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Is Changing Patent Infringement Liability the Appropriate Mechanism for Allocating the Cost of Pollen Drift

by

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Is Changing Patent Infringement Liability the Appropriate Mechanism for Allocating the Cost of Pollen Drift?

Tim Van Pelt*

* I dedicate this Note to my late wife, Kristi, who died in a tragic car accident on Dec. 20, 2005. I wouldn't be the person I am today without all of the love she gave me. Her radiance will always be remembered.

I. INTRODUCTION

Now that plants are patentable subject matter, new issues are arising in the context of patent infringement because of the ability of plants to spread through pollen drift and naturally propagate without human intervention. Part II introduces this issue in the context of *Monsanto Canada Inc. v. Schmeiser.*[1] Part II also provides background on the history and science behind genetically modified plants as well as the development of intellectual property law with respect to plants. Part III begins by evaluating some of the alternatives available for an alleged infringer that receives patented plant matter from pollen drift. Other commentators have proposed nuisance, trespass, and monopolization as possible counterclaims that an alleged infringer could assert. Part III highlights the drawbacks of these alternatives. It also addresses two possible legislative actions for this issue: (1) requiring an element of intent for infringement in these special situations; or (2) indemnifying infringers who are infringing because of pollen drift. Part III highlights why requiring an element of intent would be impractical in reality.

Using Coase's theorem, Part IV analyzes whether indemnifying the passive recipient of pollen drift would actually allocate the cost of pollen drift to the patent holder, assuming this allocation of costs is the desired policy. Part IV concludes that indemnifying legislation is not likely to allocate the cost of pollen drift to the patent holder. This Note suggests that other legal mechanisms, such as regulatory agencies, are better equipped to allocate and enforce the costs of pollen drift.

1. Monsanto Can. Inc. v. Schmeiser, [2001] F.C.T. 256 (Can.).

II. BACKGROUND

A. *The Source of Discussion*—Monsanto Canada Inc. v. Schmeiser

1. *The Trial Court Decision*

In 1996, Percy Schmeiser planted and grew conventional[2] canola near Bruno, Saskatchewan.[3] At the same time, five neighboring farmers grew Roundup Ready canola.[4] One of these Roundup Ready canola fields was diagonally adjacent to Schmeiser's field six,[5] while the next closest field was located five miles from field two.[6]

In 1997, Schmeiser planted his canola crop using seed saved from the 1996 harvest of field one.[7] During the 1997 growing season, Schmeiser's routine ditch spraying of Roundup along fields one through four revealed a large number of Roundup-resistant canola plants.[8] Schmeiser then conducted a test in field two and found that approximately 60% of the plants were resistant to Roundup herbicide.[9] Also during the 1997 growing season, an investigator from Monsanto took seeds from fields two and five.[10] Tests on these samples revealed a significant amount of Roundup resistance, indicating that the crop contained the Roundup Ready gene.[11]

In 1998, Schmeiser planted his canola crop using seed saved from his 1997 harvest of field two.[12] During 1998, more samples were taken from Schmeiser's canola fields, with significant amounts testing positive for the Roundup Ready gene.[13] Schmeiser and Monsanto disagreed about the amount of Roundup resistance exhibited in Schmeiser's 1998 crop with Schmeiser's tests showing approximately 40% to 50% Roundup resistance,[14] while Monsanto's tests showed approximately 95% to 98% resistance.[15]

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2. In this Note, I refer to conventional crops in the sense that they are not genetically modified with transgenes from organisms that are not plants. This does not necessarily mean that conventional crops are not patented.

3. *Schmeiser*, [2001] F.C.T. at 256, paras. 7, 32.

4. *Id.* at para. 33. Roundup Ready plants are genetically modified to be resistant to the herbicide glyphosate, commonly known as Roundup. *Id.* at para. 1.

5. *Id.* at para. 34. The trial court did not find this fact significant because there was no evidence that showed whether Schmeiser saved any seed from field six to plant his 1997 crop. *Id.* For ease of discussion, the trial court numbered Schmeiser's fields one through nine.

6. *Schmeiser*, [2001] F.C.T. at 256, para. 33.

7. *Id.* at para. 32.

8. *Id.* at para. 38.

9. *Id.* at para. 39.

10. *Schmeiser*, [2001] F.C.T. at 256, para. 41. Monsanto Canada Inc. is a part of Monsanto Co., a plant biotechnology and chemical company based in St. Louis, Missouri, that sells a variety of transgenic seeds and complementary herbicide products, including Roundup Ready seed and Roundup herbicide. *See id.* at paras. 4-5, 15-17.

11. *Id.* at paras. 43, 44.

12. *Id.* at para. 32.

13. *Id.* at para. 48.

14. *Schmeiser*, [2001] F.C.T. at 256, para. 56.

15. *Id.* at para. 53. These differences did not matter for the purpose of determining whether infringement

Monsanto then sued Schmeiser in 1998, alleging infringement of its Canadian patent number 1,313,830 (the Roundup Ready gene) because Schmeiser had grown and sold canola plants with the patented Roundup Ready gene without a license or consent from Monsanto, the patentee.[16] After a trial on the merits, the court made several findings. First, the trial court concluded that the crop samples obtained by Monsanto were admissible evidence.[17] Second, the court found that Monsanto's patent was valid, rejecting Schmeiser's arguments for invalidity.[18] With respect to patent validity, the court concluded that it did not matter whether the patented gene could naturally replicate itself and spread without human intervention.[19] Third, the trial court determined that Monsanto did not waive its right to enforce its patent,[20] concluding that the manner in which the patented gene arrived onto Schmeiser's property did not matter.[21] On the issue of infringement, the court determined that whether Schmeiser intended to use the patented gene did not matter,[22] since Schmeiser knew or should have known that he planted the Roundup Ready canola seed in 1998.[23] Finally, the court awarded damages in the form of an injunction and lost profits. The court then enjoined Schmeiser from planting any of his saved seed that he knew or should have known to be Roundup resistant,[24] and ordered Schmeiser to give this seed to Monsanto.[25] In addition, the court awarded Monsanto profits from Schmeiser's 1998 crop.[26]

2. *The Canadian Federal Court of Appeal Decision*

The Canadian Federal Court of Appeal unanimously upheld the trial court's findings and conclusions.[27] On the question of infringement, however, the court acknowledged that intent or knowledge may be relevant in a situation where a patented gene can replicate and spread itself without human intervention.[28] However, the court concluded that it did not need to reach the question here because Schmeiser knew or should have

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had occurred.

16. *Id.* at paras. 1, 9.
17. *Id.* at para. 76.
18. *Id.* at para. 90.
19. *Schmeiser*, [2001] F.C.T. at 256, paras. 78, 83.
20. *Id.* at para. 100.
21. *Id.* at para. 92. Examples cited by the court as possible means by which the patented gene ended up on Schmeiser's property included blown seed, cross-pollination caused by the wind, and/or transport by birds and insects. *Id.*
22. *Id.* at para. 115.
23. *Schmeiser*, [2001] F.C.T. at 256, paras. 102-03, 119.
24. *Id.* at para. 131.
25. *Id.* at para. 132.
26. *Schmeiser*, [2001] F.C.T. at 256, para. 140. The court determined lost profits to be between $15,450 ($15 technology fee per acre that Monsanto charged for the use of its patented gene multiplied by the 1038 acres of canola that Schmeiser planted in 1998), and $105,000, the profit from Schmeiser's 1998 crop as reported by his accountant. *Id.* at paras. 133, 140, 137. However, the court felt that $105,000 was too high because it did not account for Schmeiser's labor. *Id.* at para. 137. Therefore, the court ordered the parties to agree upon an appropriate lost profits amount after trial. *Id.* at para. 140. The court also awarded pre- and post-judgment interest. *Id.* at para. 142.
27. Monsanto Can. Inc. v. Schmeiser, [2003] 2 F.C. 165 (Can. Fed. Ct. App.).
28. *Id.* at para. 57.

known that he recycled and planted Roundup Ready canola in 1998.[29]

3. The Canadian Supreme Court Decision

In a five to four decision, the Supreme Court of Canada affirmed the Federal Court of Appeal on the questions of patent validity and infringement.[30] The court held that Schmeiser infringed Monsanto's patent because he "used" the invention without Monsanto's authorization.[31] The court indicated that if Schmeiser had only harvested and sold the Roundup Ready seed, rather than harvested, saved, and replanted it, there may have been a different outcome.[32] The court also indicated that intent does become relevant when the alleged infringer is in possession of the patented invention, but is not using it.[33] However, the court dismissed this issue because, in this case, Schmeiser was not an "innocent bystander."[34]

On the issue of remedies, the Canadian Supreme Court overturned the $19,832 award of profits by the trial court.[35] The supreme court determined that the trial court incorrectly awarded Monsanto all of Schmeiser's profit from the 1998 crop. Instead, the proper calculation should have used the "differential approach" where the profits awarded to the patentee consist of the value added by the use of the patented invention.[36] Since Monsanto did not prove that Schmeiser increased his profits by using the Roundup Ready canola, Monsanto was not entitled to any of Schmeiser's profits from the sale of his 1998 crop.[37]

B. Understanding the Source of Controversy—Genetically Modified Plants

To gain a better understanding of the underlying policy issues involved with genetically modified crops, it is necessary to understand the scientific progress in plant breeding and how genetic engineering has entered the picture. The following Part explains how genetic engineering is transforming plant performance. It concludes by highlighting some of the positive and negative effects of genetically modified plants.

1. What is "Genetic Modification" of Plants?

Humans have been genetically modifying plants for thousands of years.[38] For example, over a period of ten thousand years, farmers and plant breeders have used careful selection and targeted breeding to transform teosinte, a wild grass originating in Central America, into hybrid corn that is commercially grown throughout the United

29. *Id.* at paras. 57-58.
30. Monsanto Can. Inc. v. Schmeiser, [2004] 1 S.C.R. 902.
31. *Id.* at para. 97.
32. *Id.* at para. 92 (emphasizing "sowing" and "cultivation").
33. *Id.* at paras. 50, 86.
34. *Id.* at para. 95.
35. *Schmeiser*, [2004] 1 S.C.R. at 902, paras. 98-105.
36. *Id.* at para. 102.
37. *Id.* at paras. 103-05.
38. Harold Richards & Susan Hefle, *Plant Biotechnology and Food Safety Evaluation*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 217, 218 (C. Neal Stewart, Jr. ed., 2003) (referring to the history of genetic modification of plants in the context of biotechnology and food safety).

States today.[39] Improvements in agronomic practices and plant genetics have led to astounding gains in yields since the early 1900s. From 1930 to 2001, corn yields have increased 380%.[40] Studies indicate that approximately half of this yield increase is from increased stress tolerance because of genetic improvements in the plants.[41]

Because a plant's genetics are altered through natural cross-fertilization even when human intervention is not involved, it is important to clarify what is meant by a "genetically modified" plant. Today's meaning of genetically modified plants refers to plants having genes inserted by humans from a donor organism that is not necessarily a plant.[42] The gene that is transferred from the donor organism to the plant is called the transgene.[43]

2. The Rise of Genetically Modified Plants

Genetic engineering entered the field of plant production for many reasons. For one, conventional plant breeding is limited by sexual barriers across species.[44] That is, in conventional plant breeding, genetic modification can only take place between plants that are sexually compatible with each other. Because of this limitation, conventional plant breeding limits the number and kinds of proteins that plant breeders can introduce into plants. In addition, conventional plant breeding requires significant time to develop a new variety before it is ready for commercial production. It takes approximately ten to twelve years on average.[45] Conventional plant breeding requires several generations of backcrossing to obtain the required level of genetic purity for commercial production.[46] Transgenic technology reduces the time to commercial production because a gene with the desired trait is inserted into an already elite genetic line. Thus, fewer backcrosses are required to obtain the required level of genetic purity for commercial production.[47]

Genetic modification has drastically changed U.S. agriculture during the last quarter century. In 1983, tobacco became the first plant to be genetically modified.[48] Since then, the use of genetically modified plants in commercial crop production has skyrocketed in the United States. For example, the use of herbicide-resistant soybeans increased from

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39. *Id.*

40. Matthijs Tollenaar & Elizabeth A. Lee, *Genetic Yield Improvement and Stress Tolerance in Maize*, *in* PHYSIOLOGY AND BIOTECHNOLOGY INTEGRATION FOR PLANT BREEDING 51, 52 (Henry T. Nguyen & Abraham Blum eds., 2004) (discussing the sources of yield improvement in corn since the 1930s where the 380% is based on a calculation from Figure 1 in the article).

41. *Id.* at 51-52, 60.

42. YVES TOURTE, GENETICALLY MODIFIED ORGANISMS—TRANSGENESIS IN PLANTS 2 (2003) (discussing the meaning of "genetically modified organism").

43. *Id.*

44. Vipaporn Phuntumart, *Transgenic Plants for Disease Resistance*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 179, 179 (C. Neal Stewart, Jr. ed., 2003) (discussing genetic alteration to increase disease resistance in plants).

45. TOURTE, *supra* note 42, at 13 (discussing the drawbacks of conventional plant breeding).

46. *See, e.g.*, Rainer Moufang, *Protection for Plant Breeding and Plant Varieties—A Frontier of Patent Law*, 23 INT'L REV. INDUS. PROP. & COPYRIGHT L. 328, 332 n.19 (1992) (referring to a Canadian Supreme Court case where a conventional soybean variety developed by Pioneer Hi-Bred International, Inc. required fifteen years and approximately fifteen generations before it was ready for patenting).

47. *See* TOURTE, *supra* note 42, at 61 (comparing conventional backcrossing to transgenic production).

48. *Id.* at 14 (discussing the history of transgenic plants).

17% of total soybean acreage in 1997 to 68% in 2001.[49] The use of herbicide-resistant cotton increased from 10% to 56% of total cotton acreage during the same period.[50]

3. How Genetic Modification is Transforming Plant Performance

Genes are segments of deoxyribonucleic acid (DNA) that encode proteins.[51] Proteins have a variety of functions in the cells of a plant.[52] A protein's function in another organism might also be useful in a plant. For example, a protein from the bacteria *Bacillus thuringiensis* (Bt) is toxic to certain insects like the European corn borer.[53] If the gene encoding that protein is cloned from Bt and transferred into a plant, the plant also becomes toxic to the insect.[54]

The complete genome sequence of a plant is analogous to the periodic table in chemistry.[55] Scientists have completely sequenced the genomes of two plants—*Arabidopsis* and rice.[56] The ultimate goal of scientists is to learn the function and interaction of all the genes in a plant.[57] With a complete understanding of the function and interaction of genes, plants may in the future be designed and built like machines to perform functions and produce products.

So far, however, genetically modified plants have mainly been used to increase crop yields by producing crops that are more tolerant to stressful environmental conditions.[58] An example of increased stress resistance is resistance to physical factors such as frost, drought, and excess salinity in water.[59] Other examples include resistance to viruses,[60] pathogenic fungi,[61] predatory insects,[62] and herbicides.[63] A specific example of insect

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49. ADRIAN SLATER ET AL., PLANT BIOTECHNOLOGY—THE GENETIC MANIPULATION OF PLANTS 126 (2003) (discussing the environmental impact of herbicide-resistant plants).

50. *Id.*

51. *See* BOB B. BUCHANAN ET AL., BIOCHEMISTRY & MOLECULAR BIOLOGY OF PLANTS 260-61 (2000) (discussing nucleic acids, their composition, and how they are synthesized).

52. *Id.* at 412 (discussing the importance of protein synthesis to the function of the plant cell).

53. TOURTE, *supra* note 42, at 63 (discussing plant resistance to insects and how Bt corn is engineered).

54. *Id.*

55. Prasanta K. Subudhi & Henry T. Nguyen, *Genome Mapping and Genomic Strategies for Crop Improvement*, *in* PHYSIOLOGY AND BIOTECHNOLOGY INTEGRATION FOR PLANT BREEDING 403, 413 (Henry T. Nguyen & Abraham Blum eds., 2004) (discussing genome sequencing as a blueprint of plant life).

56. *Id.* at 414-15; Mentewab Ayalew, *Genomics Using Transgenic Plants*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 265, 266 (C. Neal Stewart, Jr. ed., 2003) (discussing plant transformation technology).

57. Subudhi & Nguyen, *supra* note 55, at 430-31 (discussing future aspirations for the field of plant genomics).

58. Tuan-hua David Ho & Ray Wu, *Genetic Engineering for Enhancing Plant Productivity and Stress Tolerance*, *in* PHYSIOLOGY AND BIOTECHNOLOGY INTEGRATION FOR PLANT BREEDING 489, 490 (Henry T. Nguyen & Abraham Blum eds., 2004) (discussing genetic engineering as a vehicle for increasing stress tolerance in plants).

59. TOURTE, *supra* note 42, at 68 (discussing the development of many types of resistance in transgenic plants to various kinds of predators and physical stresses).

60. *Id.* at 66; Phuntumart, *supra* note 44, at 198 (discussing genetic alteration to increase disease resistance in plants).

61. TOURTE, *supra* note 42, at 64; Phuntumart, *supra* note 44, at 192.

62. TOURTE, *supra* note 42, at 62-63.

63. *Id.* at 61.

resistance is Bt corn.[64] The Bt gene protects corn plants from the European corn borer, an insect that damages corn by tunneling through the stalks and ears of the corn plant, thereby reducing corn yields.[65] Genes conferring herbicide resistance may also be transformed into plants. Glyphosate (commonly known as Roundup) resistant plants are the most common example of herbicide resistant plants. Examples of plants that can be altered for Roundup resistance include "soybean, cotton, alfalfa, canola, flax, tomato, sugar beet, sunflower, potato, tobacco, corn, wheat, rice, and lettuce."[66] Farmers have widely adopted Roundup resistant plants since the Roundup herbicide kills all unwanted weeds but does not affect the plants in the desired crop. As a result, use of Roundup Ready canola in Canada grew from fifty thousand acres in 1996 to almost five million acres in 2000, nearly 40% of the Canadian canola crop.[67]

Besides increasing crop yields, transgenic plants are also being developed for other beneficial uses. Plant genetic engineers are developing transgenic plants to function as producers of industrial polymers,[68] as biosensors to monitor environmental pollution,[69] as soil purifiers to concentrate and remove heavy metals from the soil,[70] as nutritional enhancers,[71] and as vaccine producers.[72] By producing vaccines with transgenic plants, vaccines have the potential to be produced in greater quantities and at lower cost than through conventional production techniques.[73]

Transgenic plants also come with concerns. First, transgenic plants may create new food allergies because of new proteins that they produce.[74] Second, there are concerns about new forms of bacteria becoming antibiotic resistant because of the use of antibiotic resistant genes as markers in transgenic plants.[75] Third, transgenic plants create the possibility of herbicide resistant weeds because of gene transfer from the transgenic crop

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64. *Id.* at 63; *see also supra* notes 53-54 and accompanying text (discussing the Bt protein and why it may be useful to insert a gene from another organism into a plant).

65. SLATER, *supra* note 49, at 138 (discussing genetic modification for insect resistance in plants).

66. Monsanto Canada Inc. v. Schmeiser, [2004] 1 S.C.R. 902, at para. 18.

67. *Id.* at para. 10. Weeds reduce crop yields by stealing water and competing for sunlight with the desired plants.

68. C. Neal Stewart, Jr. & Anil Day, *Introduction: The Future of Transgenic Plants*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 1, 2 (C. Neal Stewart, Jr. ed., 2003) (discussing the future possibilities for transgenic plants).

69. *Id.* at 2.

70. TOURTE, *supra* note 42, at 81 (discussing transgenic plants as a vehicle for environmental management).

71. Stewart & Day, *supra* note 68, at 2 (citing Vitamin A and iron-enriched transgenic rice as an example).

72. James E. Carter III et al., *Plant-Based Vaccines*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 233, 235 (C. Neal Stewart, Jr. ed., 2003) (discussing vaccine production using plants); Field Testing of Plants Engineered to Produce Pharmaceutical and Industrial Compounds, 68 Fed. Reg. 11,337, 11,338 (Animal & Plant Health Inspection Serv., U.S. Dep't of Agric. Mar. 10, 2003) ("In 2002, approximately 130 acres of pharmaceutical producing plants were planted in experimental field tests at 34 sites [in the United States].").

73. Carter III et al., *supra* note 72, at 235 (discussing advantages of using plants for vaccine production).

74. Richards & Hefle, *supra* note 38, at 223 (discussing transgenic plants and food safety).

75. Anil Day, *Antibiotic Resistance Genes in Transgenic Plants: Their Origins, Undesirability and Technologies for Their Elimination From Genetically Modified Crops*, *in* TRANSGENIC PLANTS—CURRENT INNOVATIONS AND FUTURE TRENDS 111, 120-22 (C. Neal Stewart, Jr. ed., 2003) (discussing potential problems of using antibiotic resistant genes as genetic markers in plants).

to the weed, such as when the crop and the weed can cross-pollinate with each other.[76] For example, Roundup Ready canola can hybridize with cabbage, wild radish, or mustard.[77] These plants can then become Roundup resistant weeds in other fields of Roundup Ready canola. However, herbicide resistance is not a new problem. Conventional crops are also sprayed with herbicides in which mutant weeds become resistant to the herbicides over time. The concern with transgenic crops is that weed resistance will occur more quickly and will be more widespread because of the popularity of crops like Roundup Ready canola.

Although many of these safety concerns are valid, it is also likely that many of them are overreactions. For example, "automobiles, airplanes, fluoridated water, [irradiated meat,] microwave ovens, and cell phones [were also] disputed as unsafe" when they were introduced, but are now fully integrated into everyday life.[78] It is important to note that "safe" does not mean risk-free, especially when dealing with sources of food.[79] Food produced from plants is fungible and is susceptible to many different pathogens, regardless of whether the source is a transgenic plant.[80]

C. Understanding the Source of Controversy—The Rise of Intellectual Property Rights in Transgenic Plants

In the United States, the Plant Patent Act of 1930 marked the beginning of intellectual property rights for plants. In 1970, Congress enacted the Plant Variety Protection Act which set up a protection system for plants that was separate from the patent system. Because the Plant Variety Protection Act offered a more limited scope of protection than what the utility patent statutes provided, plant breeders increasingly sought utility patent protection for plants throughout the 1980s and 1990s. In 2001, the U.S. Supreme Court confirmed that plants were eligible subject matter for utility patents.[81]

1. Plant Patent Act of 1930

Before 1930, plants were not patentable because of the general belief that they were products of nature and could not be adequately described to meet patent law's written description requirement.[82] In order to reward "plant breeders and their contributions to

76. *Id.* at 127-28 (discussing potential problems from gene transfer between different plant species); SLATER, *supra* note 49, at 126-28 (discussing the problem of herbicide resistance when the crop cross-pollinates with a "weedy relative").

77. TOURTE, *supra* note 42, at 51 (discussing the stability and dispersal of transgenic plants).

78. Stewart & Day, *supra* note 68, at 6 (discussing overreactions about the hazards of new technologies); Richards & Hefle, *supra* note 38, at 228 (same).

79. Richards & Hefle, *supra* note 38, at 218-19 (discussing what "safe" means in the context of plants and food).

80. *See id.* at 219.

81. J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124 (2001) (holding that plants are patentable subject matter under 35 U.S.C. § 101).

82. *Id.* at 134. In the specification of the patent, the inventor must describe the invention "in such full, clear, concise, and exact terms" so that any person skilled in the art can make and use the invention. 35 U.S.C. § 112 (2004).

agriculture and horticulture," Congress passed the Plant Patent Act (PPA) of 1930.[83] However, the PPA limited patentability to asexually reproduced plants,[84] apparently because of the belief at the time that sexually produced plants could not be reliably reproduced "true-to-type" through seedlings.[85] Thus, the PPA limited patent protection to a plant and its asexually reproduced progeny.[86] Since many of the plant varieties used in commercial agriculture are sexually reproduced, the PPA provided little patent protection for many of the activities of commercial plant breeders.[87]

2. Plant Variety Protection Act of 1970

In 1970, Congress passed the Plant Variety Protection Act (PVPA)[88] "to provide patent-like protection to novel varieties of sexually reproduced plants (i.e., plants grown from seed) parallel to that afforded asexually reproduced plant varieties (varieties reproduced by propagation or grafting) under the PPA."[89] As an independent regime separate from the patent system, the PVPA protects "any sexually reproduced or tuber propagated plant variety (other than fungi or bacteria)" that is "new," "distinct," "uniform," and "stable."[90] Whereas the PPA only extended patent protection to asexually reproduced plants and their offspring, the PVPA expanded intellectual property protection to sexually reproduced plants and their seeds.[91] However, the PVPA provided both a saved-seed exemption and a research exemption.[92] The saved-seed exemption allows a "farmer who legally purchases and plants a protected variety [to] save the seed from these plants for replanting on his own farm."[93]

3. Plants as Eligible Subject Matter for Utility Patents

Because the saved-seed and research exemptions in the PVPA reduce a certificate holder's scope of protection, it is not surprising that plant breeders began seeking utility

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83. Roger A. McEowen, *Legal Issues Related to the Use and Ownership of Genetically Modified Organisms*, 43 WASHBURN L.J. 611, 628 (2004) (discussing the history of the PPA). The PPA is codified at 35 U.S.C. §§ 161-164 (2004).

84. 35 U.S.C. § 161 (2004). "Asexual reproduction occurs by grafting, budding, [cutting, layering, division,] or the like, and produces an offspring with a genetic combination identical to that of the single parent—essentially a clone." *Pioneer*, 534 U.S. at 132. "By contrast, sexual reproduction occurs by seed." *Id.* at 132 n.3.

85. Diamond v. Chakrabarty, 447 U.S. 303, 313 (1980) (examining the history of the PPA); McEowen, *supra* note 83, at 629 n.102 (discussing the asexual limitation in the PPA).

86. McEowen, *supra* note 83, at 629 (discussing the asexual limitation in the PPA); 35 U.S.C. § 161 (2004).

87. McEowen, *supra* note 83, at 629 (discussing the history of the PPA).

88. The PVPA is codified at 7 U.S.C §§ 2321-2582 (2004).

89. McEowen, *supra* note 83, at 630 (discussing the history of the PVPA).

90. 7 U.S.C § 2402(a) (2004).

91. McEowen, *supra* note 83, at 630 & n.110 (discussing the scope of PVPA protection compared to the PPA).

92. J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 140 (2001) (comparing the PVPA to utility patent protection).

93. *Id.*; 7 U.S.C. § 2543 (2004). For a detailed summary of the evolution and scope of the saved-seed exemption, see McEowen, *supra* note 83, at 631-33. Essentially, the saved-seed exemption has been narrowed so that farmers can only save enough seed to plant their own crop for the following year.

patent protection for new plant varieties. In 1980, the U.S. Supreme Court paved the way for utility patent protection of plants. The Court upheld genetically engineered bacteria[94] as patentable subject matter under 35 U.S.C. § 101 since it was a new and useful manufacture or composition of matter.[95]

Five years later, the Board of Patent Appeals and Interferences interpreted *Diamond v. Chakrabarty* as supporting the proposition that plants are patentable life forms under 35 U.S.C. § 101 and upheld claims in a patent application directed at a corn plant.[96] In 2001, the U.S. Supreme Court confirmed that plants are patentable subject matter as "compositions of matter" under 35 U.S.C. § 101.[97] The Court held that the PPA and the PVPA were not the exclusive means for protecting intellectual property in plants.[98] The Court stated that Congress never intended for the PPA and the PVPA to be the exclusive means for protecting plants,[99] and that the PVPA and 35 U.S.C. § 101 could be easily harmonized.[100] Comparing the utility patent statutes to the PVPA, the Court noted that it is more difficult to obtain a utility patent for a plant, compared to a PVP certificate, because of requirements such as nonobviousness that are not present in the PVPA.[101] Thus, because of the heightened requirements for obtaining a patent, "utility patent holders receive greater rights of exclusion than holders of a PVP certificate. Most notably, there are no exemptions for research or saving seed under a utility patent."[102]

D. Formulation of the Issue

Because of the rapid increase in the use and development of transgenic plants over the last twenty years,[103] new issues are arising in patent infringement law. Patented inventions are now capable of transporting themselves (e.g., through pollen drift caused by the wind) and replicating without human intervention. Parts III and IV will analyze how American law should handle *Schmeiser*-type situations, with one caveat. In *Schmeiser*, the court found that Schmeiser knowingly saved and replanted seed having the patented gene and that he could not prove how the Roundup Ready gene entered his crops. Parts III and IV will analyze the issue assuming that the farmer can prove that the patented gene entered the alleged infringing crop through pollen drift.

The analysis of this Note also assumes that the desired policy is to shift the cost of pollen drift from the farmer to the owner of the patented genetics, that is, the patent holder. This assumption about the desired policy for allocating the cost of pollen drift rests on preventing cost externalities. When costs are external, the party who creates the

94. The bacteria at issue were genetically engineered to break down crude oil. Diamond v. Chakrabarty, 447 U.S. 303, 305 (1980).

95. *Id.* at 305, 309-10.

96. *Ex parte* Hibberd, 227 U.S.P.Q. 443, 443-44 (Bd. of Pat. Appeals & Interferences 1985).

97. *Pioneer*, 534 U.S. 124.

98. *Id.* at 145.

99. *Id.* at 132, 138.

100. *Id.* at 138.

101. *Id.* at 142.

102. *Pioneer*, 534 U.S. at 143 (comparing the PVPA to utility patent protection).

103. From the early 1980s until 2001, the U.S. Patent and Trademark Office issued approximately 1800 utility patents for plants. *Id.* at 127.

costs is not the party who pays for them.[104] The patent holder should not be able to let its patented genetics freely spread since the pollen drift generates costs for others (e.g., farmers) who want to avoid passive infringement or who want to preserve genetic purity in their crops. Thus, the patent holder should be forced to internalize the costs related to the spread of its own patented genetics.

III. ANALYSIS

A. The Current State of U.S. Patent Infringement Law with Respect to Plants

Current U.S. patent law would also find Schmeiser liable for patent infringement.[105] Like Canadian law, the United States does not require intent as an element of patent infringement.[106] In other words, under current U.S. patent law, it is irrelevant how the patented subject matter comes into possession of the infringer.[107] Thus, even if Schmeiser could prove that the Roundup Ready canola gene entered his crop through pollen drift, U.S. patent law would still find him liable as an infringer for using Monsanto's patented gene without permission in 1998.

B. Counterclaims to an Infringement Claim if the Alleged Infringer Receives the Patented Plant Matter from Pollen Drift

Several commentators have suggested various claims that the alleged infringer could assert in response to an infringement action. Three of these are nuisance, trespass, and antitrust causes of action. This Part analyzes the weaknesses of these solutions.

1. Nuisance

As prior commentators have suggested, a legal claim based on nuisance[108] would be difficult to prove in the context of pollen drift. Transgenic crops are unlikely to be an unreasonable use of property for two reasons: (1) they are widely used;[109] and (2) many

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104. *See* SHELDON F. KURTZ & HERBERT HOVENKAMP, AMERICAN PROPERTY LAW 784 (4th ed. 2003) (illustrating that if the harmful effects created by a cement plant are not an actionable nuisance, then the cement plant does not include or calculate the injuries imposed on neighboring landowners as costs).

105. "[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a) (2003). By planting, growing, and harvesting Roundup Ready canola in 1998, Schmeiser would have infringed under section 271(a) by "using" Monsanto's patented gene without permission.

106. *See* Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 35 (1997) ("Application of the doctrine of equivalents . . . is akin to determining literal infringement, and neither requires proof of intent.").

107. McEowen, *supra* note 83, at 644 (stating that "the process by which the patented seed arrives on a farmer's land is irrelevant"); *see also* Mark D. Janis & Jay P. Kesan, *Intellectual Property Protection for Plant Innovation: Unresolved Issues After* J.E.M. v. Pioneer, 20 NATURE BIOTECHNOLOGY 1161, 1162 (2002) (stating that infringement can occur regardless of whether the infringer intended to copy the patent or was aware of the patent), *available at* http://papers.ssrn.com/abstract=378820.

108. A private nuisance is a nontrespassory invasion (i.e., a substantial and unreasonable interference) of another's interest in the private use and enjoyment of land. RESTATEMENT (SECOND) OF TORTS §§ 821D, 822 (1979).

109. *See, e.g.*, *supra* Part II.B.2 (noting the increase in the use of herbicide-resistant soybeans and cotton).

states have right-to-farm laws.[110] In addition, if multiple transgenic crops are grown by different farmers around the alleged infringer's field, it may be difficult to prove the source of the nuisance.[111]

If the desired legal policy is to place the costs of pollen drift on the patent holder, then the nuisance cause of action also has other shortcomings. It does not give the alleged infringer a defense to the infringement action, nor is it a cause of action against the patent holder. Rather, nuisance is a claim against the neighboring farmer that grows the patented crop, who is unlikely to be the patent holder.[112] Also, it is an after-the-fact solution, that is, after the cross-pollination has occurred and the resulting change in the plants' genetics cannot be reversed.[113] Furthermore, the neighboring farmer will likely only prevent the nuisance if the risk associated with possible nuisance liability exceeds the cost of preventing the pollen drift.[114]

2. *Trespass*

A trespass cause of action has many of the same shortcomings as the nuisance cause of action. Like nuisance, proving the source of the trespass may be difficult, and the trespasser will likely only try to prevent the trespass if the risk of possible trespass liability is greater than the cost of trying to prevent the pollen drift.[115] In addition, trespass is not a defense against the infringement, it is not a cause of action against the patent holder, and it is an after-the-fact solution.[116] Furthermore, the neighbor could possibly countersue for trespass if the cross-pollination occurred in both directions.[117]

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110. Jane Matthews Glenn, *Footloose: Civil Responsibility for GMO Gene Wandering in Canada*, 43 WASHBURN L.J. 547, 556 (2004) (discussing right-to-farm laws); McEowen, *supra* note 83, at 623-24 (discussing right-to-farm laws and noting that widespread use of transgenic crops makes them less likely an unreasonable use of property).

111. Matthews Glenn, *supra* note 110, at 555-56 (discussing the problem of proving causation when there are multiple tortfeasors). For example, assume Schmeiser was able to prove that the Roundup Ready gene entered his canola through pollen drift. Under the nuisance cause of action, he would have to prove which of the five neighboring farmers who grew Roundup Ready canola caused the cross-pollination. *See* RESTATEMENT (SECOND) OF TORTS § 822 (1979) ("One is subject to liability for a private nuisance if, but only if, his conduct is [the] legal cause . . . ."). Of course, proving the source becomes easier if the surrounding crops are comprised of different transgenic crops, e.g., if only one of the five neighboring farmers grew Roundup Ready canola while the other four grew canola that was resistant to a different herbicide. The problem of proving the source does not exist for the patent holder who is suing for infringement because the cause of the infringement is irrelevant under current patent law. *See supra* Part III.A (discussing that under U.S. patent law the way in which infringement occurs is essentially irrelevant).

112. *See* Matthews Glenn, *supra* note 110, at 554-55 (discussing nuisance as an action against the neighboring farmer). Because of the time, costs, and hard feelings that litigation may produce, the alleged infringing farmer may not want to sue his neighbor, especially in farming communities where neighbors may have relationships spanning several decades. Furthermore, since the cross-pollination would likely occur in both directions, the neighbor could possibly countersue for nuisance. *See also infra* Part III.B.2 (discussing the same problem with a trespass cause of action).

113. This is especially true with organic farming where it may take years to regain organic certification.

114. *See infra* Part IV.C (applying the Coase theorem to predict the neighboring farmer's behavior when legal liability and the likelihood of pollen drift are varied).

115. *See infra* Part IV.C (asserting that the neighboring farmer's behavior is affected by the likelihood of pollen drift).

116. *See supra* Part III.B.1 (discussing these problems in the context of nuisance).

117. *See* McEowen, *supra* note 83, at 619 n.42 (stating that a conventional or organic farmer could be

3. Monopolization

A patent does not give the patent holder the ability to violate antitrust laws, but antitrust laws do not prohibit the patent holder from asserting its patented monopoly.[118] There are two scenarios, however, when a patent infringement suit could give rise to an antitrust claim of monopolization.[119] The first scenario occurs when the patent holder tries to enforce a patent that was obtained by knowing and willful fraud on the Patent and Trademark Office (PTO).[120] Even if fraud by the patent holder is established, the plaintiff must also prove all of the other elements of a monopolization claim under section 2 of the Sherman Act, including market power in the relevant market.[121]

The second scenario for a Sherman Act monopolization claim occurs when the patent infringement suit is nothing more than "sham" litigation, that is, an "attempt to

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countersued for trespass by a farmer of genetically modified crops if the conventional or organic farmer's pollen drifts onto the genetically modified crop). However, there is no reason why one farmer needs to be a conventional or organic farmer. The suit could go both ways if the crops that cross-pollinate are both patented transgenic crops. For example, if Farmer *A* grows patented Roundup Ready corn while Farmer *B* grows patented Bt corn in which cross-pollination occurs, they could potentially both sue each other for trespass. However, success of these actions turns on proving actual damage. *Id.* at 620 n.51; *see also id.* at 622, 622 n.63, 626-27 & nn.86-91 (discussing the "economic loss doctrine" in torts where solely economic injuries are not recoverable, only physical injuries are).

118. *In re* Indep. Serv. Org. Antitrust Litig., 203 F.3d 1322, 1325 (Fed. Cir. 2000) (stating that, generally, patent holders have the right to exclude others from their patented property).

119. Section 2 of the Sherman Act provides the statutory basis for an antitrust claim of monopolization or attempt to monopolize:

> Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine . . . .

15 U.S.C. § 2 (2003). Because the text of the statute is so vague, courts have fashioned a two-part test for monopolization.

> The offense of monopoly under § 2 of the Sherman Act has two elements: (1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power [e.g., through anticompetitive acts] as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident.

United States v. Grinnell Corp., 384 U.S. 563, 570-71 (1966).

120. Walker Process Equip., Inc. v. Food Mach. and Chem. Corp., 382 U.S. 172, 174 (1965); *id.* at 177 (narrowly defining fraud in this context to "knowingly and willfully misrepresenting facts to the [PTO]," and stating that good faith and honest mistakes would not be fraud under the narrow definition used). In *Walker Process*, the patent holder committed fraud on the PTO by representing that its invention had not been "in public use in the United States for more than one year prior to filing its patent application when, in fact, [the patent holder] was a party to prior use within such time." *Id.* at 174. Thus, the invention should have been ineligible for a patent under the one-year public use bar. 35 U.S.C. § 102(b) (2002).

121. *Walker Process*, 382 U.S. at 174, 177-78 (stating that the relevant market is not necessarily defined by the patent—it depends on whether there are other effective substitutes for the patented product); *see also In re Indep. Serv. Org. Antitrust Litig.*, 203 F.3d at 1326 ("A patent alone does not demonstrate market power."). For example, if Schmeiser sued Monsanto for monopolization, the relevant product market probably would not be limited to Roundup Ready canola. Rather, it would include all available varieties of canola seed. *See, e.g.*, Monsanto Co. v. McFarling, 302 F.3d 1291, 1298 (Fed. Cir. 2002) (recognizing that there are over "two hundred commercial sources of soybean seed, including several herbicide-resistant [varieties]" and implying that the relevant market would include all of them).

interfere directly with the business relationships of a competitor."[122] To determine whether the litigation is a "sham," the suit must be objectively baseless[123] and subjectively motivated "by a desire to impose collateral, anti-competitive injury rather than to obtain a justifiable legal remedy."[124] A court reaches the subjective motivation prong only if the objectively baseless prong is met first.[125] If the alleged infringer proves the litigation is a sham, the alleged infringer still must prove all the other elements of an antitrust monopolization claim, including market power and that the sham litigation was used to maintain or acquire a monopoly.[126]

In the context of patent infringement suits, one example of sham litigation is when the patent holder knows that the asserted patent is invalid and unenforceable, but sues for infringement anyway.[127] Because the patent holder did not commit a fraud on the Patent and Trademark Office, this type of sham litigation is distinguished from *Walker Process*.[128] In other words, even though the patent holder knows the patent is currently invalid, it was lawfully obtained from the Patent and Trademark Office.[129] Another possible example of sham litigation occurs when the alleged infringer is clearly not infringing.[130]

In a case where the alleged infringer comes into possession of the patented plant matter because of pollen drift, a monopolization claim is likely to fail as long as the patent holder's patent is valid.[131] A monopolization claim under *Walker Process* would fail because, if the patent is valid and was not obtained through fraud on the PTO, there is no actionable antitrust violation solely for the patent infringement suit. Likewise, a monopolization claim alleging sham litigation would also fail as long as the patent is valid because the patent holder has an objective basis for pursuing the infringement suit. The alleged infringer cannot satisfy the "clearly not infringing" prong of a sham litigation

122. Prof'l Real Estate Investors, Inc. v. Columbia Pictures Indus., 508 U.S. 49, 56 (1993) (quoting E. R.R. Presidents Conference v. Noerr Motor Freight, Inc., 365 U.S. 127, 144 (1961)); *see also In re Indep. Serv. Org. Antitrust Litig.*, 203 F.3d at 1326 (summarizing the "sham" exception to antitrust immunity in the context of patent infringement).

123. "Objectively baseless" means "no reasonable litigant could realistically expect success on the merits." *Prof'l Real Estate Investors*, 508 U.S. at 60.

124. Nobelpharma AB v. Implant Innovations, Inc., 141 F.3d 1059, 1071 (Fed. Cir. 1998); *see also In re Indep. Serv. Org. Antitrust Litig.*, 203 F.3d at 1326 (citing *Nobelpharma*).

125. *Prof'l Real Estate Investors*, 508 U.S. at 60.

126. *See id.* at 61 (stating that proof of a sham does not relieve the obligation to establish all other elements of the antitrust claim).

127. Handgards, Inc. v. Ethicon, Inc., 601 F.2d 986, 990 (9th Cir. 1979) (stating that ill-founded, bad faith patent infringement actions can constitute an antitrust violation if the other elements of a Sherman Act monopolization claim are present); *id.* at 990-91 (giving examples of bad faith patent infringement actions); *see also id.* at 996 (stating that bad faith must be proved by clear and convincing evidence).

128. *See supra* note 120 (discussing *Walker Process* and its narrow definition of what constitutes a fraud on the PTO).

129. *Handgards*, 601 F.2d at 994.

130. E. THOMAS SULLIVAN & HERBERT HOVENKAMP, ANTITRUST LAW, POLICY AND PROCEDURE: CASES, MATERIALS, PROBLEMS 1021 (5th ed. 2003) (stating that when "the infringement defendant is clearly not infringing" the infringement suit may be objectively baseless even though the patent is valid).

131. *See, e.g.*, Monsanto Co. v. Trantham, 156 F. Supp. 2d 855, 861-65 (W.D. Tenn. 2001) (holding Monsanto not liable for monopolization or attempting to monopolize because it did not have market power in the relevant soybean seed market and enforcing its patent on Roundup Ready soybean did not constitute anticompetitive conduct under section 2 of the Sherman Act).

claim if the alleged infringer possesses the patented plant matter, even though pollen drift caused the infringement. As a result, it appears that the recipient of pollen drift has a weak antitrust claim as long as the patent is valid.[132] Therefore, if the desired policy is to impose the costs of pollen drift onto the patent holder, antitrust law is a poor mechanism for achieving this goal.[133]

C. Legislative Actions

This Section describes two possible legislative solutions. A legislative solution would possibly save farmers the time, expense, and stress of defending infringement lawsuits that are caused by pollen drift. A legislative solution would also relieve the courts from formulating a judicial solution.

1. Carve an Exception into the Infringement Statute—Require an Element of Intent?

One proposed solution is for the law to require an element of intent in the patent infringement action. One rationale for adding an element of intent is that biological inventions, such as patented plants, are able to reproduce and spread without human intervention.[134] Requiring an element of intent would therefore separate innocent bystanders from true infringers.

In the abstract, requiring intent appears to resolve the problem of finding innocent bystanders liable for infringement from pollen drift. As a practical matter, however, applying an element of intent in patent infringement law is difficult.[135] Requiring intent for some kinds of infringement but not others would also present problems of classification and line drawing. For example, when transgenic plants are used to produce pharmaceutical products, should they be classified as plants (intent required) or drugs (no intent required)? Furthermore, crops are often only divided by a fence row and sometimes are only divided by a visual boundary (e.g., a visual line between two fence posts). In this context, it may be difficult to determine when a farmer is intentionally planting next to the patented crop in order to illegally obtain the patented plant genetics (i.e., free riding) or is just trying to efficiently utilize all of his land for crop production. Requiring intent would essentially indemnify infringers who passively receive pollen drift. Part IV shows that indemnification may not fulfill the policy goal of allocating the cost of pollen drift onto the patent holder. Thus, adding intent as an element of patent infringement may not fulfill this goal either.

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132. If the alleged infringer can prove that the patent is invalid, this is a defense to the infringement suit as well as a basis for the monopolization claim.

133. *See infra* Part IV.C (using the Coase theorem to predict the patent holder's behavior when legal liability and the likelihood of pollen drift are varied).

134. Brad Sherman, *Biological Inventions and the Problem of Passive Infringement*, 13 AUSTRALIAN INTELL. PROP. J. 146, 150 (2002) (generally advocating that intent should be relevant when passive infringement can occur from biological inventions).

135. *See, e.g.*, Janis & Kesan, *supra* note 107, at 1162 (stating that intent is difficult to prove and costly to adjudicate); Michael N. Rader, *Toward a Coherent Law of Inducement to Infringe: Why the Federal Circuit Should Adopt the* Hewlett-Packard *Standard for Intent Under § 271(B)*, 10 FED. CIRCUIT B.J. 299 (2000) (discussing the Federal Circuit's difficulty with formulating a test for intent in the context of inducement to infringe under 35 U.S.C. § 271(b)).

2. *Indemnifying Legislation*

A similar alternative to requiring intent is for Congress to enact legislation that would effectively exempt farmers from infringement liability if they can prove that the infringement was caused by passive behavior such as pollen drift. A few states have enacted similar legislation.[136] The state statutes are directed at the terms of the seed contract between the farmer and the seller of seed, rather than legal liability for patent infringement. The state statutes are carefully worded because any state law interfering with substantive federal patent law would probably be invalid on its face.[137] Although indemnifying legislation may look like the most equitable solution for the farmer at first glance, it may not shift the cost of pollen drift from the farmer to the patent holder. Using Coase's social cost approach, Part IV analyzes whether indemnifying the farmer from infringement liability is the appropriate way to allocate the cost of pollen drift.

IV. RECOMMENDATION

A. *Using a Coase Approach*

Coase showed that two parties, in a world with no transaction costs, will bargain to a solution that maximizes total economic production, regardless of how legal liability is allocated.[138] Thus, in a world with no transaction costs, legal liability for pollen drift would not matter because the two parties would bargain to the same solution regardless of how legal liability is arranged.[139] When transaction costs are taken into account, however, the parties will only bargain to a more efficient solution if the increase in the value of production from the bargain is greater than the cost of negotiating the bargain.[140] Because courts and legislatures affect transaction costs by allocating legal

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136. *See, e.g.*, IND. CODE ANN. § 15-4-14-11 (West 2004).

> If: (1) a product in which the seed supplier has rights is possessed by the farmer or found on real property owned or occupied by the farmer; and (2) the presence of the product is de minimus or not intended by the farmer; the farmer is not liable for breach of the seed contract.

Id. One Federal Circuit judge has even advocated that inventions which can spread themselves should be unpatentable because they violate patent law's public notice requirement. Smithkline Beecham Corp. v. Apotex Corp., 365 F.3d 1306, 1331 (Fed. Cir. 2004) (Gajarsa, J., concurring) ("Because products . . . that can be 'made' through a natural process of spontaneous conversion imply inevitable infringement, no combination of claim language and written description could possibly teach even one skilled in the art how to avoid infringement."). This may be an extreme position for plants because, as analyzed in Part IV, pollen drift may be controllable if costs are allocated so that there is adequate incentive to prevent it. Furthermore, because the possibilities of genetic engineering appear to be limitless, pollen drift problems may be eliminated in the future as the science progresses.

137. Janis & Kesan, *supra* note 107, at 1164 (noting that states generally lack authority to interfere with federal intellectual property laws).

138. R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 15 (1960); *see also id.* at 8.

139. *See id.* at 2-8 (illustrating the scenario of the crop farmer and the cattle raiser, whose cattle cause damage to the crop farmer, and showing that the result that maximizes economic production is independent of legal liability when there are no transaction costs).

140. *Id.* at 15-16.

> When [the increase in the value of production] is less [than the transaction costs], the granting of an injunction (or the knowledge that it would be granted) or the liability to pay damages may

rights, Coase advocates that lawmakers should consider economic consequences when arranging legal rights so that, to the extent possible, parties can still bargain to the most efficient solution, or close to it.[141] This Part will analyze the problem of pollen drift and patent infringement liability using Coase's approach[142] and question whether changing patent infringement liability is the proper mechanism for allocating the cost of pollen drift.

B. A Hypothetical Scenario for Analysis

Suppose that Farmer *A* and Farmer *B* plant crops of the same species (e.g., both canola or both corn) in separate rectangular fields that border each other.[143] Suppose further that Farmer *A* plants a transgenic, patented crop (Crop *A*) while Farmer *B* plants Crop *B* with the intent to save a portion of his seed from Crop *B* for planting the following year.[144] Part IV.C uses this hypothetical situation as a framework for analysis.

C. Applying the Coase Approach

1. The First Situation: Predicted Behavior under Current Patent Law

In the first situation, suppose that if pollen drift occurs from Crop *A* to Crop *B*, current law would make Farmer *B* liable for patent infringement.[145] How would Farmer *A*, Farmer *B*, and the patent holder of Crop *A* behave if legal liability is allocated in this way? Farmer *A*'s behavior probably will not change because he is already using patented Crop *A* on his land. He may stop planting patented Crop *A* if he fears a nuisance, trespass, or other tort suit from Farmer *B*. However, Farmer *A* will only stop planting patented Crop *A* if he believes that his risk of legal liability[146] to Farmer *B* is greater than his economic gain from using patented Crop *A*.

Farmer *B* will likely behave in one of two ways. First, he may take the chance of receiving pollen drift from Crop *A*. If pollen drift does occur, Farmer *B* will either pay the appropriate royalty fee to the patent holder of Crop *A* so that he can save the seed, or Farmer *B* will refuse to pay the royalty. If Farmer *B* takes the latter action, he will not be

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> result in an activity being discontinued (or may prevent its being started) which would be undertaken if market transactions were costless.

Id. at 16.

141. *See* Coase, *supra* note 138, at 19 (suggesting that lawmakers should be aware of the economic consequences of their decisions); *see also id.* at 27 ("In a world in which there are costs of rearranging the rights established by the legal system, the courts, in cases relating to nuisance, are in effect, making a decision on the economic problem and determining how resources are to be employed.").

142. "A[n] [appropriate] approach would seem to be to start our analysis with a situation approximating that which actually exists, to examine the effects of a proposed policy change and to attempt to decide whether the new situation would be, in total, better or worse than the original one." *Id.* at 43.

143. Thus, Crops *A* and *B* have one side adjacent to each other.

144. Farmer *B*'s crop could either be a conventional, non-patented crop; a patented crop in which Farmer *B* has obtained a license to save the seed for the following year; or an organic crop. For purposes of this analysis, any of these will work as long as Farmer *B*'s crop is not the same patented crop that Farmer *A* is growing.

145. *See supra* Part III.A (discussing current U.S. patent infringement law).

146. Farmer *A*'s risk of legal liability to Farmer *B* depends on the likelihood of pollen drift occurring and the probability of success of Farmer *B*'s lawsuit against Farmer *A*.

able to legally save the seed and will have to purchase new seed for the following year.[147] Second, Farmer *B* may employ preventative measures to avoid receiving pollen drift from Crop *A*. Such measures could include using a buffer between Crops *A* and *B* that either increases the separation distance or creates a barrier between Crops *A* and *B*, either of which would decrease the risk of pollen drift.[148] An alternative preventative measure is that Farmer *B* could plant an entirely different crop from Farmer *A* so that cross-pollination is sexually impossible. Farmer *B* could also pay Farmer *A* to take preventative measures such as paying Farmer *A* to plant a different crop. The use of any preventative measures depends on whether Farmer *B* believes their benefit (i.e., reduction in risk by preventing the likelihood of pollen drift) outweighs their cost.

At first glance, the patent holder's behavior is unlikely to change since the arrangement of legal rights does not force the patent holder to prevent the pollen drift. However, this may not be the case. If the risk of tort liability is great enough for Farmer *A*, then Farmer *A* may not purchase the patented seed which means the patent holder would lose royalty fees. Therefore, the patent holder would be motivated to reduce pollen drift. Second, the transaction costs for the patent holder of pursuing all possible infringers, such as Farmer *B*, may be higher than the cost of preventing the pollen drift. For example, if U.S. courts award no damages in these types of infringement lawsuits, similar to the Canadian Supreme Court result in *Schmeiser*,[149] then the patent holder's transaction costs of pursuing Farmer *B* for infringement will be higher than their net benefit.[150] If this is true, then the patent holder will pursue pollen drift prevention even though Farmer *B* is liable for infringement.

2. The Second Situation: Predicted Behavior if Farmer B is Not Liable for Infringement

Now suppose that patent law is changed so that, if pollen drift from Crop *A* to Crop *B* occurs, Farmer *B* is not liable for infringement, that is, he is exempt from paying royalties to the patent holder. How would Farmer *A*, Farmer *B*, and the patent holder behave under this arrangement of legal rights? Farmer *A*'s behavior is unlikely to change, unless he still fears a nuisance, trespass, or similar tort suit from Farmer *B*.[151] Farmer *A* may also stop buying the patented seed from the patent holder if he can try to free ride off of another neighbor.[152]

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147. This outcome would be similar to the outcome in *Monsanto Canada Inc. v. Schmeiser*. Monsanto Canada Inc. v. Schmeiser, [2004] 1 S.C.R. 902 (Can.); *see supra* Part II.A (fully discussing this case).

148. Examples of buffers could include planting a dense grove of trees between the two fields that would serve as a barrier, or planting a different type of crop between Crops *A* and *B* that would serve to increase the separation distance between the two.

149. *Schmeiser*, [2004] 1 S.C.R. at 902; *see supra* Part II.A (fully discussing this case).

150. This may be especially true as the patent holder's market share increases up to a certain point, for example, as Monsanto's market share of Roundup Ready canola increases, the amount of Roundup Ready canola bordering other canola will keep increasing, thereby increasing the number of possible infringers from cross-pollination. At some point, a large and increasing market share would mean that the number of possible infringers has to start decreasing since Roundup Ready canola would be bordering itself.

151. Farmer *A* may still fear a lawsuit under this scenario for the following reason: if Farmer *B* is trying to grow a certified organic crop or some other specialty crop where its value depends on genetic purity, then Farmer *B* may still want to avoid possible pollen drift even though he does not have any risk for infringement liability.

152. In this situation, Farmer *A* could free ride if he has another neighbor growing the patented crop and he

Farmer *B* will either take the risk of getting pollen drift from Crop *A*, or Farmer *B* will still try to prevent the pollen drift if he does not want the genetics from Crop *A* in his seed. Farmer *B* will follow the first option if the damage caused by the pollen drift is less than the cost of preventing it,[153] or if he is indifferent about receiving the genetics from Crop *A*. Furthermore, if Farmer *B* is indifferent about receiving pollen drift from Crop *A*, he may get the benefits of being a free rider if the genetics from Crop *A* that enter his seed improve his economic production the following year.

The patent holder may be motivated to prevent pollen drift so that Farmer *B* cannot try to free ride. However, the patent holder may not have to pay for the cost of preventing the pollen drift. The patent holder, in its license agreement, could impose the cost of preventing pollen drift onto Farmer *A* by requiring him to use preventative measures. Furthermore, if the patent holder thinks the likelihood and amount of pollen drift will be minimal or does not care if there may be some free riders, then the patent holder may not try to prevent the pollen drift, especially if the cost of preventing the pollen drift is greater than its expected benefit.

3. Comparing the Two Situations—Which Legal Arrangement Maximizes Economic Production?

As Coase states, the particular legal arrangement that is most desirable "depends on the particular circumstances."[154] In this hypothetical scenario involving pollen drift, the "particular circumstance" is the likelihood and amount of pollen drift that will occur. Because there are so many variables that affect the likelihood and amount of pollen drift, a range of possibilities must be considered.[155]

a. No Likelihood of Pollen Drift

If there is no likelihood of pollen drift, then the difference in legal liability between the two situations does not matter. Neither Farmer *A*, Farmer *B*, nor the patent holder has to account for the cost of pollen drift when making economic decisions. Thus, changing infringement liability becomes a non-issue.

b. Small Likelihood of Pollen Drift

If there is a small likelihood of a small amount of pollen drift,[156] then again, the

thinks that he could acquire the patented genetics for free from advantageous pollen drift.

153. In the situation where the damage caused by the pollen drift is less than the cost of preventing it, then Farmer *B* is likely to take the chance of receiving unwanted pollen drift. If pollen drift occurs, then he will likely purchase new seed for the following year instead of saving some from the current crop.

154. Coase, *supra* note 138, at 34.

155. Some physical factors that influence pollen drift include "gravity, wind speed and direction, turbulence, air density, and air viscosity." V.S. Luna et al., *Maize Pollen Longevity and Distance Isolation Requirements for Effective Pollen Control*, 41 CROP SCI. 1551, 1552 (2001) (discussing pollen longevity and isolation distances for effective pollen control in corn). "Biological parameters that influence the effect of [the physical] factors include pollen density, pollen radius, and sedimentation velocity." *Id.* Note that pollen drift is only a problem when sexually compatible crops are planted within the range that pollen can physically drift.

156. Self-pollinated crops such as soybeans, wheat, cotton, barley, rice, oats, tobacco, and sorghum would likely fit in this category since it is rare for a self-pollinated plant to pollinate other plants that are more than a few feet away. *See* COOP. EXTENSION SERV., N.C. STATE UNIV., PUB. NO. AG-448, SEED AND SEED QUALITY 4

difference between the two legal arrangements is unlikely to change either Farmer *A*'s or Farmer *B*'s behavior. Since the likelihood of pollen drift is very low, Farmer *A* is unlikely to consider the risk of a tort suit from Farmer *B* as being high enough to warrant using preventative measures or not planting patented Crop *A*. As for Farmer *B*, even if he is open to infringement liability, the cost of pollen drift prevention is probably more than the cost associated with the small risk of pollen drift. Thus, Farmer *B* is unlikely to change his behavior even when he faces a small risk of infringement liability.[157] Granted, there could be cases where the patent holder files an infringement suit against Farmer *B* for the purpose of deterring other possible infringers.[158] For Farmer *B*, this suit could be expensive enough that it could drive him out of business. Fearing the cost of a similar lawsuit, other farmers like Farmer *B* may change their behavior to avoid any possibility of pollen drift if they think the cost is less than the risk of a rare, catastrophic infringement suit. However, assuming that the patent holder does not want to create bad will with its potential customers, this risk should be low.

As for the patent holder, it probably will not pursue the cost of preventing a small chance of pollen drift, even if Farmer *B* is not liable for infringement. Since the likelihood of pollen drift is very low, Farmer *B* has a very low probability of successfully free riding. Thus, the cost of pollen drift prevention is probably greater than its benefit for the patent holder. Furthermore, as discussed in Part IV.C.2, even if the patent holder is sufficiently concerned about Farmer *B* free riding, the patent holder still may not incur the cost of pollen drift prevention. The patent holder could pass on this cost to Farmer *A* through its license agreement with Farmer *A*.

c. High Likelihood of Pollen Drift

Suppose the likelihood is high that a large amount of pollen drift will occur,[159] and that Farmer *B* is liable for infringement. Farmer *B* may take preventative measures to avoid the pollen drift if their benefit outweighs their cost.[160] Or, Farmer *B* may switch to

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(1991) (discussing differences between self-pollinated and cross-pollinated plants), *available at* http://www.ces.ncsu.edu/depts/hort/consumer/agpubs/ag-448.pdf (on file with the author); PAT BYRNE ET AL., COLO. STATE UNIV., TRANSGENIC CROPS: AN INTRODUCTION AND RESOURCE GUIDE, http://www.colostate.edu/programs/lifesciences/TransgenicCrops/croptoweed.html (last visited Mar. 5, 2006) (listing pollination modes for several different crop species).

157. In reality, this risk is further minimized by the difficulty for the patent holder of detecting a de minimus amount of its patented genetics in Farmer *B*'s crop.

158. However, if Farmer *B* is clearly not infringing, the patent holder could be liable for patent misuse, antitrust violations, malicious prosecution, or some other tort. *See supra* Part III.B.3 (discussing possible antitrust violation when alleged infringer is clearly not infringing).

159. Very few crops appear to fall within this category. Cross-pollinated crops such as corn are the most likely to exhibit pollen drift. Various studies have tried to measure corn pollen drift with reported maximum distances ranging anywhere from less than 300 feet to more than 1650 feet. *See, e.g.*, H.J. Hodgson, *Flowering Habits and Pollen Dispersal in Pensacola Bahia Grass, Paspalum Notatum, Flugge*, 41 AGRON. J. 337, 339 (1949) (reporting less than 300 feet); MELVIN D. JONES & JAMES S. BROOKS, OKLA. AGRIC. EXPERIMENT STATION TECHNICAL BULL. NO. 38, EFFECTIVENESS OF DISTANCE AND BORDER ROWS IN PREVENTING OUTCROSSING IN CORN 11, 14-17 (1950) (reporting more than 1650 feet). One problem with most of these studies is that they did not measure important weather conditions such as wind speed, wind direction, relative humidity, and temperature during the pollination period, all of which influence dispersal distance and longevity of the pollen. *See supra* note 155 (discussing the factors that affect pollen drift and pollen longevity).

160. *See supra* Part IV.C.1 (discussing possible preventative measures). One such preventative measure

planting patented Crop *A* in order to avoid any possibility of infringement liability. As for the patent holder, it probably will not pursue pollen drift prevention unless the transaction costs of pursuing Farmer *B* for infringement are greater than the cost of pollen drift prevention, or the risk of tort liability for Farmer *A* is sufficiently great that he threatens to stop purchasing Crop *A*.[161]

Now suppose the likelihood and amount of pollen drift is high, but Farmer *B* is exempt from infringement. Farmer *B* will not take preventative measures if he is indifferent about receiving the pollen from Crop *A*. However, if genetic purity is sufficiently important to the value of Farmer *B*'s crop, then Farmer *B* may still pay the cost of avoiding the pollen drift even though he does not have any risk of infringement liability.

Even though Farmer *B* is exempt from infringement liability, this rearrangement of legal rights, by itself, does not force the patent holder to prevent the pollen drift. The patent holder will only pay the cost of preventing the pollen drift if the risk of free riding by Farmer *B* is great enough to justify the cost of pollen drift prevention. Furthermore, the patent holder, through its license agreement, could try to pass on the cost of preventing pollen drift to Farmer *A* by requiring him to use preventative measures. Also, if the patent holder knows that genetic purity is important enough to Farmer *B* and that Farmer *B* is willing to take unilateral action to prevent the pollen drift, then the patent holder does not need to take action.

D. Overall Observations and Recommendation

As the analysis shows, even when Farmer *B* is exempt from infringement liability and there is a high likelihood of pollen drift, the patent holder still may escape the costs of pollen drift. As Part IV.C shows, the patent holder may be able to divert the cost of preventing pollen drift onto Farmer *A* or Farmer *B*. Therefore, exempting Farmer *B* from infringement liability is not the most effective way to impose the cost of pollen drift onto the patent holder.

Based on this analysis, legal mechanisms other than patent law should be used to impose the cost of pollen drift. Perhaps a better alternative is government regulation through administrative agencies. For example, the Animal and Plant Health Inspection Service (APHIS), an agency of the United States Department of Agriculture, has the authority to regulate plants which includes setting separation distances for industrial and pharmaceutical crops.[162] If pollen drift is a problem for crops other than industrials and

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would include a tort suit by Farmer *B* against Farmer *A*. If Farmer *B* is likely to win a tort suit against Farmer *A*, then Farmer *A* would switch to a different crop in order to avoid tort liability and Farmer *B* would prevent the pollen drift.

161. *See supra* Part IV.C.1 (discussing these points).

162. *See, e.g.*, Field Testing of Plants Engineered to Produce Pharmaceutical and Industrial Compounds, 68 Fed. Reg. 11337, 11337-38 (Animal & Plant Health Inspection Serv., U.S. Dep't of Agric. Mar. 10, 2003) [hereinafter Field Testing of Plants] (proposing separation distances for pharmaceutical and industrial crops, including a one-mile isolation distance for open-pollinated pharmaceutical corn). Mandatory separation distances impose the costs of pollen drift by requiring enough distance between the crop in question and the nearest field so that pollen drift is physically impossible or is at least within acceptable levels.

The Plant Protection Act, 7 U.S.C. §§ 7701-7772 (2004), allows the Secretary of Agriculture to:

> prohibit or restrict the importation, entry, exportation, or movement in interstate commerce of any

biopharmaceuticals, then regulatory agencies such as APHIS are better equipped than patent law to measure the likelihood of pollen drift and to impose appropriate restrictions.[163] More specifically, regulatory agencies are in a better position than courts to collect data and assess the risks of pollen drift such as the likelihood of it occurring and the damage it would cause. Based on this ability to collect data and quantify risks, regulatory agencies can appropriately tailor regulations for the risks involved. Some crops may pose no pollen drift risk and therefore would not need any restrictions on separation distance. Other crops may pose a high likelihood of large amounts of pollen drift which would warrant greater separation distances, restrictions on planting locations, or other restrictions that would prevent the problems caused by cross-pollination. Thus, a regulatory agency is better positioned to make factual findings, perform risk assessments, and impose less restrictive solutions compared to granting a broad indemnification under patent law and having courts enforce it.[164]

V. CONCLUSION

The thought that a farmer could be liable for patent infringement by receiving pollen drift seems inequitable. Other commentators have suggested several solutions for the farmer who is a passive infringer. These solutions include nuisance and trespass claims against the neighboring farmer, or antitrust counterclaims against the patent holder. As Part III highlighted, all of these solutions have shortcomings. Another possible solution is legislation that indemnifies the passive infringer. However, assuming that imposing the cost of pollen drift onto the patent holder is the desired legal policy, Part IV shows that exempting the farmer from patent infringement liability still may not fulfill this goal. Furthermore, adding a "farmer's exemption" to infringement liability would add a layer of complexity to patent law that is probably not needed. Other government agencies are in a better position to evaluate the risks of pollen drift and to impose appropriate restrictions if pollen drift is a problem that needs to be addressed using government intervention.

> plant, plant product, biological control organism, noxious weed, article, or means of conveyance, if the Secretary determines that the prohibition or restriction is necessary to prevent . . . the dissemination of a plant pest or noxious weed within the United States.

Id. § 7712(a).

163. *See* Field Testing of Plants, *supra* note 162.

> The APHIS Biotechnology Permitting Program is a flexible system that allows the Agency to tailor permit conditions to address new information, technical innovations, and experience gained from compliance monitoring, as well as feedback from the public. This flexibility enables the Agency to address new advances in science that affect current and future uses of the technology with genetically engineered plants.

Id. at 11338.

164. A patent law solution is also underinclusive since not all crops that cause pollen drift problems will be patented.