively saved.⁸ These cultivated and saved seeds are called "heirloom varieties," and evolve with natural and human selection over time.⁹ Each heirloom variety is genetically distinct. For example, farmers produced a variety of crops from the cabbage species by selecting

7. SUZANNE ASHWORTH, *SEED TO SEED* 15 (2d ed., 2002).

8. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 3.

9. See *Genetic Resources Preservation*, SEED SAVERS EXCH., www.seedsavers.org/Preservation/Genetic-Resources-Preservation/ (last visited May 3, 2013).

and encouraging the development of different parts of the plant.¹⁰ This human selection has allowed for the cultivation of Brussels sprouts, kohlrabi, cauliflower, broccoli, kale, and cabbage from a single species.¹¹

By saving seeds from desirable, healthy, and productive plants, farmers steadily increased the quality and yield of their crops for the following years. As one farmer explains:

The reason for producing our own seed was and always has been quality. I will pick out only the very best beans from my field for seed. I can then carefully store and condition that seed and am assured that it is treated correctly. I cannot be sure of this kind of quality anywhere else.¹²

Additionally, the domestication process forced plants to adapt to their cultivated environment.¹³ Farmers developed genetically distinct varieties adapted to diverse climates through introgression, “the introduction of a gene from one gene complex to another, through cross-breeding.”¹⁴ Each domesticated seed answered a very specific challenge presented by each diverse climate.¹⁵ Furthermore, programs at land-grant universities, the United States of Agriculture (USDA), and other publicly funded institutions

10. CARY FOWLER & PAT MOONEY, SHATTERING: FOOD, POLITICS, AND THE LOSS OF GENETIC DIVERSITY 21 (1990).

11. *Id.* (citing Peter Crisp & George Forster, *Banking Seeds for the Future*, 105 GARDEN 410 (Oct. 1980)).

12. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, OUT OF HAND: FARMERS FACE THE CONSEQUENCES OF A CONSOLIDATED SEED INDUSTRY 40 (Dec. 2009).

13. As used here, domestication means qualities that stem from adaptation to cultivation and human harvesting, as compared to wild populations. Dorian Q. Fuller & Robin Allaby, *Seed Dispersal and Crop Domestication: Shattering, Germination and Seasonability in Evolution Under Cultivation*, in ANNUAL PLANT REVIEWS 239 (2009).

14. FOWLER & MOONEY, *supra* note 10, at 25.

15. Charles Siebert, *Food Ark*, NAT’L GEOGRAPHIC, July 2011, <http://ngm.nationalgeographic.com/2011/07/food-ark/siebert-text>.

have bred varieties geared towards growers in their specific geographic regions.¹⁶

B. Monsanto Company

Monsanto, a “sustainable agricultural company¹⁷,” is the “Goliath” seed company at the center of the issue of patent protection on seeds. Monsanto “sells seeds, traits developed through biotechnology, and crop protection chemicals.”¹⁸ Additionally, Monsanto “owns the most widely adopted seed technologies, [and] maintains substantial market power” from its aggressive enforcement of intellectual property rights.¹⁹ This section will provide background on Monsanto’s seed patent protection, licensing scheme, and litigation practices with respect to its “Roundup Ready” soybean seed product.

1. Roundup Ready

Monsanto’s Roundup herbicide, with active ingredient glyphosate, is one of Monsanto’s best-selling products.²⁰ Glyphosate is extremely effective against most plants and weeds, but it is not selective and can severely damage farmers’ crops if sprayed “over-the-top” of crops.²¹ Monsanto developed recombinant-DNA technology agricultural seed products to protect crops from being killed by glyphosate, and to increase the use of Roundup. Monsanto’s agricultural seed products are sold through

16. ASHWORTH, *supra* note 7, at 13; CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 3.

17. See MONSANTO, www.monsanto.com (last visited May 4, 2013).

18. *Who We Are*, MONSANTO, <http://www.monsanto.com/whoweare/Pages/default.aspx> (last visited May 4, 2013).

19. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G *supra* note 12, at 16.

20. Jason Savich, Note, *Monsanto v. Scruggs: The Negative Impact of Patent Exhaustion on Self-Replicating Technology*, 22 BERKELEY TECH. L.J. 115, 117 (2007).

21. *Id.*

its “Roundup Ready” line.²² Roundup Ready soybeans were first commercialized in 1996, and Monsanto followed with alfalfa, corn, cotton, spring canola, sugarbeets, and winter canola seeds.²³ These seeds contain in-plant tolerance to glyphosate herbicide. Monsanto’s seed products’ genetically modified tolerance to glyphosate allows farmers to “spray Roundup agricultural herbicides in-crop from emergence through flowering for unsurpassed weed control, proven crop safety and maximum yield potential.”²⁴ Therefore, farmers can spray their fields with Roundup to effectively kill several weeds and grasses, but without also killing their soybeans.²⁵

The adoption of Roundup Ready crops was “unprecedented,” and some farming organizations claim that its wide-scale adoption is directly related to the value of the technology.²⁶ As discussed above, when Roundup is applied to Roundup Ready crops, “it has a wider window of application than other herbicides, has no soil activity, which provides flexible crop rotations, and has low environmental and human health risks.”²⁷ By farmers’ accounts, the popular Roundup with Roundup Ready weed control system is simple, flexible, and can be applied over the soybean crop during all stages of growth without damaging the crops.²⁸ With the Roundup system, farmers only need to use one herbicide—Roundup—as opposed to previous weed control systems that

22. *Id.*

23. *Roundup Ready*, MONSANTO, <http://www.monsanto.com/weedmanagement/Pages/roundup-ready-system.aspx> (last visited May 4, 2013).

24. *Id.*

25. Amanda Welters, *Striking a Balance: Revising USDA Regulations to Promote Competition Without Stifling Innovation*, 13 MINN. J.L. SCI. & TECH. 407, 410 (2012).

26. *Wisconsin Farmers and Agri-Business Call for Glyphosate (Roundup) Stewardship*, PENN. STATE EXTENSION, <http://extension.psu.edu/pests/weeds/control/glyphosate-wi.pdf> (last visited Oct. 20, 2013).

27. *Id.*

28. Janet Carpenter & Leonard Gianessi, *Herbicide Tolerant Soybeans: Why Growers Are Adopting Roundup Ready Varieties*, AGBIOFORUM: J. BIOTECHNOLOGY MGMT. & ECON. (1999), available at <http://agbioforum.org/v2n2/v2n2a02-carpenter.htm>.

required the use of a collection of herbicides to achieve broad spectrum weed control.²⁹ Additionally, Roundup weed control programs can be easily integrated with other current farming trends, such as post-emergence weed control, adoption of conservation tillage practices and narrow row spacing.³⁰

The Roundup Ready soybean is covered by two patents. The first patent discloses the insertion of a synthetic gene consisting of a promoter, a protein sequence of interest, and a stop signal into plant DNA to create resistance to herbicide.³¹ The second patent discloses the gene that encodes a modified enzyme that is necessary for plant growth, the isolated DNA molecule encoding it, the glyphosate-tolerant plant cell with that DNA molecule, a transgenic soybean plant, and a method of producing genetically transformed plants that are resistant to glyphosate herbicide.³² The combination of these two patents involves the insertion of a

29. *Id.* To illustrate the complexity of pre-Roundup weed control systems, in 1994, the average number of active ingredients from different herbicides per acre was 2.7 and 21% of soybean acreage was treated with four or more active ingredients. *Id.*

30. *Id.* To briefly explain these emerging farming techniques, post-emergent herbicides treat weeds that have already emerged, as opposed to controlling weeds from emerging. *Post Emergent Weed Controls*, LANDSCAPE AMERICA, www.landscape-america.com/problems/weeds/postemerge.html (last visited Oct. 20, 2013). Conservation tillage is a method of soil cultivation that leaves the previous crop's residue on fields when planting the next crop, and reduces soil erosion and runoff. *Conservation Tillage*, MINN. DEPT. OF AGRIC., www.mda.state.mn.us/protecting/conservation/practices/constillage.aspx (last visited Oct. 20, 2013). Finally, planting soybeans in narrower row spacing has been shown to have yield advantages over wider row spacing. Palle Pederson, *Row Spacing in Soybean*, IOWA STATE UNIV., www.extension.agron.iastate.edu/soybean/documents/RowSpacing.pdf (last visited Oct. 20, 2013).

31. Savich, *supra* note 20, at 118; *see also* U.S. Patent No. 5,352,605 (filed Oct. 28, 1993).

32. Savich, *supra* note 20, at 118; *see also* U.S. Patent No. 5,633,435 (filed Sept. 13, 1994). The glyphosate in Roundup inhibits the metabolic activity of the enzyme 5-enolpyruvylshikimate-3-phosphate synthase ("EPSPS"), which converts sugars into amino acids needed for plant growth. Savich, *supra* note 20, at 118.

modified enzyme gene into crop seed to confer glyphosate-resistance to plants grown using the seed.³³

2. Licensing Scheme

Monsanto employs a two-tiered licensing scheme to distribute Roundup Ready. First, Monsanto licenses the patented genes to other seed companies. Under this first tier of Monsanto's licensing scheme, the seed companies may not sell seed to a seed grower without the grower first signing a license agreement.³⁴ Additionally, the seed sold can only be used by growers for a single commercial crop.³⁵ Those seed companies then manufacture glyphosate-tolerant seeds by incorporating Monsanto's patented traits into their own germplasm, and license the seeds to their own customers under a technology agreement.³⁶ The seed companies to whom Monsanto licenses the patented genes in this first tier often do not have the financial resources to develop their own GE traits.³⁷

Under the second tier of Monsanto's licensing scheme, the restrictions on the seed grower, often a farmer, include: (1) the aforementioned single commercial crop restriction, (2) the prohibition against saving the seed containing the biotechnology for replanting, (3) the prohibition against research or experimentation, and (4) the payment of a technology fee.³⁸ Effectively, the technology agreements that Monsanto requires

33. Savich, *supra* note 20, at 118. Thus, the glyphosate will inhibit the metabolic activity of the modified EPSPS in the soybean seeds. *Id.*

34. *Monsanto Co. v. Scruggs*, 459 F.3d 1328, 1333 (Fed. Cir. 2006).

35. *Id.*

36. *Id.*

37. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 19.

38. *Scruggs*, 459 F.3d at 1333. The technology agreements incorporate Monsanto's Technology Use Guide by reference, which Monsanto revises annually. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 22. The Guide contains an extensive amount of use restrictions that are not listed here. *Id.* The Guide is a 31-page supplement to the technology agreements, and farmers are responsible for strictly following the rules and restrictions contained within. CTR. FOR FOOD SAFETY, *MONSANTO V. U.S. FARMERS* 17 (2005).

farmers to sign ensure that farmers have to pay for new seed on an annual basis.³⁹ Monsanto was the first company to require farmers to sign such technology and stewardship agreements, but other companies now follow its model.⁴⁰

Under these technology agreements, farmers are merely “users” of Monsanto’s patented traits.⁴¹ Monsanto remains the owner of the patented genetic trait and rents the trait inside the seed to the farmers.⁴² The controversial agreements encountered a lot of resistance from farmers who saved seed for replanting, because of how common-place the practice was.⁴³ However, Monsanto saw those farmers as “affect[ing] competitive conditions.”⁴⁴

3. *Monsanto-Farmer Litigation*

In addition to its licensing scheme, Monsanto prosecutes U.S. farmers for patent infringement and violation of their technology agreements. Since 1997, shortly after Roundup Ready seeds were first commercialized, Monsanto has filed 145 suits against farmers in the United States.⁴⁵ Eleven of these lawsuits have proceeded through trial, and each case was found “in Monsanto’s favor” (according to Monsanto).⁴⁶ Of these lawsuits, 72 awarded publicly-recorded damages to Monsanto, 27 awarded unrecorded

39. Tempe Smith, *Going to Seed?: Using Monsanto as a Case Study to Examine the Patent and Antitrust Implications of the Sale and Use of Genetically Modified Seeds*, 61 ALA. L. REV. 629, 631-32 (2010).

40. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 22. DuPont/Pioneer Hi-Bred’s Terms and Conditions of Purchase also specify that buyers of its patented seed can only purchase it for a single crop and explicitly forbids any seed saving, breeding, or research. *Id.* at 25.

41. MARIE-MONIQUE ROBIN, *WORLD ACCORDING TO MONSANTO* 206 (2010).

42. *Id.* at 205-06.

43. *Id.* 205

44. *Id.* at 204.

45. *Saved Seed and Farmer Lawsuits*, MONSANTO, <http://www.monsanto.com/newsviews/Pages/saved-seed-farmer-lawsuits.aspx> (last visited May 3, 2013). Monsanto admits that “[t]his may sound like a lot, but when you consider that we sell seed to more than 250,000 American farmers a year, it’s really a small number.” *Id.*

46. MONSANTO, *supra* note 45.

damages to Monsanto (in confidential settlements), 14 were dismissed with no indication of damages awarded to Monsanto, and eleven are still ongoing as of November 28, 2012.⁴⁷

The economic impact of Monsanto's litigation is evident through each stage of Monsanto's efforts to prosecute farmers: investigation, out-of-court settlements, and litigation.⁴⁸ Monsanto's "investigation department," as of 2003, had 75 employees and a budget of \$10 million.⁴⁹ This department, as estimated from press reports, investigates approximately 500 farmers each year.⁵⁰ Under the technology use agreements signed by the farmers, Monsanto is explicitly allowed to examine subsequent crops to make sure each farmer is not growing Monsanto seed illegally.⁵¹ Personal accounts from farmers sued by Monsanto reveal that agents hired by Monsanto would "knock[] on their door, sometimes accompanied by the police."⁵² The agents go into the farmers' fields and take plant samples and photographs.⁵³

From the above-mentioned publicly recorded damages, Monsanto was awarded \$23,675,820.99, with judgments ranging from \$5,595.00 to \$3,052,800.00.⁵⁴ However, "[t]he vast majority of cases filed by Monsanto against farmers have been settled

47. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 30.

48. *Id.* at 27.

49. *Id.* As with the technology use agreements, other companies have followed Monsanto's lead in investigating farmers. For example, DuPont hired approximately 35 investigators in 2013 to examine planting and purchasing records of U.S. farmers, and to take samples of their fields for genetic analysis. *Id.*

50. *Id.* at 30 (citing n.27).

51. ALAN MCHUGHEN, PANDORA'S PICNIC BASKET 249 (2000).

52. ROBIN, *supra* note 41, at 208.

53. *Id.* at 208. Other investigative techniques include an anonymous toll-free number, 1-800-ROUNDUP, for farmers to report other farmers. *Id.* This tip line received 1500 tips in just 1999, which many criticize as "fraying the social fabric" of farming communities. *Id.*

54. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 30. However, these reported figures may be lower than actual damages paid because they may not include, for example, expert witness fees, post judgment interest, plaintiff's attorney fees, or costs of testing fields. *Id.*

before any extensive litigation [took] place.”⁵⁵ The Center for Food Safety, in 2006, estimated that Monsanto had instituted from 2,000 to 5,000 “seed piracy matters” against farmers.⁵⁶ They then estimated that Monsanto was paid an estimated \$85,653,601 to \$160,594,230 in out-of-court settlements.⁵⁷

C. History of Patent Protection of Seeds

In order to understand how Monsanto’s utility patents are leading to a dangerous loss of biodiversity, it is important to understand the evolution of seed patent protection. In the beginning of the U.S. Patent System, it was widely accepted that plants could not be “owned” via patent protection, even for a limited patent term.⁵⁸ However, plant life can now be protected by three mechanisms: (1) a plant patent via the Plant Patent Act, (2) a plant Certificate of Protection via the Plant Variety Protection Act, or (3) a § 101 utility patent.

1. Plant Patent Act of 1930

With increasing profits in the seed industry, plant breeders rallied for protection of seed varieties.⁵⁹ Shortly after the Hi-Bred Corn Company marketed the first hybrid seed corn in 1926, Congress passed the Townsend-Purnell Plant Patent Act of 1930 (PPA).⁶⁰ The PPA granted intellectual property rights to breeders for any “asexually reproduced . . . distinct and new variety of plant, other than a tuber-propagated [sic] plant,” rejecting the patentability of sexually reproducing plants.⁶¹ This act gave

55. *Monsanto Co. v. McFarling*, No. 04:00CV84, 2005 WL 1490051, at *5 (E.D. Mo. June 23, 2005).

56. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 30.

57. *Id.*

58. PETER PRINGLE, FOOD, INC. 87 (2003).

59. *Id.* at 87-88.

60. Elizabeth A. Rowe, *Patents, Genetically Modified Foods, and IP Overreaching*, 64 SMU L. REV. 859, 863-64 (2011).

61. *Id.* at 864 (quoting 8 DONALD S. CHISUM, CHISUM ON PATENTS § 24.02(1) (2010)) The PPA defined “asexual reproduction” as reproduction “by means other than from seeds, such as by the rooting of cuttings, by layering,

breeders, for the first time, patent-like protection and incentives.⁶² However, Congress was reluctant to give breeders intellectual property protection over staple food crops such as potatoes, which were specifically excluded under the act.⁶³ Congress believed that private sector companies could not be trusted with monopoly control over the food supply with intellectual property protection.⁶⁴ Plant patents, thus, provided a narrow form of protection that protected novel and distinct asexual plants from direct copying.⁶⁵

2. Plant Variety Protection Act of 1970

Breeders still demanded more intellectual property protection, and after the International Convention for the Protection of New Varieties of Plants created an international plant patent-like protection system in 1961, Congress passed a similar law in the United States.⁶⁶ The Plant Variety Protection Act (PVPA), enacted by Congress in 1970, expanded intellectual property protection available to breeders of novel sexually reproduced or tuber

budding, in-arching, etc.” *Id.* The exclusion of sexually reproducing plants is significant because it denied protection to the majority of food-producing plants that reproduced via seeds. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 4.

62. Rowe, *supra* note 60, at 864.

63. PRINGLE, *supra* note 58, at 88.

64. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 4.

65. Paul J. Heald & Susannah Chapman, *Veggie Tales: Pernicious Myths About Patents, Innovation, and Crop Diversity in the Twentieth Century*, 2012 U. ILL. L. REV. 1051, 1057 (2012). The plants protected by the PPA do not reproduce “true-to-type,” as opposed to soybeans. *Id.* Therefore, a competitor could only misappropriate a protected variety by stealing a cutting from a new tree. *Id.* Saving seeds from a new tree and replanting them would be ineffective, because each seed will grow into a different tree genetically. *Id.*

66. PRINGLE, *supra* note 58, at 88-89. The International Convention for the Protection of New Varieties and Plants permitted other breeders to use protected varieties as source material for their breeding programs, and farmers were allowed to save seeds for replanting. *Id.* at 88. This system was a compromise between breeder’s need for intellectual property protection and the fear of allowing patents on plants could lead to monopolies and would increase the price of food. *Id.*

propagated plant varieties.⁶⁷ Plant developers were required to prove that their new variety was novel, genetically uniform, and stable through successful generations.⁶⁸ Exclusive rights were available via a plant variety certificate issued by the USDA, as opposed to the United States Patent and Trademark Office (USPTO).⁶⁹ The certificates gave exclusive marketing rights to breeders for an 18-year terms.⁷⁰

Most important to seed growers and farmers, however, were the two new exemptions not contained in the PPA. First, there was a crop exemption, which allowed for crops to be grown from protected varieties to be sold as food, feed, fiber, and other nonreproductive purposes.⁷¹ The crop exemption also allowed farmers to save seed produced from protected varieties to replant the next farm season.⁷² Second, the PVPA also contained a research exemption, in which the use and reproduction of a protected variety for plant breeding or other research was not infringement of PVPA exclusive rights.⁷³

3. *Diamond v. Chakrabarty*

While some argued that the enactments of PPA and PVPA reflected a Congressional understanding to exclude living things from “manufacture” or “composition of matter” for utility patents, the Supreme Court rejected that view in 1980 in *Diamond v. Chakrabarty*.⁷⁴ The patent applicant, Ananda Chakrabarty, filed an application for a bacterium to soak up oil spills that was rejected

67. Plant Variety Protection Act, Pub. L. No. 91-577, 84 Stat. 1542 (1970) (codified as amended in scattered sections of 7 and 28 U.S.C.).

68. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 43.

69. Rowe, *supra* note 60, at 864.

70. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 4.

71. 7 U.S.C. § 2543 (2006).

72. *Id.* However, this exception was later limited to saving seeds only for personal use. See *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179, 185 (1995). Any farmer who sold saved seeds that were protected by the PVPA to neighbors would violate the PVPA. *Id.*

73. 7 U.S.C. § 2544 (2006).

74. *Diamond v. Chakrabarty*, 447 U.S. 303, 311 (1980).

by the USPTO.⁷⁵ The application was rejected on the grounds that living things were not patentable by § 101 utility patents.⁷⁶ The Supreme Court reversed the decision of the examiner, upheld by the Board of Patent Appeals and Interferences and the Court of Customs and Patent Appeals, and found that Chakrabarty's bacterium was patentable subject matter.⁷⁷ The Supreme Court held that the living, human-made bacterium "was [§ 101] patentable subject matter because (1) it was a product of creative human agency containing characteristics 'markedly different' from those found in nature, and (2) it possessed potential for significant utility."⁷⁸ *Diamond v. Chakrabarty*, thus, marked a massive sea-change in the patentability of seeds.

4. *Ex parte* Hibberd

Even after *Chakrabarty*, breeders did not immediately rush to file utility patents for their plants because of their existing rights under the PPA and PVPA.⁷⁹ Additionally, despite the Court's ruling in *Chakrabarty*, the USPTO still debated whether utility patents could cover sexually reproducing plants.⁸⁰ Plant breeders still continued to avail themselves of their rights under the PPA and PVPA.⁸¹ This changed, however, in 1985 when the USPTO granted a series of patents on a new line of corn in *Ex parte Hibberd*.⁸² The patentee was granted patents on the tissue culture, the seed, and the whole plant.⁸³ This ruling was a marked expansion from the rights a breeder would enjoy under the PPA or PVPA: a single claim for a new plant variety.⁸⁴ The *Hibberd* ruling gave plant breeders an incentive to use utility patent

75. *Id.* at 305.

76. *Id.*

77. *Id.* at 310.

78. Rowe, *supra* note 60, at 862.

79. PRINGLE, *supra* note 58, at 91.

80. Rowe, *supra* note 60, at 865 (citing *Ex parte Hibberd*, No. 645-91. 227 U.S.P.Q. (BNA) 443, 444 (B.P.A.I. 1985)).

81. PRINGLE, *supra* note 58, at 91.

82. Rowe, *supra* note 60, at 865 (citing *Hibberd*, 227 U.S.P.Q. at 443).

83. PRINGLE, *supra* note 58, at 91.

84. *Id.*

protection because the utility patent would cover the process of creating the variety and the product.⁸⁵ A utility patent would cover the DNA sequences, genes, cells, tissue cultures, seed, specific plant parts, and the entire plant.⁸⁶ Additionally, a utility seed patent did not incorporate the crop exemption in the PVPA and denied farmers the right to save and replant seeds.⁸⁷ The Supreme Court subsequently affirmed USPTO practice in 2001 in *J.E.M. Ag. Supply v. Pioneer Hi-Bred International*, which upheld utility patent protection for plants.⁸⁸

III. THE CONSEQUENCES OF MONSANTO'S POWER

With the ability to receive advantageous utility patent protection for seeds, the seed industry quickly responded by filing large amounts of applications. Utility patents caused a major restructuring of the seed industry, with strategic mergers and acquisitions. As a result, the companies that survived the consolidation movement now own large market shares, to the detriment of the seed industry's competitive nature. Farmers, therefore, are effectively denied the ability to choose any seed other than Monsanto's industry leader, and are then required to sign Monsanto's technology use agreements. As prohibited by the agreement, the farmers cannot save seeds for replanting and must buy new seeds annually. The net effect of the consolidation of the seed industry and farmers' inability to save seeds has led to a decrease in genetic diversity. This loss of diversity has had severe consequences due to a loss of resistance towards diseases and pests.

A. *Effect of Utility Patents*

After *Hibberd*, the number of patent applications dramatically

85. *Id.*

86. *Id.*

87. *Id.* (citing JACK RALPH KLOPPENBERG, *FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY* 267 (1988)).

88. *J.E.M. Ag. Supply v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 127 (2001).

rose, with the industry in a “global race against time to assure [its] eminence in biotechnology.”⁸⁹ The life patent “floodgate” was open. In the time period between 1983 and 2005, Monsanto was granted 647 patents.⁹⁰ The USPTO was granting broad patents that gave patentees the ability to exclude others from using key techniques useful in genetically engineering plants.⁹¹ For example, the USPTO granted patents on components such as genes, gene fragments and sequences, cell lines, human proteins, and naturally occurring compounds—that sometimes even covered non-GE properties.⁹² To illustrate these broad patents, critics point out that a soybean plant has over 46,000 genes that give plants several non-GE properties.⁹³ However, seed firms could often receive patent rights to the entire plant by adding one genetic trait, broadly covering all of the plant’s GE and non-GE properties.⁹⁴ These broad patents sometimes even covered “all genetically engineered soybeans.”⁹⁵ Patents were occasionally granted on discoveries, such as a therapeutic use for the Indian neem tree.⁹⁶ The patentee described the tree, isolated the tree from its natural context, and filed a patent application: “the deciding factor is that the description be done in a laboratory, and no attention is paid to the fact that the plant and its virtues have been known for thousands of years.”⁹⁷

Additionally, Congress enacted the Bayh-Dole Act in 1980, which allowed university researchers to retain title on patents on

89. PRINGLE, *supra* note 58, at 91-93 (citing Mark Sagoff, *Patented Genes: An Ethical Appraisal*, ISSUES IN SCIENCE & TECH. ONLINE (Spring 1998), <http://www.nap.edu/issues/14.3/sagoff.htm>).

90. ROBIN, *supra* note 41, at 203.

91. PRINGLE, *supra* note 58, at 92.

92. *Id.* (citing Sagoff, *supra* note 89).

93. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 16.

94. *Id.* Examples of non-GE properties include yield potential, seed size, time to maturity, various seed qualities, disease resistance, drought tolerance, and adaptations to particular soils and climates. *Id.* These properties are product of plant breeding, for example through saving seed. *Id.*; see also *supra* Part II.A.

95. PRINGLE, *supra* note 58, at 94.

96. ROBIN, *supra* note 41, at 203.

97. *Id.* (quoting Christoph Then, the Greenpeace representative in Munich).

federally supported inventions.⁹⁸ This act expanded the class of possible patentees, and university researchers began to negotiate “one-on-one deals with corporations.”⁹⁹ Critics of the Bayh-Dole Act argued that it would have a chilling effect on publicly funded agricultural research: researchers who used to freely exchange their scientific findings would now take their patent rights into account first.¹⁰⁰ Historically, public universities contributed most of the conventional seed supply for major field crops.¹⁰¹ However, due to the Bayh-Dole Act, these public universities have become dependent on biotech companies for funding and have distorted their research goals to serve the industry rather than the farmers.¹⁰² Therefore, the Bayh-Dole Act also had a chilling effect on the conventional seed supply.¹⁰³

B. Seed Market Consolidation

After the advent of seed utility patents, the seed industry quickly began to consolidate. Many of the acquisitions by major seed companies were for the sole purpose of acquiring patent portfolios.¹⁰⁴ Between 1995 and 1998, Monsanto, DuPont and Novartis spent \$30 billion on acquiring other seed companies.¹⁰⁵ Between 1996 and 2009, at least 200 independent seed companies were acquired.¹⁰⁶ In particular, Monsanto spent \$4.81 billion

98. See 35 U.S.C. §§ 200-212 (2006).

99. PRINGLE, *supra* note 58, at 92.

100. *Id.*

101. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 50.

102. *Id.* From the time the Act passed to 2006, industry supported research increased by 8% annually. ORGANIC SEED ALLIANCE, STATE OF ORGANIC SEED 8 (2011).

103. ORGANIC SEED ALLIANCE, *supra* note 102, at 37.

104. PRINGLE, *supra* note 58, at 93. “One company was created solely for the purpose of ‘buying up broad patents and then suing other companies for alleged infringements.’” *Id.* (citing W. Lambert & A.S. Hayes, *Investing in Patents to File Suits is Curbed*, WALL ST. J., May 30, 1990).

105. *Id.*

106. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 15 (citing Philip H. Howard, *Visualizing Consolidation in the Global Seed Industry: 1996-2008*, 1 SUSTAINABILITY 1266 (2009)).

between 2005 and 2009 to acquire other seed firms.¹⁰⁷ From 1996 (when Roundup Ready soybeans were first commercialized) to today, Monsanto acquired at least thirty other seed companies for \$12 billion.¹⁰⁸

The increasing concentration of the seed industry has effectively eliminated competitive conditions. In 2004, ten companies controlled half of global seed sales.¹⁰⁹ However, today, the same ten companies control nearly three quarters of global seed sales.¹¹⁰ Furthermore, as of 2008, the top four firms (Monsanto, DuPont/Pioneer Hi-Bred, Syngenta, and Bayer CropScience) accounted for 43% of the global commercial seed market.¹¹¹ When the concentration ratio of the top four firms in an industry is 40% or more, economists say that the industry has lost its competitive character.¹¹²

Monsanto is the number one seed firm, after its series of acquisitions, mergers, and partnerships with its competitors.¹¹³ In the soybean seed market, Monsanto controls nearly 30% directly through seed sales.¹¹⁴ However, this number is closer to 60% when one considers Monsanto's ownership of the genetic traits that it licenses to other seed companies through the first tier of its licensing scheme.¹¹⁵ As a result, Roundup Ready soybeans are

107. *Id.* at 17.

108. Lina Khan, *How Monsanto Outfoxed the Obama Administration*, SALON (Mar. 15, 2013), http://www.salon.com/2013/03/15/how_did_monsanto_outfox_the_obama_administration/.

109. Lappé, *supra* note 5.

110. *Id.*

111. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 13 fig. 1. This number includes both public and proprietary varieties sold.

112. *Id.* (citing U.S. SENATE, DEMOCRATIC STAFF OF THE COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY, ECONOMIC CONCENTRATION AND STRUCTURAL CHANGE IN THE FOOD AND AGRICULTURE SECTOR: TRENDS, CONSEQUENCES AND POLICY OPTIONS (2004), *available at* <http://www.sraproject.org/wp-content/uploads/2007/12/harkinconcentrationwhitepaper.pdf>).

113. *Id.* at 16.

114. *Id.* at 18.

115. *Id.* (citing *Supplemental Toolkit for Investors*, MONSANTO (Feb. 2010), http://www.monsanto.com/investors/documents/supplemental_toolkit.pdf).

grown on 93% of soybean acreage in the United States.¹¹⁶

C. Lack of Farmer Choice

The consolidation of the seed industry has decreased the number of firms in the seed industry, and has effectively prevented farmers from being able to choose which seeds to plant. Monsanto argues that farmers have the option to not purchase biotech seeds from Monsanto or any other firm, and identifies three other available options to farmers.¹¹⁷ First, farmers could purchase organic seeds.¹¹⁸ Second, farmers could choose to purchase, conventional, non-organic seed.¹¹⁹ Finally, farmers could purchase biotech seeds from a company other than Monsanto.¹²⁰ However, these options are increasingly less available to farmers.

First of all, with the consolidation of the seed industry, independent seed companies are dying out. Large seed companies have bought out many smaller seed companies to acquire their germplasm and breeding programs.¹²¹ As the Independent Professional Seed Association estimates, there were approximately 300 independent and consolidated companies in 2000.¹²² Of those 300, only 100 independent seed companies remain.¹²³ While many of those independent seed companies were acquired in the consolidation of the industry, others have gone bankrupt.¹²⁴

116. Brief for American Soybean Association, et al. as Amici Curiae Supporting Respondents, *Bowman v. Monsanto, Co.*, No. 11-796 (2013), 2013 WL 315223, at *8.

117. *Monsanto, the Government, Monopoly Claims*, MONSANTO, www.monsanto.com/food-inc/Pages/monsanto-revolving-door.aspx (last visited May 4, 2013).

118. *Id.*

119. *Id.*

120. *Id.*

121. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 16.

122. *Id.* at 28. The Independent Professional Seed Association launched a campaign to increase the viability of these remaining seed companies, but after only a year, twenty five more seed companies had gone out of business. *Id.*

123. *Id.*

124. Khan, *supra* note 108.

Therefore, non-GE soybeans are increasingly unavailable in the marketplace. As one farmer explains, “[i]f you want to raise . . . a non-GMO soybean . . . you better get your seed needs locked in far in advance or you may not be able to secure your needs.”¹²⁵ To illustrate this, one can look at conventional seeds’ renewed demand and the inability of seed producers to meet that demand. In 2009, there was a reduction in GE soybean acreage planted, and some reported that conventional soybean sales had doubled.¹²⁶ However, there were conventional soybean shortages reported in Arkansas, Mississippi, Missouri, and Ohio.¹²⁷ Furthermore, it was estimated that if, in Mississippi, all of the available conventional seed was planted, it would only total 3% of the state’s soybean acreage.¹²⁸ Similarly, for organic seeds, many private companies are unwilling to invest in the time and money required to create new and improved organic varieties.¹²⁹ As a result, organic farmers cannot access quality certified organic seed.¹³⁰

Finally, Monsanto identifies other companies that develop genetic traits, such as DuPont, Syngenta, and Dow, who can sell seeds to farmers who do not want to purchase them from Monsanto.¹³¹ However, while Monsanto has been the most aggressive with licensing and litigation, other agricultural companies have followed its lead.¹³² Therefore, these seeds with other genetic traits will still restrict farmers from seed saving. Additionally, Monsanto’s confidential licensing arrangements with seed dealers are alleged to contain clauses that restrict seed dealers’ selection and marketing of Monsanto’s competitors’ genetic traits, further adversely affecting the availability of non-Monsanto seeds. For example, Monsanto’s contracts with independent seed distributors sometimes contractually obligate the

125. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, *supra* note 12, at 26-27.

126. *Id.* at 35.

127. *Id.*

128. *Id.* Additionally, if only the available public varieties were planted, it would only total to 0.5% of the state’s soybean acreage. *Id.*

129. ORGANIC SEED ALLIANCE, *supra* note 102, at 15.

130. *Id.* at 38.

131. MONSANTO, *supra* note 117.

132. *See supra* notes 40, 49 and accompanying text.

distributor to carry only certain seeds, or give a steep discount if Monsanto's products comprise a certain proportion of the distributor's inventory.¹³³ Some licensing agreements condition the license of soybean seed on the acceptance of a "bundling agreement[] that financially penalize[s] seed companies for selling less than a minimum percentage of seed containing Monsanto traits."¹³⁴

Furthermore, Monsanto cross-licenses the Roundup Ready traits to 200 other seed companies, "creating the fiction of competition."¹³⁵ Monsanto has restrictive cross-licensing arrangements with many of its competitors, such as Syngenta, Dow AgroSciences LLC, Pioneer Hi-Bred International Inc., and Bayer CropScience.¹³⁶ Many of the cross-licensing arrangements result from settlement of litigation: because of the overwhelming popularity of the Roundup pesticide, many companies fear being denied access to Monsanto's technology and agree to withdraw antitrust and infringement cases in exchange for cross-licensing arrangements.¹³⁷ Similar to farmers, competitors often accept highly restrictive license agreement language because "the nature of the industry requires competitors to cross-license in order to access prime seed lines and distribution relationships."¹³⁸

133. Elizabeth Winston, *A Patent Misperception*, 16 LEWIS & CLARK L. REV. 289, 303 (2012). Furthermore, Monsanto reserves the right to cancel a deal and wipe out the inventory of an independent seed company that violates the terms of its licensing agreement. Christopher Leonard, *Monsanto Stomps Down Budding Seed Competitors*, USA TODAY, Dec. 14, 2009, 10:51 AM, http://www.usatoday.com/money/industries/food/2009-12-14-monsanto-practices_N.htm.

134. Winston, *supra* note 133, at 323.

135. *Id.* at 305. Cross licensing and other private ordering amongst seed industry competitors is accomplished through a variety of techniques, such as joint venture agreements "that restrict the licensing of one partner's technology outside the agreement, thus impeding rivals' access to that technology for the purposes of developing competing products." *Id.* at 322.

136. *Id.* at 306 n.108.

137. *Id.*

138. *Id.* at 322.

D. Decrease in Seed Saving

As discussed above, Monsanto views seed saving as adversely affecting competition. Historically, the amount of seeds that farmers saved used to constrain the pricing freedom of new seed producers.¹³⁹ To prevent seed saving, as previously discussed, Monsanto's farmer technology agreements bind farmers to buy new seed for the next year. Assuming that these farmers actually abide by these agreements,¹⁴⁰ it follows that farmers planting Monsanto seeds do not save their seed for replanting the following season. Between the years of 1986 and 1995, on average 72% of land was planted with purchased seed.¹⁴¹ In 1996 and 1997, that percentage rose to 76% and 81%, respectively.¹⁴² By 2000, 83.9% of soybean acreage planted was from purchased seeds, meaning that only 16.1% of soybean acreage planted was from saved seeds.¹⁴³ Finally, "[t]oday nearly all the soybeans planted are patented varieties with seed saving restrictions."¹⁴⁴

E. Decrease in Varietal Diversity

By prohibiting farmers from saving seeds, agriculture is losing

139. Brief for American Antitrust Institute, et al. as Amici Curiae Supporting Petitioners, *Bowman v. Monsanto, Co.*, No. 11-796 (2012), 2012 WL 6208274 at *28.

140. Regardless of what the technology agreement binds farmer to do and to not do, many farmers do not understand that they are not supposed to save Monsanto's seed. Donald L. Barlett & James B. Steele, *Monsanto's Harvest of Fear*, VANITY FAIR, May 1, 2008, <http://www.vanityfair.com/politics/features/2008/05/monsanto200805>.

141. U.S. DEP'T OF AGRIC., ECONOMIC RESEARCH SERV., AIB-786, THE SEED INDUSTRY IN U.S. AGRICULTURE 11 (Jan. 2004), available at http://www.ers.usda.gov/media/260729/aib786_1_.pdf.

142. *Id.*

143. Brief for the Office of the Attorney General for Mississippi as Amicus Curiae in Support of Petitioners, *Scruggs v. Monsanto Co.*, 549 U.S. 1342 (2007) (No. 06-1205), 2007 WL 1050187, at *18.

144. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 12 (citing U.S. DEP'T OF AGRIC., ECONOMIC RESEARCH SERV., ADOPTION OF GENETICALLY ENGINEERED CROPS IN THE U.S. (2009)).

each farmer's contribution to the preservation of genetic variety.¹⁴⁵ Furthermore, the consolidation of the seed industry (spurred by utility patents) has eroded the genetic diversity of crops. The combination of these two losses has led to an actual decrease in varietal diversity, as feared by agricultural organizations. In 1968, the USDA opposed an amendment to the PPA that would extend plant patents to include sexually reproduced plants.¹⁴⁶ The USDA opposed the amendment on the grounds that plant patents would threaten the development and introduction of new seed varieties.¹⁴⁷ Unfortunately, data showing the loss of plant varieties throughout the last century have confirmed the negative effects of Monsanto's practices.

As seen above, the amount of seeds saved by farmers has decreased since the commercialization of Roundup Ready. Each year, farmers that license Monsanto's patented traits must purchase new seed and are prohibited from saving any of the seeds. Therefore, traditional farming practices, such as phenotypic selection of seeds from healthy and productive plants and cross-breeding of desirable traits, are no longer happening when farmers license Roundup Ready seeds. As Roundup Ready soybeans account for 93% of soybean acreage in the U.S., farmers cannot create new genetically distinct varieties from saved seed.

Additionally, the loss of independent seed companies has led to a decrease in variety. Many of the disappearing independent seed companies discussed above bred seeds suited for their regional customers.¹⁴⁸ However, as these independent companies were either acquired or driven to bankruptcy, large companies such as Monsanto, acquired their germplasm. Unlike regional breeding companies, Monsanto does not produce seed for specific areas; instead, Monsanto's products need to be broadly adapted to be sold over a large geographic area.¹⁴⁹ As a result, "[m]odern agriculture

145. See *supra* Part II.A, for an explanation of how farmers create genetically distinct varieties through seed saving.

146. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 9.

147. *Id.*

148. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 28.

149. *Id.*

is dependent upon a relatively small number of commercial crop species, some of which are dominated by a relatively small number of varieties within the species.”¹⁵⁰

While academic research has focused on varietal diversity, it is a useful proxy to show genetic diversity. From 1904 to 2004, 94% of the seed varieties available in 1903 were no longer available in 2004 seed catalogs, showing a 6% variety survival rate.¹⁵¹ Researchers, however, also find that the diversity of commercially available varieties did not decrease in that period.¹⁵² There were 7262 commercially available varieties in 1903, and 7100 in 2004. These numbers remained steady due to “varietal replacement:” the introduction of new varieties, and the reintroduction of improved varieties and heirlooms to the market.¹⁵³ In spite of data showing stability in commercially available crops, certain crops have suffered notable losses. For a specific example of a notable loss of variety, the United States has lost 6000 of 7000 apple varieties that were previously grown.¹⁵⁴

IV. “PLAGUE OF SAMENESS”¹⁵⁵: *BIODIVERSITY CONSEQUENCES*

Many describe the increasing genetic uniformity as a “plague of sameness,” overtaking vast fields of crops with monoculture agriculture.¹⁵⁶ The economic effect of this “plague of sameness” is enormous: “pest[] and plant diseases are . . . estimated to exact a

150. Brief for the American Corn Growers Association & National Farmers Union as Amici Curiae Supporting Petitioners, *J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, 534 U.S. 124 (2001) (No. 99-1996), 2001 WL 490944 at *14.

151. JANISSE RAY, *THE SEED UNDERGROUND* 6 (2012). The study discussed focused on forty-two vegetable crop species, comparing commercial catalogs from the National Agriculture Library. Heald & Chapman, *supra* note 65, at 1062-63. The researchers tracked which varieties of plants marketed in 1901 and 1902 were still being marketed in 2004, and also compared the absolute number of varieties of each crop commercially available from 1901 and 1902 to 2004. *Id.* at 1064.

152. Heald & Chapman, *supra* note 65, at 1072-73.

153. RAY, *supra* note 151, at 6.

154. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 9.

155. PRINGLE, *supra* note 58, at 14.

156. *Id.*

toll of \$20-33 billion each year nationwide.”¹⁵⁷ However, the dangers of this plague are not limited to economic concerns. When crops are threatened by pests or disease, genetically uniform crops could be wiped out. Without the ability to locate genetic resistance in any varieties, the world could lose entire major food crops, such as soybeans, corn, rice, and wheat.

A. Genetic Resistance

According to Cary Fowler and Pat Mooney, “today’s plant breeder will search for one major gene to confer resistance for the new variety.”¹⁵⁸ One-gene resistance provides that there will be only “one line of defense” against pests and diseases.¹⁵⁹ When overcome by pest or disease, the gene can no longer provide resistance.¹⁶⁰ Breeding, then, is a “step by step evasion of the pathogen,” and the use of one-gene resistance lacks an “ultimate vision of permanent or stabilized resistance.”¹⁶¹ In contrast, the traditional “landrace” confers resistance on a new variety as the product of a large number of genes working together.¹⁶² The resistance conferred by the traditional “landrace” is long-lasting, because these varieties have survived among pests and diseases “in the center of diversity.”¹⁶³ Additionally, heirloom varieties, discussed above, are used to breed insect, disease, and drought tolerance into modern crops.¹⁶⁴ In contrast to the conventional

157. CALVIN O. QUALSET & HENRY L. SHANDS, GENETIC RES. CONSERVATION PROGRAM UNIV. OF CAL., SAFEGUARDING THE FUTURE OF U.S. AGRICULTURE 7 (2005), available at <http://ucce.ucdavis.edu/files/repositoryfiles/safeguardingfutureusag-54956.pdf>.

158. FOWLER & MOONEY *supra* note 10, at 81.

159. *Id.*

160. *Id.* at 82.

161. *Id.*

162. *Id.*

163. *Id.* at 81.

164. *Saving Heirlooms*, SEED SAVERS EXCH., www.seedsavers.org/Education/Saving-Heirlooms (last visited May 5, 2013). Landraces differ from heirloom seeds in that heirloom varieties are selectively bred by farmers or plant breeders, whereas landraces develop solely to natural processes. However, many heirloom varieties have evolved from landraces. PRINGLE, *supra* note 58, at 22.

three- or four-way hybrid varieties, GE varieties, such as Roundup Ready soybeans, are “single-cross hybrids.”¹⁶⁵

The “plague of sameness” becomes even riskier when farmers plant pure line varieties instead of a mixture of varieties, or where a “few successful crop varieties replace the great diversity of crop and types found in farmers’ fields.”¹⁶⁶ Monoculture agriculture is prominent in developed countries,¹⁶⁷ largely because of the predictability that single cross varieties offer farmers and the agricultural industry.¹⁶⁸ With this monoculture agriculture, however, when part of the uniform crop is wiped out by pests or diseases, the entire crop is wiped out.¹⁶⁹ Furthermore, when the neighbor farmer plants the same variety, his crop is also wiped out.¹⁷⁰ Finally, “when virtually every farmer plants the *same variety* or group of varieties, the risk becomes dangerous.”¹⁷¹ The lack of resistance and genetic variability leads to the vulnerability of crops to pests and diseases.

B. Pest Management

First, the “plague of sameness,” or monoculture agriculture, threatens crop resistance to pests. Specifically, “[p]athogens or insect pests that mutate to overcome a crop’s innate resistance or to escape the effects of fungicides or pesticides, together with monoculture conditions, heighten the risk that such novel pests could rapidly spread and cause great losses in crop yield and quality.”¹⁷² In recent years, the percentage of annual crop lost to insects has doubled,¹⁷³ and global crop loss due to pests is an

165. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, *supra* note 12, at 31.

166. QUALSET & SHANDS, *supra* note 157, at 7.

167. *Id.*

168. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, *supra* note 12, at 31.

169. FOWLER & MOONEY, *supra* note 10, at 82.

170. *Id.*

171. *Id.* at 82-83 (emphasis added).

172. QUALSET & SHANDS, *supra* note 157, at vi.

173. FOWLER & MOONEY *supra* note 10, at 47 (citing Robert M. May & Andrew P. Dobson, *Population Dynamics and the Rate of Evolution of Pesticide*

estimated 30-40% of potential yield.¹⁷⁴ The rise of pest problems is also evident through increased pesticide use: from 1945 to 1975, the amount of pesticide employed rose from less than 200 million pounds to 1600 million pounds.¹⁷⁵

Genetic mutations in these pathogens or pests require quick replacement with varieties that have resistance.¹⁷⁶ These replacements require the screening of gene resources to find new resistance.¹⁷⁷ However, with a narrowing genetic resource base, varieties that have resistance are slowly disappearing.

C. Vulnerability to Diseases

Second, monoculture agriculture increases vulnerability to disease causing widespread damage. Two historical examples show the dangers of monoculture agriculture in the face of disease. Ireland's potato blight in 1846 that led to the Great Famine, was a result of a lack of crop diversity.¹⁷⁸ The Irish were dependent on the potato for food, and about 90% of the potatoes eaten were a variety called "Lumper."¹⁷⁹ When blight infected the potatoes, the Lumper variety lacked resistance in the tubers.¹⁸⁰ This lack of resistance and the uniformity of the potatoes allowed the blight to dramatically wipe out Ireland's potato supply. Potatoes "were the first crop in modern history to be devastated by lack of resistance."¹⁸¹ Not only were potatoes nearly lost as a major food

Resistance, in PESTICIDE RESISTANCE: STRATEGIES AND TACTICS FOR MANAGEMENT 171 (1986)).

174. QUALSET & SHANDS, *supra* note 157, at 7.

175. FOWLER & MOONEY *supra* note 10, at 47 (citing U.S. ENVTL. PROT. AGENCY, NATIONAL RESEARCH COUNCIL, EPA-600/8-80-044, RESEARCH SUMMARY: INTEGRATED PEST MANAGEMENT 171 (1986)).

176. QUALSET & SHANDS, *supra* note 157, at 7.

177. *Id.* at 7-8.

178. See generally *Monoculture and the Irish Potato Famine: Cases of Missing Genetic Variation*, UNDERSTANDING EVOLUTION, http://evolution.berkeley.edu/evolibrary/article/agriculture_02 (last visited Oct. 4, 2013).

179. FOWLER & MOONEY, *supra* note 10, at 44; RAY, *supra* note 151 at 7.

180. RAY, *supra* note 151, at 7.

181. FOWLER & MOONEY, *supra* note 10, at 45. Fortunately, potato resistance was in distinct types of potatoes in the Andes and Mexico. *Id.*

crop, but 1 to 2 million Irish people died or left Ireland as a result of the famine.¹⁸²

In more recent history, the U.S. corn leaf blight of the 1970s provides another example of the dangers of “monoculture” agriculture. Similar to the uniformity of the Irish potato crop, in 1970, almost 85% of U.S. cornfields were planted with one corn variety, Texas cytoplasmic male sterile.¹⁸³ This type of corn was highly susceptible to a new type of fungus that wiped out 15% of the corn crop and resulted in a \$1 billion loss in the United States.¹⁸⁴

While the U.S. hybrid corn industry only “[took] one year to correct the problem and get resistant varieties back on the market,” Fowler and Mooney point out that biodiversity crises such as these raise many “unanswered questions.”¹⁸⁵ One of the most troubling questions is: with such a narrow genetic base, will the seed industry be able to find a quick solution the next time a crisis occurs?¹⁸⁶ A potential soybean “rust” crisis in 2004, with a disease “that could ruin a field in two weeks, and . . . up to 80 percent of yield,” spurred plant scientists to screen seed samples in the USDA U.S. crop gene banks.¹⁸⁷ Scientists identified some soybean varieties with weak resistance, but mostly found that none was fully immune to the rust.¹⁸⁸ As a result, the scientists had to find resistance in wild relatives of soybeans from China, Taiwan, and Australia—countries where soybeans were first domesticated.¹⁸⁹

The dangers of the “plague of sameness” show that crop

182. *Id.* at 45.

183. *Historical Perspectives of Plant Diseases*, AM. PHYTOPATHOLOGICAL SOC’Y, <http://www.apsnet.org/edcenter/K-12/TeachersGuide/PlantBiotechnology/Pages/History.aspx> (last visited May 5, 2013).

184. *What is Plant Pathology or Phytopathology?*, AM. PHYTOPATHOLOGICAL SOC’Y, <http://www.apsnet.org/edcenter/intropp/Documents/presentation.ppt> (last visited May 5, 2013).

185. FOWLER & MOONEY, *supra* note 10, at 83.

186. *Id.* at 84.

187. QUALSET & SHANDS, *supra* note 157, at 1.

188. *Id.*

189. *Id.*

diversity needs to be preserved for future generations. The Genetic Resources Conservation Program has found that “[n]early every major U.S. food or fiber crop is battling pests and diseases against which it has no resistance.”¹⁹⁰ Without resistant varieties from a diverse genetic resource pool, future plant scientists will not be able to locate or introduce resistance into modern crops. As a result, “without these infusions of genetic diversity, food production is at risk from epidemics and infestations.”¹⁹¹ The Food and Agriculture Organization of the United Nations has found that the Earth’s population will grow by 50% in the next fifty years; thus, “crop diversity must be managed in a manner that promotes productivity with reducing diversity.”¹⁹²

V. CURRENT DOCTRINE HAS NOT, AND WILL NOT, PREVENT LOSS OF BIODIVERSITY

In light of this loss of biodiversity, however, Monsanto has been victorious against farmers in district courts and the Court of Appeals for the Federal Circuit. Courts have been focused on whether the second generation of seeds are protected or whether the patent right was exhausted by the sale. In *Bowman v. Monsanto*, the latest Monsanto-farmer legal battle, the Supreme Court restricted its analysis using the patent exhaustion doctrine, holding that patent exhaustion does not permit a farmer to reproduce patented seeds through planting and harvesting without the patent holder’s permission.¹⁹³ This precedent has not been, and will continue to not be, effective in combating decreasing biodiversity.

A. Federal Circuit Precedent

Only two litigants against Monsanto have been able to progress far enough in litigation to petition the Supreme Court for a writ of

190. *Id.* at 2.

191. SEED SAVERS EXCH., *supra* note 164.

192. Zachary R.F. Schreiner, Comment, *Frankenfuel: Genetically Modified Corn, Ethanol, and Crop Diversity*, 30 ENERGY L.J. 169, 172 (2009).

193. *Bowman v. Monsanto*, 133 S.Ct. 1761, 1763 (2013).

certiorari.¹⁹⁴ These two litigants, Homan McFarling and Mitchell Scruggs, along with many other farmers sued by Monsanto, relied on the patent exhaustion defense.¹⁹⁵ This doctrine provides that the unrestricted first sale by a patentee of his patented article exhausts his patent rights in the article.¹⁹⁶ However, the Federal Circuit has held this defense inapplicable to McFarling and Scruggs, as well as other farmers who saved patented seed in cases against Monsanto.¹⁹⁷ As discussed in *Monsanto Co. v. Scruggs*, the Federal Circuit found that there was no unrestricted sale because the use of the seeds by seed growers was conditioned on obtaining a license from Monsanto and new seeds grown from the original batch via saved seeds had never been sold.¹⁹⁸ Just because the patented seeds were self-replicating, and could be reproduced from saved seeds, the Federal Circuit held, did not give farmers the right to plant the second generation of seeds: “[a]pplying the first sale doctrine to subsequent generations of self-replicating technology would eviscerate the rights of the patent holder.”¹⁹⁹

B. *Bowman v. Monsanto Co.*

The Supreme Court granted *certiorari* to the latest Monsanto-farmer legal battle, *Bowman v. Monsanto Co.*²⁰⁰ Vernon H. Bowman, the Indiana farmer at the center of the litigation, purchased second generation seed from a grain elevator for his second planting.²⁰¹ Bowman saved seeds from that purchase for a later planting.²⁰² However, after examining his planting activities,

194. Smith, *supra* note 39, at 637.

195. *Id.*

196. *Scruggs*, 459 F.3d at 1335-36 (citing *Mallinckrodt, Inc. v. Medipart, Inc.*, 976 F.2d 700, 701 (Fed. Cir. 1992)).

197. *Id.* at 1336; *Monsanto Co. v. McFarling*, 302 F.3d 1291, 1299 (Fed. Cir. 2002).

198. *Id.* at 1336.

199. *Id.*

200. *Bowman v. Monsanto Co.*, 133 S. Ct. 420 (2012).

201. *Bowman*, 133 S. Ct. at 1763. For the “risky” second crop of the season, Bowman purchased “commodity soybeans” from a grain elevator that were meant for human or animal consumption. *Id.*

202. *Id.*

Monsanto found that the second-planting crops from the grain elevator seed contained Monsanto's patented technology. The District Court granted summary judgment in favor of Monsanto,²⁰³ and the Federal Circuit affirmed.²⁰⁴

This case presented two questions to the Court for review: (1) whether the first-sale doctrine grants the purchaser of a patented article the right to make, use, and sell an unlimited number of new copies of the patented invention that have never been sold, and (2) whether patent law treats as *per se* unenforceable all restrictions imposed by license on the use of a patented article following an authorized sale.²⁰⁵ A unanimous Court held that an authorized sale of a patented article does not allow the purchaser to make new copies of the patented invention.²⁰⁶ However, the Court focused on whether Bowman infringed Monsanto's patents when he grew a second generation of crops from saved seeds, and not on Monsanto's "conditional sales."²⁰⁷ Justice Sotomayor specifically asked Monsanto's attorney in oral arguments whether the Court even needed to address the "lingering confusion the Federal Circuit may have with respect to conditional sales at all."²⁰⁸ Indeed, the Court did not address the Federal Circuit's conditional sale doctrine in *Bowman*, leaving the resolution of the "lingering confusion" to a later time.²⁰⁹

203. *Monsanto Co. v. Bowman*, 686 F. Supp. 2d 834, 840 (S.D. Ind. 2009).

204. *Monsanto Co. v. Bowman*, 657 F.3d 1341, 1343 (Fed. Cir. 2011).

205. Brief for Respondent at i, *Bowman v. Monsanto Co.*, 133 S. Ct. 1761 (2013) (No. 11-796).

206. *Bowman*, 133 S. Ct. at 1769.

207. Lawrence Hurley, *Analysis: Top Court Unlikely to Decide Conditional Sale Issue in Monsanto Case*, THOMSON REUTERS, Feb. 21, 2013, available at http://newsandinsight.thomsonreuters.com/Legal/News/2013/02_-_February/Analysis__Top_court_unlikely_to_decide_conditional_sale_issue_in_Monsanto_case/.

208. Oral Argument, *Bowman v. Monsanto Co.*, No. 11-796, 2013 WL 606035, at *49.

209. *U.S. Supreme Court Monsanto Decision Leaves Patent Exhaustion Questions About Self-Replicating Products Unanswered*, KIRKLAND & ELLIS, http://www.kirkland.com/siteFiles/Publications/Alert_052813.pdf (last visited Aug. 29, 2013).

VI. PATENT MISUSE

Farmers could use patent misuse as a defense in infringement actions brought by Monsanto. Other solutions have been suggested that are beyond the scope of this paper.²¹⁰ However, as applied here, patent misuse would be only a limitation on Monsanto's patent rights and their enforcement of those patents as opposed to a *per se* rule of exhaustion of self-replicating technologies²¹¹ or unenforceable restrictions by patent licenses. This section will first explore the defense and its application in the Supreme Court and the Federal Circuit, and will examine how the defense has been unsuccessfully used against Monsanto. Finally, this section will evaluate three different levels of applying patent misuse rules to Monsanto's conduct, showing that farmers should be able to successfully raise this defense.

A. Background

Patent misuse, an affirmative defense to patent infringement, is an impermissible attempt to extend the time or scope of the patent grant.²¹² The policy of this equitable doctrine is "to prevent a patentee from using the patent to obtain market benefit beyond that which inheres in the statutory patent right."²¹³ Patent misuse is directed at a patent's enforceability, not its validity.²¹⁴

Patent misuse is largely a judicial doctrine, with some statutory

210. These suggestions include legislative reforms, such as establishing the Plant Variety Protection Act, with its seed saving exemption, as the sole mechanism for patent protection for plants, or creating an analogous seed saving exemption for utility patents. FARMER TO FARMER CAMPAIGN ON GENETIC ENG'G, *supra* note 12, at 49. Other solutions include amendments to the Bay-Dole Act, rebuilding public plant breeding and public cultivar development programs, removing the research restriction on licensing agreements, and enacting "farmer protection" statutes that would protect farmers in patent infringement litigation. *Id.* at 48-49.

211. The discussion of possible implications on other self-replicating technologies is beyond the scope of this paper.

212. Robin Feldman, *The Insufficiency of Antitrust Analysis for Patent Misuse*, 55 HASTINGS L.J. 399, 402 (2003).

213. *Mallinckrodt*, 976 F.2d at 704.

214. 1 CALLMANN ON UNFAIR COMP. TR. & MONO. 4.57 (4th Ed. 2012).

input. Congress has statutorily exempted five types of conduct from patent misuse.²¹⁵ In enacting Section 271(d), Congress wanted to confine the judicially-created patent misuse doctrine to anticompetitive conduct by patentees who leverage their patents to obtain economic advantages outside the legitimate scope of the patent grant.²¹⁶ However, the application of patent misuse through Supreme Court, Federal Circuit, and other lower court jurisprudence has been less than straightforward. The Supreme Court created the patent misuse doctrine in 1917 when responding to rampant, unchecked monopolies.²¹⁷ However, the Court has not substantively returned to the doctrine since *Zenith Radio Corp. v. Hazeltine Research Corp.* in 1969.²¹⁸

The Federal Circuit has characterized patent misuse as the patentee's "impermissible broaden[ing] [of] the 'physical or temporal scope' of the patent grant with anticompetitive effect."²¹⁹ Federal Circuit precedent has limited patent misuse to *per se* antitrust and misuse specific practices.²²⁰ The latest Federal Circuit decision addressing patent misuse, *Princo Corp. v. ITC*, emphasized the narrow scope of the doctrine: "the defense . . . is not available to a presumptive infringer simply because a patentee engages in some kind of wrongful commercial conduct, even

215. 35 U.S.C. § 271(d) (2006).

216. *Princo Corp. v. ITC*, 616 F.3d 1318, 1330 (Fed. Cir. 2010) (citing S. REP. NO. 100-492, at 9 (1988); 134 CONG. REC. 32,471 (1988) (statement of Sen. Patrick Leahy)).

217. Vincent Chiappetta, *Living with Patents: Insights from Patent Misuse*, 15 MARQ. INTELL. PROP. L. REV. 1, 4 (2011) (citing Motion Picture Patents Co. v. Universal Film Mfg., Co., 243 U.S. 502 (1917)).

218. *Id.* (citing *Zenith Radio Corp. v. Hazeltine Res., Inc.*, 395 U.S. 100 (1969)). Since *Zenith*, the Court discussed misuse in *Blonder-Tongue Lab. V. Univ. of Ill. Found.*, 402 U.S. 313 (1971), but not about its substantive application. *Id.* at 4 n.16. The Court has also discussed misuse in two other cases noting misuse's evolution towards an antitrust net effects assessment. *Id.* (citing *Ill. Tool Works, Inc. v. Indep. Ink, Inc.*, 547 U.S. 28 (2006); *Dawson Chem. Co. v. Rohm & Haas Co.*, 448 U.S. 176, 221-23 (1980)).

219. *Princo*, 616 F.3d at 1328 (citing *Windsurfing Int'l, Inc. v. AMF, Inc.* 782 F.2d 995, 1001 (Fed. Cir. 1986)).

220. *Mallinckrodt*, 976 F.2d at 708. The Federal Circuit further rejected the notion that cases such as *Bauer* and *Motion Picture* were limited to certain *per se* violations. *Id.* at 708 n.8.

conduct that may have competitive effects.”²²¹ Factually, the defendant must either show impermissible expansion through (1) Supreme Court precedent that has specifically held the activity *per se* misuse,²²² or (2) a showing that the overall effect of a specific action (such as a licensing arrangement) tends to restrain competition unlawfully in an appropriately defined relevant market.²²³ However, the Federal Circuit is deferential to patent owners’ conditions on the sale of patented goods to restrict the disposition of the goods by the purchasers.²²⁴

An ongoing debate exists with courts and commentators on the need for the patent misuse doctrine.²²⁵ Some argue that the doctrine has little utility since the development of modern antitrust doctrine.²²⁶ However, others support strengthening the defense. Judge Dyk, dissenting in *Princo*, asserted that the majority opinion “emasculated” patent misuse to make it a non-meaningful defense.²²⁷ This issue is ripe for the Supreme Court to revisit, especially given that its recent decision in *Quanta Computer, Inc. v. LG Electronics, Inc.* refrained from stating whether license language could overcome triggering the exhaustion doctrine,²²⁸ and left unclear the lingering confusion of the Federal Circuit regarding the conditional sale doctrine. Furthermore, because the Supreme Court did not address the Federal Circuit’s conditional sale doctrine in *Bowman*, the Court will need to revisit the issue in a later case. As noted in the *Bowman* oral arguments, Justice Sotomayor recognized that the Court did not need to resolve the

221. *Princo*, 616 F.3d at 1329.

222. *See, e.g., Va. Panel Corp. v. MAC Panel Co.*, 133 F.3d 860, 868 (Fed. Cir. 1997).

223. Chiappetta, *supra* note 217, at 20; *Windsurfing*, 782 F.2d at 1001-02.

224. *Mallinckrodt*, 976 F.2d at 709 (holding that if a restriction on reuse was within the scope of the patent grant or otherwise justified, then violation of the restriction may be remedied by action for patent infringement).

225. *See Princo*, 616 F.3d 1329 at n.2 (citing *USM Corp. v. SPS Techs., Inc.* 694 F.2d 505, 511 (7th Cir. 1982)); *see generally* Chiappetta, *supra* note 217.

226. Mark A. Lemley, *The Economic Irrationality of the Patent Misuse Doctrine*, 78 CAL. L. REV. 1599, 1614-20 (1990).

227. *Princo*, 616 F.3d at 1342 (J. Dyk, dissenting).

228. *Quanta Computer, Inc. v. LG Elecs., Inc.*, 553 U.S. 617, 637 n.7 (2008).

conditional sale confusion with *Bowman*, but should with a future case.²²⁹

B. Patent Misuse in Monsanto Cases

As discussed above, Monsanto has proceeded to trial with farmers eleven times and only two of these have proceeded to the point at which the respective farmers could petition the Supreme Court for certiorari. In these two cases, *Monsanto Co. v. McFarling* and *Monsanto Co. v. Scruggs*, the Federal Circuit rejected each farmer's argument of patent misuse.

First, in *Monsanto Co. v. McFarling*, farmer Homan McFarling argued that Monsanto had committed patent misuse by impermissibly tying an unpatented product, the germplasm, to a patented product, the genetic trait.²³⁰ McFarling proposed that Monsanto could permit farmers to save and replant the Roundup Ready seed each year, with annual payment of a technology fee, instead of requiring the farmer to buy both the germplasm and Roundup Ready trait each year.²³¹ The Federal Circuit held that McFarling's tying allegations were not sufficient to successfully raise a patent misuse defense.²³² First, the court found that McFarling and other farmers would be able to buy genetically unmodified soybean germplasm.²³³ Second, the court also found that McFarling did not seek and would not be able to perform under a license to purchase, make, or use the patented genetic trait before its insertion into the seed.²³⁴

Second, in *Monsanto Co. v. Scruggs*, Scruggs asserted that Monsanto's practices violated federal and state antitrust laws and constituted patent misuse.²³⁵ Specifically, Scruggs focused on the exclusivity provisions, no replant policies, and technology fee payments required by Monsanto's licensing agreements as

229. Oral Argument, *Bowman v. Monsanto Co.*, No. 11-796, 2013 WL 606035, at *49.

230. *Monsanto Co. v. McFarling*, 363 F.3d 1336, 1341 (Fed. Cir. 2004).

231. *Id.* at 1342.

232. *Id.*

233. *Id.*

234. *Id.*

235. *Scruggs*, 459 F.3d at 1339.

anticompetitive practices.²³⁶ The Federal Circuit quickly held these practices as within Monsanto's valid exercise of rights under the patent laws.²³⁷ Scruggs also argued that Monsanto tied the purchase of its seed through its licensing scheme.²³⁸ This argument was also dismissed, as the Federal Circuit found that Scruggs did not point to sufficient evidence to establish that Monsanto's behavior constituted illegal tying.²³⁹

C. A Workable Solution

While the patent misuse defense has not been successful for farmers at the Federal Circuit level, McFarling and Scruggs failed to allege sufficient facts to show patent misuse.²⁴⁰ Their defenses were erroneously dismissed, and the correct resolution should proceed as the following discussion explains. With proper fact allegations, farmers should be able to show Monsanto's patent misuse at three alternatives of inquiry: by (1) showing that Monsanto has illegally tied two products, (2) showing the licensing arrangement's anticompetitive effect on the relevant

236. *Id.* at 1340.

237. *Id.*

238. *Id.*

239. *Id.*

240. It is worth emphasizing here that there is an extreme imbalance between the financial resources of the farmers litigating and Monsanto. Often the litigating farmers have been pushed to the brink of bankruptcy by Monsanto's actions against them. See Adam Liptak, *Saving Seeds Subjects Farmers to Suits Over Patents*, N.Y. TIMES, Nov. 2, 2003, <http://www.nytimes.com/2003/11/02/us/saving-seeds-subjects-farmers-to-suits-over-patent.html?pagewanted=2&src=pm>. Additionally, most of the technology agreements contain a forum selection clause, and farmers defending themselves have to incur expensive travel and litigation costs. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS, *supra* note 1, at 40. The technology agreements require that the exclusive jurisdiction and venue for all disputes are either the U.S. District Court for the Eastern of Missouri or the Circuit Court of the County of St. Louis, both located in Monsanto's headquarters. CTR. FOR FOOD SAFETY, *supra* note 38, at 21. Perhaps the farmers' failure to sufficiently allege patent misuse may be influenced by their lack of financial resources necessary to litigate such a claim.

market, and (3) showing that Monsanto's practices have overreached and offended public policy.

1. Tying Arrangements

One way that farmers could defend against patent infringement lawsuits from Monsanto would be to allege that Monsanto has conditioned the license or sale of its patented trait on the license or purchase of the separate germplasm.²⁴¹ If farmers could show that Monsanto's licensing scheme created a tying arrangement with market power in the relevant market, which is patent misuse,²⁴² they could show that Monsanto has violated several antitrust statutes and could fight the prohibition on saving seeds.²⁴³ While tying arrangements used to be entitled to a presumption under a *per se* rule, a decision that there is a tying arrangement must be supported by proof of power in the relevant market.²⁴⁴

For a farmer to establish an illegal tying arrangement, he must "prove that there is a tying arrangement between two separate products where the seller has market power in the tying product and the tying arrangement forecloses a substantial part of the market."²⁴⁵ In this case, the two separate products are the actual seed (germplasm) and that patented Roundup Ready gene; there is sufficient consumer demand for the products to be provided separately.²⁴⁶ However, in the case of saved seeds, the element of sufficient consumer demand for separate products is trickier for the farmer to show, since he does not want to buy seeds from another dealer. Instead, the farmer wishes to use his own seeds saved from the previous season. Therefore, farmers are forced to buy new germplasm with the patented genetic trait inserted annually. Indeed, McFarling pointed out that he would even pay an annual

241. See 35 U.S.C. § 271(d)(5) (2012).

242. See *Carbice Corp. of Am. v. Am. Patents Dev. Corp.*, 283 U.S. 27, 30-31 (1931).

243. Smith, *supra* note 39, at 642.

244. *Ill. Tool Works*, 547 U.S. at 42-43; see also 35 U.S.C. § 271(d)(5).

245. Smith, *supra* note 39, at 642 (citing *Jefferson Parish Hosp. Dist. No. 2 v. Hyde*, 466 U.S. 2, 2 (1984), *abrogated by Ill. Tool Works*, 547 U.S. at 28).

246. *Id.* (quoting *Eastman Kodak Co. v. Image Technical Servs.*, 504 U.S. 451, 461-62 (1992)).

licensing fee each year for using the Roundup Ready trait.²⁴⁷ This must be indicative of other farmers' views: saving seed was historically engrained in agricultural history before Monsanto's licensing practices.²⁴⁸

Second, a farmer must show that Monsanto has market power in the tying product.²⁴⁹ Properly narrowed, this market should be genetically modified seeds in the United States.²⁵⁰ The consolidation of the seed industry and Monsanto's resulting market power was discussed above,²⁵¹ but it is worth repeating that Monsanto's genetically engineered Roundup Ready soybeans are planted on 93% of soybean acreage as of 2012.²⁵² While a patent alone cannot establish a presumption of market power, a farmer should clearly be able to show other "proof of power in the relevant market" that Monsanto has created through its patents, licensing arrangements, and seed firm acquisitions.²⁵³

2. *Anticompetitive Effect*

Alternatively, instead of alleging tying arrangements, farmers should be able to show that Monsanto's patents and licensing arrangements tend to unlawfully restrain competition in the relevant market. While the Department of Justice (DOJ) closed its investigation of Monsanto for antitrust violations without taking any enforcement action, patent misuse should encompass a broader range of violations.²⁵⁴ Because Monsanto's licensing arrangement has effectively eliminated competition in the genetically modified

247. *McFarling*, 363 F.3d at 1342.

248. *See* 7 U.S.C. § 2543 (2006); ROBIN, *supra* note 41, at 205.

249. Smith, *supra* note 39, at 644.

250. *Id.* at 645.

251. *See supra* Part III.B.

252. Brief for the American Soybean Association, et al. as Amici Curiae, *supra* note 116, at *8.

253. Smith, *supra* note 39, at 644 (citing *Ill. Tool Works*, 547 U.S. at 31 (where the Supreme Court held that the mere fact that a tying product is patented does not support the presumption that the seller has market power)).

254. Feldman, *supra* note 212, at 400 ("Antitrust law is designed to address only particular types of harm, and it cannot reach everything that patent policy addresses.").

seed market, courts should find that its actions constitute patent misuse. Farmers would then have a defense against Monsanto's patent infringement actions for their seed saving practices.

Some courts have advocated applying antitrust rules to patent misuse questions.²⁵⁵ While antitrust rules cover a narrower, more specific range of harms, Monsanto's treatment under antitrust rules would be a useful place to start a patent misuse analysis. Monsanto has been investigated by state attorneys general and federal DOJ officials for antitrust violations. State attorneys general, such as in Texas and Iowa, initiated inquiries in 2007, looking into whether Monsanto had used its dominance in the seed industry to illegally maintain a monopoly.²⁵⁶ In their investigations, state officials analyzed several provisions within the licensing arrangements that required seed dealers to favor Monsanto over their competitors.²⁵⁷ Via a public information request, documents uncovered from the Texas investigation suggest that state investigations were focused broadly on whether Monsanto had used its dominance to maintain an illegal monopoly.²⁵⁸ The state investigations were closed in 2012 without further action.²⁵⁹

255. *Id.* at 399 (citing *C.R. Bard, Inc. v. M3 Sys.*, 157 F.3d 1340, 1372 (Fed. Cir. 1998); *B. Braun Med. Inc. v. Abbott Labs.*, 124 F.3d 1419, 1428 (Fed. Cir. 1997); *Va. Panel*, 133 F.3d at 869; *Mallinckrodt*, 976 F.2d at 708).

256. Khan, *supra* note 108.

257. *Id.* "For example, one contract provision bans independent companies from breeding plants that contain both Monsanto's genes and the genes of any of its competitors, unless Monsanto gives prior written permission – giving Monsanto the ability to effectively lock out competitors from inserting their patented traits into the vast share of U.S. crops that already contain Monsanto's genes." Christopher Leonard, *Monsanto Squeezes Out Seed Business Competition, AP Investigation Finds*, HUFFINGTON POST (Dec. 13, 2009, 1:45 PM), http://www.huffingtonpost.com/2009/12/13/monsanto-squeezes-out-see_n_390354.html. Monsanto has also been reported to offer rebates if a seed dealer's product line consisted of 70% Monsanto products. Khan, *supra* note 108.

258. Khan, *supra* note 108. These documents included research on Monsanto's bundled pricing and how to police companies with intellectual property rights for anticompetitive conduct. *Id.*

259. Press Release, Monsanto Co., Monsanto Company Announces Iowa Attorney General and Working Group Have Closed Inquiry (Dec. 20, 2012),

On the other hand, at the federal level, DOJ officials specifically investigated Monsanto's licensing arrangements for Roundup Ready soybean traits.²⁶⁰ For example, a Midwest seed owner reported that, in an interview, DOJ officials had asked him very specific questions about Monsanto's contracts, suggesting that the DOJ did not investigate the layout of the seed industry or other broad issues.²⁶¹ However, the federal DOJ investigation was also closed in 2012 without any enforcement action.²⁶² Furthermore, the DOJ did not issue a public statement on why the investigation was closed, what types of conduct were investigated, or why no enforcement remedies were pursued.²⁶³ This lack of transparency has disappointed many antitrust advocates, who note that the "public is in the dark about how the DOJ will pursue concerns involving intellectual property and competition in important markets."²⁶⁴ There are both cynical and non-cynical interpretations of the termination of this investigation, such as that "[t]here was a good case to be made, but at the end of the day nobody was prepared to bite the bullet and move forward" given Monsanto's political connections.²⁶⁵ Nevertheless, the fact that Monsanto's

available at www.monsanto.com/newsviews/Pages/iowa-attorney-general-working-group-closed-inquiry.aspx.

260. *Id.*

261. *Id.*

262. Press Release, Monsanto Co., Monsanto Notified that U.S. Department of Justice Has Concluded its Inquiry (Nov. 16, 2012), available at <http://www.monsanto.com/newsviews/Pages/monsanto-notified-that-us-department-of-justice-has-concluded-its-inquiry.aspx>

263. *Lack of Transparency in the Closing of DOJ's Investigation into Monsanto's Transgenic Seed Practices Disappoints Antitrust Advocates*, AM. ANTITRUST INST., <http://www.antitrustinstitute.org/~antitrust/content/lack-transparency-closing-doj's-investigation-monsanto's-transgenic-seed-practices-disappoint> (last visited Oct. 20, 2013).

264. *Id.*

265. Khan, *supra* note 108. Cynical reasons include allegations of Monsanto having a "revolving door in Washington," and pointing to its significant lobbying expenditures. *Id.* However, seed companies have reported that Monsanto began loosening up its licensing arrangements in 2008, at the beginning of the investigations. *Id.* Additionally, Monsanto announced that it would open the market up to generic competition once the Roundup Ready patent expires in 2014. *Id.*

conduct does not rise to an antitrust violation reinforces the need for the patent misuse doctrine to police its anticompetitive behavior, especially anticompetitive behavior perpetuated by its patent licensing practices.²⁶⁶

Through its patents and licensing arrangements, Monsanto has restrained competition unlawfully in its relevant market. As with the tying analysis, Monsanto's relevant market is genetically modified seeds in the United States.²⁶⁷ Courts need to then look at the consolidation of the seed industry, and Monsanto's resulting market share. Farmers would need to submit evidence on Monsanto's, and other major seed companies', series of acquisitions from 1996 to present. Additionally, farmers would submit evidence about the number of independent seed companies that have either been acquired or have gone bankrupt, and how that has adversely affected the availability of non-Monsanto seeds.²⁶⁸

Beyond restraining competition in the genetically modified seeds market, courts should also look at how Monsanto's practices have eliminated one historic form of competition. Particularly, courts should focus on Monsanto's licensing arrangements that specifically prohibit saving seeds for replanting, and Monsanto's investigative and prosecutorial actions towards farmers alleged to have saved seed.²⁶⁹ These specific practices have eliminated farmers' saving seed practices, which Monsanto regarded as affecting competitive conditions.²⁷⁰ According to Monsanto, the practice of saving seeds operated as a constraint on the pricing freedom of the seed industry.²⁷¹ Therefore, Monsanto's

266. See *Princo*, 616 F.3d at 1350 (J. Dyk, dissenting) (“The difficulty of securing a misuse determination with respect to the suppressed patent or traditional antitrust relief underscores the importance of applying the doctrine of patent misuse to the protect patents. Unless the protected patents are held unenforceable, there will be no adverse consequence to the patent holder for its misconduct nor will the patent misuse be remedied.”)

267. See *supra* note 250 and accompanying text.

268. See *supra* Part III.C

269. See *supra* Parts II.B.1-2.

270. ROBIN, *supra* note 41, at 205.

271. See Brief for Center for Food Safety & Save Our Seeds as Amici Curiae Supporting Petitioner, *Bowman v. Monsanto Co.*, No. 11-796 (2012), 2012 WL 6591149, at *22.

enforcement of its Roundup Ready patent through licensing and prosecution has eliminated at least one form of competition in the seed industry.²⁷²

3. *Expand Patent Misuse for Biodiversity Concerns*

In addition to misuse in the antitrust context, some have advocated that patent misuse should be expanded to restrain patent practices that offend public policy.²⁷³ Patent misuse in this iteration could cover patentee conduct that is contrary to the public interest, such as “patent overreaching [that] violates our sensibilities about justice and fairness and potentially threatens public health.”²⁷⁴ Under this framework, farmers would be able to use patent misuse to fight Monsanto’s practices that are found to be contrary to public policy, even if the practices did not violate any antitrust laws.²⁷⁵ This defense would, however, require a court to evaluate the prohibition on saving seeds as a threat to public policy, because of the loss of variety and biodiversity. As discussed above, in the event where resistance is needed in an emergency, plant pathologists may not be able to locate resistance.²⁷⁶ In addition to overwhelming amounts of crop devastation, the production of major food crops might not be able to recuperate as it has in the past.²⁷⁷

Expansion of patent misuse has been favorably discussed, and could be supported by, judicial precedent. For example, a district court judge noted that “[i]t would be inappropriate to confine patent misuse, as is sometimes suggested, to practices that violate antitrust law, for in that event the doctrine would be superfluous.”²⁷⁸ He advocated for a more flexible, adaptable

272. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, *supra* note 12, at 40.

273. Rowe, *supra* note 60, at 888 (citing *SmithKline Beecham Corp. v. Apotex Corp.*, 247 F. Supp. 2d 1011, 1047 (N.D. Ill. 2003); *C.R. Bard*, 157 F.3d at 1372; *Mallinckrodt*, 976 F.2d at 704).

274. Rowe, *supra* note 60, at 888.

275. See *Mallinckrodt*, 976 F.2d at 704.

276. See *supra* Part III.F.

277. See *supra* notes 186-192 and accompanying text.

278. *SmithKline Beecham*, 247 F. Supp. 2d at 1047.

incarnation of the patent misuse doctrine:

When the advance of science well illustrated by the products in this case enables a form of patent misuse that is new but is well within the conceptual heartland of the doctrine, the boundaries of the doctrine can expand modestly to encompass it. ‘The sea-changes in both law and technology stand as a testament to the ability of law to adapt to new and innovative concepts, while remaining true to basic principles.’²⁷⁹

Monsanto’s practices are within the “conceptual heartland” of the patent misuse doctrine, because not only are they anticompetitive, but they have also threatened plant variety and biodiversity in service of Monsanto’s economic gain. However, patent misuse doctrine expansion to practices that offend public policy would exceed “modest expansion” and would probably best be left to Congressional policy judgments.

VII. DOES GENETIC SEED TECHNOLOGY NEED PATENT PROTECTION?

While the doctrine of patent misuse should be used by farmers to prevent Monsanto from overreaching the scope of its patent protection, patent protection does inherently involve slight overreaching.²⁸⁰ That reaching is “the harm society has decided individuals must bear to obtain the [patent] regime’s benefits.”²⁸¹ The goal of the patent system is to promote the progress of the useful arts.²⁸² By offering a limited right to exclude, patent law induces inventions for the benefit of society.²⁸³ Therefore, opponents of using patent misuse could argue that the benefits of

279. *Id.* (quoting *AT&T Corp. v. Excel Commc’ns, Inc.*, 172 F.3d 1352, 1356 (Fed. Cir. 1999)).

280. Chiappetta, *supra* note 217, at 4

281. *Id.*

282. U.S. CONST. art. 1, § 8, cl. 8.

283. Feldman, *supra* note 212, at 400.

Monsanto's patent protection outweigh the anticompetitive harm its patents and licensing arrangements cause. As a proxy to determining whether Monsanto's patent protection does in fact encourage invention, one can first examine whether patentability on seeds has increased agricultural technology innovation. Then, one needs to examine whether Monsanto's seed innovation is performing its "vital market function" by producing new varieties that increase output.²⁸⁴ In addition to the "societal value" of Monsanto's patented technology, one must also examine the practical value of Roundup to farmers in production, the group of people Monsanto proclaims to help with its research and development.²⁸⁵

A. Monsanto's Argument

Monsanto has maintained that its restrictions on reproduction, use, and transfer are essential to protecting the company's investment in its patented technology.²⁸⁶ Without their finely attuned ability to exclude, the company argues that its ability to protect its patented technology would effectively be lost as soon as the first generation of the product was introduced into the market.²⁸⁷ Without patent protection, Monsanto might argue, their high investments would be lost; Monsanto typically takes an average of ten years and \$100 million to develop and commercialize a new product.²⁸⁸ While Monsanto can spend

284. Chiappetta, *supra* note 217, at 10-11.

285. *Why Does Monsanto Sue Farmers Who Save Seeds?*, MONSANTO CO., www.monsanto.com/newsviews/Pages/why-does-monsanto-sue-farmers-who-save-seeds.aspx (last visited Oct. 21, 2013).

286. Brief for Respondents, *Bowman v. Monsanto Co.*, No. 11-796 (2013), 2013 WL 179941, at *31-32.

287. *Id.*

288. Amanda Welters, Note, *Striking a Balance: Revising USDA Regulations to Promote Competition Without Stifling Innovation*, 13 MINN. J.L. SCI. & TECH. 407, 411-12 (2012) (citing Jeffrey Tomich, *Monsanto Growth Falters as SmartStax Yields, Pricing Raise Questions*, STLtoday.com (Oct. 6, 2010, 12:05 AM)). Monsanto spends about \$2.6 million per day to develop and commercialize new products. *Why Does Monsanto Sue Farmers Who Save Seeds?*, MONSANTO, <http://www.monsanto.com/newsviews/Pages/why-does-monsanto-sue-farmers-who-save-seeds.aspx> (last visited Oct. 21, 2013).

astronomical amounts of money on developing and marketing the new seed, it will always be cheap for others to replicate it.²⁸⁹

The American Soybean Association, in an *amicus curiae* brief to the Supreme Court, echoes this argument: “a loss of patent protection is likely to result in the loss of substantial research dollars currently devoted towards developing improved plant varieties.”²⁹⁰ Its brief points to the USDA Free Agricultural Seed Program, where seed purchasers were not barred from saving seeds, to show that little progress was made to increase seed productivity.²⁹¹ Private seed breeders were “crowded” from the marketplace, had little control over the fate of their genetic material, and were not compensated when purchasers saved seed or sold new seeds they grew.²⁹²

B. Does Patentability of Seeds Lead to Higher Innovation?

Monsanto argues that without patent protection, its investment into developing and commercializing new products would be lost. Therefore, after losing that investment, Monsanto (as well as other large agricultural giants) would not be incentivized to innovate. Monsanto’s argument that seed patent protection is necessary for innovation can be analyzed in two parts: patent protection leads to (1) an increase in research and development, or (2) the creation of new seed varieties.

One can look at indicators of innovation, such as research and development expenditures or applications for field testing. Evidence has suggested that these two indicators have either decreased due to patent protection or increased, but due to private

289. Elizabeth I. Winston, *What If Seeds Were Not Patentable?*, 2008 MICH. ST. L. REV. 321, 344 (2008).

290. Brief for American Soybean Association, et al. as Amici Curiae, *supra* note 116, at *7.

291. *Id.* at 10-11. The free seed distribution program seed collection started in 1819, and Congress did not terminate the program until 1930. *Id.* The program quickly grew to an enormous size after placed under the jurisdiction of USDA after its establishment in 1862. *Id.* Using this program as an example, the amici looked at the period of 1866 to 1930, showing that the average national yield for corn decreased from 24.3 to 20.5 bushels per acre. *Id.*

292. *Id.* at 11.

ordering instead. First, due to the seed industry consolidation trend described above, there are obviously fewer players in the seed industry. A decrease in the number of players that are sponsoring research leads to a decrease in innovation. This result can be seen in the findings made by the USDA Economic Research Service, which show that the few major players that “survived” the seed industry consolidation are sponsoring “less research relative to the size of their individual markets than when more companies were involved.”²⁹³

Additionally, Monsanto’s license agreements prohibit research or experimentation and growing of the crops for research purposes, which arguably chills innovation.²⁹⁴ Critics of Monsanto and other biotechnology seed companies argue that independent research on the “critical questions” could not be legally conducted.²⁹⁵ Because university scientists cannot freely buy genetically engineered seeds for research without seeking permission from seed companies, scientists argue that the environmental and health consequences cannot be examined.²⁹⁶ Furthermore, that permission is often denied or made conditional upon the seed company’s review of the findings before publication, allowing seed companies to “control the research that appears in the public domain” and “reduce the potential negatives that can come out of any research.”²⁹⁷ In response to some of this criticism, Monsanto has made agreements with the U.S. Department of Agriculture and certain universities providing access to its genetically engineered seeds.²⁹⁸ However,

293. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G, *supra* note 12, at 17.

294. Rowe, *supra* note 60, at 873. These research restrictions arguably also violate public policy, because scientists “cannot test seeds, compare one company’s seeds to another’s, or investigate the environmental effects of genetically modified crops.” *Id.* at 874.

295. Andrew Pollack, *Crop Scientists Say Biotechnology Seed Companies Are Thwarting Research*, N.Y. TIMES, Feb. 19, 2009, www.nytimes.com/2009/02/20/business/20crop/html?r=0.

296. *Id.*

297. *Id.*

298. *8 Ways Monsanto Fails at Sustainable Agriculture*, UNION OF CONCERNED SCIENTISTS, www.ucsusa.org/food_and_agriculture/our-failing-food-system/genetic-engineering/eight-ways-monsanto-fails.html (last visited Oct. 26, 2013).

these agreements are not binding, are not transparent to the public, and still have industry restrictions.²⁹⁹ Monsanto, and other seed companies, are still “driving the bus”: for example, while the Monsanto-USDA agreement allows the USDA to research crop production practices, the agreement does not also cover investigation into the health risks of genetically engineered crops.³⁰⁰

Second, between 1987 and 1998, applications for field-testing of new plant varieties increased by 13,300%.³⁰¹ This increase correlated to a rise in plant patent and plant variety certificates, but not utility patents.³⁰² Therefore, one could assume that the increase in field variety testing, which can be correlated to an increase in research, was not attributable to utility patent protection. Instead, increases in innovation could be attributable to private ordering through licensing.

Additionally, seed patent protection might not be necessary for the creation of new seed varieties. Empirical research has suggested that many innovations have occurred without patent law.³⁰³ This study showed that only 3.8% of varieties available in 2004 were subject to private intellectual property rights.³⁰⁴ However, of the vegetable varieties available in 2004, only 6% were available in 1904.³⁰⁵ The researchers concluded that intellectual property rights are not necessary to create new varieties.³⁰⁶ Applying for protection “may simply be pure rent seeking, a standard business practice, or the result of risk aversion (defense patenting.)”³⁰⁷

299. *Id.*

300. *Id.*

301. Winston, *supra* note 289, at 327.

302. *Id.*

303. Heald & Chapman, *supra* note 65, at 1093.

304. *Id.*

305. *Id.*

306. *Id.*

307. *Id.* at 1094.

C. Does Patentability of Seeds Lead to Higher Crop Productivity?

As Monsanto argues, it needs patent protection of its seed products in order to be incentivized to make progress in increasing farm productivity. Monsanto has advertised future advances such as drought-resistant crops that “will reset the bar for on-farm productivity.”³⁰⁸ While research has suggested that greater enforcement correlates to greater crop productivity, this research cannot conclusively establish causation.³⁰⁹ Additionally, traditional farming practices are also useful tools in increasing crop productivity.

One study analyzed the correlation between utility patents and crop productivity, using patent applications as a proxy for patents granted.³¹⁰ A strong correlation was found between patent applications and soybean production, yield, and hectares planted.³¹¹ Additionally, comparing the United States’ enforcement regime to that of other countries, the researchers found a significant, positive correlation to soybean yield, production, exports, and imports.³¹² That correlation did not exist for the other countries that had weaker enforcement regimes.³¹³

However, other studies have shown that yield rates have increased, but not as a result of GE-crops. Yield rate may be the product of preexisting, non-GE properties of the germplasm (intrinsic yield rate).³¹⁴ There are no current transgenic varieties

308. Lappé, *supra* note 5.

309. See generally A. Bryan Endres & Carly E. Giffin, *Necessity is the Mother, But Protection May Not be the Father of Invention: The Limited Effect of Intellectual Property Regimes on Agricultural Innovation*, 14 COLUM. SCI. & TECH. L. REV. 203, 244 (2013).

310. *Id.*

311. *Id.* at 245-46.

312. *Id.* at 248. The researchers also noted that the United States utility patent system was different from the other countries examined in that it allows for separate protection of the process to develop the genetically improved seed and the plant itself. *Id.*

313. *Id.*

314. DOUG GURIAN-SHERMAN, UNION OF CONCERNED SCIENTISTS, FAILURE TO YIELD: EVALUATING THE PERFORMANCE OF GENETICALLY ENGINEERED CROPS 2 (Apr. 2009), available at

that enhance intrinsic yield rate,³¹⁵ which is a product of plant breeding instead of genetic engineering.³¹⁶ Roundup Ready soybeans and other transgenic varieties purport to increase operational yield by resistance to pesticide. Some data show that herbicide-resistant varieties have not improved operational yield rates.³¹⁷ Therefore, one cannot conclusively determine that stronger patent enforcement is necessary for greater crop productivity. Furthermore, allowing farmers to save seeds based on yield rates, drought resistance, adaptation to soil and climates may increase the intrinsic yield of seeds with genetic traits increasing operational yield rates.

D. Is Monsanto's Patent Protection Helping or Harming Farmers?

Beyond a broad evaluation of Monsanto's patent protection's value to society, one must also specifically look at its practical effect on the group of people most affected by its practices—farmers. To defend its patent enforcement practices, Monsanto asserts that it invests more than \$2.6 million per day in research and development to benefit farmers.³¹⁸ Monsanto's attitude that "[t]he vast majority of farmers understand and appreciate [Monsanto's] research and are willing to pay for [Monsanto's] inventions and the value they provide,"³¹⁹ reflects another understanding that so many farmers continue to use the Roundup weed control system because of its value to farmers.³²⁰ This value to farmers is the simplicity of the Roundup herbicide with Roundup Ready seeds, allowing for broad spectrum weed control at a low cost.³²¹ However, Monsanto's patent protection and licensing practices have gradually eroded these practical benefits

http://www.ucsusa.org/assets/documents/food_and_agriculture/failure-to-yield.pdf.

315. *Id.*

316. *Id.*

317. *Id.*

318. MONSANTO, *supra* note 285.

319. *Id.*

320. *See supra* note 26 and accompanying text.

321. *Id.*

to its farming consumers. With the consolidation of the seed market, there has been an unprecedented increase in the cost of seeds. Furthermore, there have been several instances of glyphosate-resistant weeds, requiring farmers to use additional herbicides to achieve broad spectrum weed control. Together, these examples show that Monsanto's patent protection and licensing practices have offset any economic and practical benefits that farmers might incur from using genetically modified seeds, in turn, harming the American farmer.

The dramatically increasing cost of genetically-engineered seeds, caused by biotech trait royalty fees, has offset any economic benefit provided to farmers.³²² A survey of growers found that the mean reported benefit of Roundup Ready compared to conventional varieties was monetarily valued by farmers to be \$23.20 per acre.³²³ However, this monetary benefit to farmers is dwarfed by the increase in the price of seeds since Roundup Ready seeds were introduced. Between 1975 and 1995, before Roundup Ready seeds were introduced into the seed market, the price of seeds per planted acre increased by 60%.³²⁴ In stark contrast, between 1995 and 2011, the period of years following the introduction of Roundup Ready seeds, the price of seeds per planted acre increased by 325%.³²⁵ A large portion of the price increase of Roundup Ready seeds is the "technology fee," paid under the second licensing tier of Monsanto's distribution scheme for the patented trait in addition to the actual cost of the seed.³²⁶ Between 1996 and 2008, this technology fee has increased from \$4.50 to \$17.50. As discussed above, because of the consolidation of the seed market, farmers effectively have no choice but to pay the higher seed price.³²⁷ The exorbitant increase in the cost of Monsanto seeds claims a greater share of farmers' operating costs,

322. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 18.

323. Terrance M. Hurley, Paul D. Mitchell, & George B. Frisvold, *Effects of Weed Resistance Concerns and Resistance Management Practices on the Value of Roundup Ready® Crops*, 12 J. BIOTECH. MGMT. & ECON. (2010), available at www.agbioforum.org/v12n34/v12n34a05-mitchel.htm

324. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 16.

325. *Id.*

326. *See supra* note 38 and accompanying text.

327. *See supra* Part 0.

gross crop income, and net return per acre.³²⁸ In other words, “[t]his means [that] a farmer who plants one bag of Roundup Ready soybeans per acre on 1,000 acres has seen his production costs increase by \$11,000 in five years.”³²⁹ Therefore, even if the Roundup system offers an economic benefit to farmers—broad spectrum weed control at a lower cost—that economic benefit is increasingly undermined by the costs of the Roundup Ready seeds. Eventually, “[i]f these GE seed price and income trends continue, the consequences for farmers will be of historic significance, as dollars once earned and retained by farmers are transferred to the seed industry.”³³⁰

In addition to historic increases in the prices of seeds, the “broad spectrum” weed control ability of Roundup is eroding, as more and more weeds have developed glyphosate-resistance. In 1997, there were no glyphosate-resistant weed species in the United States; however, by 2005, that number had already grown to six.³³¹ These “super-weeds” are a result of Monsanto and the Roundup weed control system, which encourages farmers to rely on a single herbicide, even discouraging traditional resistance management approaches.³³² Moreover, these “super-weeds” cannot be easily, effectively, or economically controlled.³³³ To combat the problem, farmers are increasing overall herbicide use and using heavy tillage, in contrast to two of the “environmental” benefits that the Roundup system was advertised and thought to offer.³³⁴ Additionally, other weed management practice recommendations

328. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 18.

329. FARMER TO FARMER CAMPAIGN ON GENETIC ENG’G *supra* note 12, at 22.

330. CTR. FOR FOOD SAFETY & SAVE OUR SEEDS *supra* note 1, at 18 (quoting Dr. Charles Benbrook, agricultural economist).

331. CHRIS BOERBOOM & MICHAEL OWEN, FACTS ABOUT GLYPHOSATE-RESISTANT WEEDS 5 (2006), available at weeds.cscience.missouri.edu/publications/gwc-1.pdf.

332. UNION OF CONCERNED SCIENTISTS *supra* note 298. These approaches include alternating the types of herbicides used over time. *Id.* Some suggest that Monsanto discourages these practices because it would reduce the amount of Roundup sold in a given year, and “cut into the company’s bottom line.” *Id.*

333. *Id.*

334. *Id.* See also *supra* note 30 and accompanying text.

to “lessen the potential for developing glyphosate-resistant weeds” include rotating Roundup with other herbicides or applying a residual herbicide before Roundup.³³⁵ The need to manage glyphosate-resistance by using other herbicides alongside Roundup also undermines another advertised benefit of Roundup—the ability to control weeds with only one product.³³⁶ Thus, because of the increased price of Roundup Ready seeds to use with Roundup, and the emergence of glyphosate-resistant weeds, Roundup increasingly cannot provide broad spectrum weed control at a low cost to farmers.

There is no conclusive data on whether Monsanto’s patent protection is necessary to increase innovation, create new varieties, or lead to higher crop productivity, or whether private ordering will instead spur these advances. However, the “innovation” valued by farmers as users of Monsanto’s technologies—one herbicide able to provide broad spectrum weed control at low costs—has been undermined by steep technology fee increases and glyphosate resistance. Furthermore, this “innovation” valued by farmers in production, monetarily estimated only at just over \$20 per acre,³³⁷ seriously underestimates the social value of the lost innovation and biodiversity. Regardless of whether seed patent protection increases innovation, creates new varieties, leads to higher productivity, or provides value to farmers, the bottom line is that “[i]f we jeopardize this biodiversity for the sake of a possible wonder trait for tomorrow, then we won’t have any wonder traits for the day after tomorrow.”³³⁸ In other words, if courts and Congress continue to allow Monsanto to use its patents and licenses to prohibit farmers from saving seeds, agriculture will become increasingly uniform. In the face of potential pest or disease crises, scientists will be unable to locate resistance among genetically uniform crops. As a result, Monsanto will be unable to create a drought-resistant soybean if the soybean crop is devastated and unable to recover.

335. BOERBOOM & OWEN *supra* note 331, at 7.

336. *See supra* note 29 and accompanying text.

337. *See supra* note 323 and accompanying text.

338. Lappé, *supra* note 5 (quoting Jack Heinemann, professor of molecular biology at New Zealand’s University of Canterbury).

VIII. CONCLUSION

In conclusion, Monsanto's utility patents on the Roundup Ready soybean are directly linked to decreasing crop diversity. The advent of utility patents spurred the consolidation of the seed industry, with major firms such as Monsanto strategically acquiring smaller, independent seed companies. The top firms that survived the consolidation movement, thus, each have large shares of the seed industry, to the detriment of the industry's competitive nature. Independent seed companies are increasingly disappearing, along with the farmers' options to choose other, non-Monsanto seeds. Farmers have been restricted from continuing the traditional farming practice of seed saving, which has wreaked havoc on the genetic and varietal diversity of United States agriculture crops. The resulting "plague of sameness" is dangerous; as examples of monocultures throughout history have shown, crops have a heightened vulnerability to pests and diseases. Furthermore, in the event that genetic resistance to either of those threats needs to be located, the genetic variability to do so is disappearing.

Therefore, something must be done to halt this impending diversity crisis. However, Monsanto has continually prevailed over farmer-defendants at the district court, Federal Circuit, and Supreme Court levels. The defense of patent misuse, the judicial application of which has been confusing, should be revisited. Farmers should be able to factually show an illegal tying arrangement, but in the alternative should be able to show that Monsanto's patents and enforcements practices have had an anticompetitive effect or have violated public policy. The reasoning for allowing the successful patent misuse defense becomes even stronger when considering the conflicting evidence of whether Monsanto's patent protection is necessary for innovation, productivity, or the creation of new varieties. Monsanto's practices have had a chilling effect on research and seed saving, and as a result, have stifled innovation, productivity, and the creation of new varieties. Furthermore, Monsanto's patent protection and licensing practices have cumulatively harmed its farmer consumers through increased prices and weed management difficulty.

With the Roundup Ready patent expiration date looming in 2014, some argue that Monsanto's anticompetitive behavior will be ameliorated.³³⁹ However, Monsanto has already patented Roundup Ready 2, a second version of the glyphosate-resistant technology.³⁴⁰ Many have reported that Monsanto plans to use conditions in contracts with seed dealers "that would unfairly push farmers to buy its new Roundup Ready 2 Yield soybeans and away from the first-generation, lower-priced Roundup Ready beans."³⁴¹ Without current legislation to "oversee the transition to generic" Roundup Ready beans,³⁴² there is no way to predict how Monsanto will use either the Roundup Ready or Roundup Ready 2 patents. Nevertheless, due to the concerns of losing any more biodiversity, the world cannot afford to wait.

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339. Brief for the American Antitrust Institute, et al. as Amici Curiae, *supra* note 139, at *31.

340. U.S. Patent No. RE39,247 (filed Oct. 16, 2007).

341. Juli Weiner, *How Seed Giant Monsanto Went from 2009 Company of the Year to Worst Stock of 2010*, VANITY FAIR, Oct. 7, 2010, <http://www.vanityfair.com/online/daily/2010/10/how-seed-giant-monsanto-went-from-2009-company-of-the-year-to-worst-stock-of-2010>.

342. Welters, *supra* note 25, at 408.

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