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An Agricultural Law Research Article

**The Terminator Gene: Intellectual Property Rights vs.
the Farmers' Common Law Right to Save Seed**

by

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THE TERMINATOR GENE: INTELLECTUAL PROPERTY RIGHTS VS. THE FARMERS' COMMON LAW RIGHT TO SAVE SEED

Samantha M. Ohlgart

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I. INTRODUCTION

Genetically Modified (“GM”) seeds have become a very important part of American farming. By genetically altering seeds farmers are able to increase yields, reduce pesticide use, and reduce labor costs.¹ Corporations have made a substantial investment in researching and developing these seeds. To protect this investment they have acquired patents on them, which are permitted under United States patent law.² These patents provide a legal way for corporations to protect their investment.

In 1998, Delta and Pine Land Company (“D & PL”) and the United States Department of Agriculture (“USDA”) acquired a patent on a genetically modified seed called Technology Protection System.³ This became known around the world as the “Terminator Technology.”⁴ Previously, farmers saved seed to use in their next year’s crop. In reaction, the Terminator Gene does not allow a seed to germinate, meaning that farmers cannot save seed for the next season to replant.⁵ As a result, farmers have to return to the manufacturer to obtain more seed in order to replant the next year. This in turn insures the manufacturer’s protection of their patent and bolsters their financial investment.

This note will begin by looking at the development and growth of GM crops in general. It will analyze the development of the Terminator Gene specifically, as well as the acquisition of its patent and why seed companies want this technology. Next this note will discuss the two competing sides to the Terminator Gene existence: the farmers who claim they have a common law right to save and replant seed, in conflict with the United States intellectual property

1. See Michael Stumo, *Down on the Farm: Farmers Get the Biotech Blues*, MULTINAT’L MONITOR, Jan. 1, 2000, at 17.

2. See U.S. CONST. art I, § 8, cl. 8. See also Ann K. Wooster, Annotation, *Construction and Application of Plant Patent Act* (35 U.S.C.S. §§ 161 et seq.), 135 A.L.R. FED. 273 (1996).

3. See Ricarda A. Steinbrecher & Pat Roy Mooney, *Terminator Technology: The Threat to World Food Security*, ECOLOGIST, Sept. 1, 1998, at 276.

4. See *id.*

5. See *id.*

rights which support the seed companies. The second half of this note will look at the differing opinions of groups in relation to the Terminator Technology: the USDA, which was awarded the patent along with Delta and Pine Land Company, who is in favor of the Terminator, versus developing countries and environmental groups, who are opposed to the technology. This note will also look at what groups are doing in response to this new technology. In conclusion this note will discuss the status of the world today in relation to the Terminator.

II. GROWTH OF GENETICALLY MODIFIED CROPS

Throughout history farmers have had to deal with the problems of bugs and weeds in their fields, which greatly reduce their production yields. Traditionally, farmers used chemicals to deal with these problems.⁶ In 1996, GM crops were introduced to the American farmer.⁷ The results were increased disease and weed resistance, which increased yields, drought resistance, and stronger plants.⁸ Farmers favored these results and consequently they have continued to use GM seed in increasing numbers.⁹

GM seeds are designed with "production traits" to help reduce bugs and weeds, increase yields, provide drought tolerance, and make plants stronger.¹⁰ As a result, "[b]iotechnology now allows them to shop through the seed catalogue for products which do the same thing as many chemicals — without requiring another pass through the field to apply the chemicals."¹¹

There are many reasons for farmers to plant GM seed. A primary reason is convenience.¹² GM seed requires less management of the crops.¹³ This results

6. See generally Stumo, *supra* note 1, at 17 (stating chemicals have been used since the 1940's).

7. See T.N. Ninan, *Weekend Ruminations Monsanto or IARI?*, BUS. STANDARDS, June 17, 2000, at 7.

8. See Stumo, *supra* note 1, at 17.

9. See Ninan, *supra* note 7, at 7 (explaining that "[b]y 1999 roughly half the US soybean crop and a third of the corn crop were genetically modified").

10. See Stumo, *supra* note 1, at 17.

11. *Id.*

12. See *id.* A study from Iowa State University of why farmers plant Roundup Ready soybeans states that the main reasons are:

- * increased yield through improved weed control -- 53 percent
- * decreased weed control costs -- 27 percent
- * increased flexibility in planting -- 12 percent; and
- * more economically friendly -- 3 percent.

Id.

13. See *id.*

in less time in the field and less management of the crop, which leads to savings in labor costs.¹⁴ By spending less time in the field, farmers can even get a job in town to make additional money.¹⁵ Another reason to adopt GM seed is that farmers are often driven to be the first to adopt a new technology.¹⁶ Economic theories suggest that the early adopters of a new agricultural technology will profit at it until the advance becomes widely accepted.¹⁷ Whatever the reason for adoption, whether it is economics or psychology, GM crops have too many benefits to disappear.¹⁸

III. DEVELOPMENT OF THE TERMINATOR GENE

A. *How the Terminator Technology Works*

The goal of Terminator Technology “[i]s to promulgate plants that will produce self-terminating offspring – suicide seeds.”¹⁹ The Terminator Technology is a genetically engineered suicide mechanism where the next generation of a seed will self-destruct through self-poisoning.²⁰

[T]he main version of the Terminator consists of a set of three novel genes inserted into one plant

In a Terminator plant, three genes are inserted, each with an associated regulatory switch, called a “promoter”. One of these genes, when switched on, produces a protein called Recombinase, which acts like molecular scissors. The Recombinase removes a “spacer” between the toxin-producing gene and its promoter. While it is there, the spacer acts as a safety catch to prevent the toxin gene from being activated.

A third gene is engineered to produce a Repressor which keeps the Recombinase gene turned off until the plant with the Terminator Technology is exposed to a specific outside stimulus, such as a particular chemical, temperature shock, or osmotic

14. *See id.*

15. *See generally id.* (stating that a big factor in the decision to plant GM crops is the convenience which requires less management).

16. *See id.*

17. *See id.*

18. *See* Steve Rissing, *Terminated Gene Research Seems Likely to Rise Again*, COLUMBUS DISPATCH, Aug. 6, 2000, at 7B.

19. Steinbrecher & Mooney, *supra* note 3, at 276.

20. *See id.*

shock. When the chosen stimulus is applied to the seed before sale, the functioning of the Repressor gets interrupted. And as it is no longer repressed, the Recombinase gene is switched on. The Recombinase that is now produced, removes the spacer "safety catch." Because the promotor in front of the toxin gene is chosen to only become active in the late stages of seed maturation, only then will it initiate the production of the poison that kills the seed.²¹

Therefore, the seed will die (terminate) after one year and the farmer will need to purchase more seed from the developer, instead of saving the seed and then replanting it the next season.

B. *Acquiring the Terminator Patent*

On March 3, 1998, the USDA and Delta and Pine Land Company acquired United States patent 5,723,765, called the Technology Protection System ("TPS").²² In a few days, TPS became known to the world as Terminator Technology.²³ On May 11, 1998, Monsanto agreed to buy Delta and Pine Land Company for \$1.76 billion.²⁴ However, on December 20, 1999, Monsanto withdrew its application to purchase Delta and Pine Land Company.²⁵ Monsanto made this decision in response to protests made by farmers, environmental groups, and development agencies against the severe consequences this Terminator Technology would have not only on American farmers, but especially on farmers in third world countries who depend on saving seed to replant from year to year.²⁶

Monsanto announced that it would not use Terminator Technology, but the United States government is continuing its research.²⁷ Even if Monsanto refuses to use the Terminator Technology, the government still has the right to find another company that will use it, and officials have not yet commented on what

21. *Id.*

22. *See id.*

23. *See id.* " 'Terminator' is a reference to the on-screen robotic killer played by Arnold Schwarzenegger" in the Terminator movies. Philip Brasher, *Agriculture Sows Seeds of Discontent Science: Farmers Object to Bioengineered Sterile Plants that Would Make it Impossible to Reseed Their Crops-That Common Practice Saves Them Money*, L.A. TIMES, Mar. 12, 2000, at A31.

24. *See* Steinbrecher & Mooney, *supra* note 3, at 276.

25. *See* Lance Nixon, *South Dakota Farmers Weigh Good, Bad of Genetically Altered Seed*, KNIGHT-RIDDER TRIB. BUS. NEWS, Dec. 27, 1999, at 1, available at 1999 WL 28720505.

26. *See* Brian Halweil, *Monsanto Drops the Terminator*, WORLD WATCH, Jan. 1, 2000, available at 2000 WL 2524985.

27. *See* Brasher, *supra* note 23, at A31. *See also* U.S. Still Developing Terminator Gene, CHEMICAL BUS. NEWSBASE, Apr. 17, 2000, at 12 (Monsanto announced before its take-over of D & PL fell through that it would never bring the terminator gene to market).

they have decided.²⁸ A spokeswoman for the Agricultural Department's Agricultural Research Service, Sandy Miller Hayes, stated that, "the terminator process is still several years away from being commercially available."²⁹ However, the Terminator Technology is available now and the issue needs to be addressed immediately. "Other companies, including Pioneer Hi-Bred, Rhone Poulenc and Dupont, have developed similar techniques to produce sterile seeds," which illustrate that this terminator technology is not an isolated research agenda.³⁰

IV. INTELLECTUAL PROPERTY RIGHTS

A. Terminator Gene Replaces Technology Agreement

Monsanto Corporation is one company that sells GM seeds. Farmers often turn to the Monsanto Corporation to acquire GM seeds.³¹ These GM seeds may cost more than conventional seeds, but they have many benefits, such as built-in pest resistance and herbicide resistance.³² To ensure that farmers pay for the research needed to create GM seeds Monsanto requires farmers to sign a "Technology Agreement."³³ Under this agreement farmers pay more for the seed because it has been genetically modified, and they often sign the agreement without reading or understanding it.

The agreement also has many clauses. One of these clauses is called a "Terminator Clause," which is analogous to the Terminator Gene.³⁴ The clause requires a farmer to promise not to save or plant any of the seed produced from their crop.³⁵ This clause is there to protect Monsanto's investment into the research behind GM seeds.³⁶ However, this clause is difficult to police and enforce in the United States, and even more difficult in developing countries throughout

28. See Brasher, *supra* note 23, at A31.

29. *Id.*

30. Daniel Knight, *Agro-Giants Expand "Terminator" Seed Technology*, INTER PRESS SERVICE, Feb. 10, 1999, available at 1999 WL 5946975.

31. See Jeffrey Kluger et al., *The Suicide Seeds Terminator Genes Could Mean Big Biotech Bucks—But Big Trouble too, as a Grass-Roots Protest Breaks Out on the Net*, TIME, Feb. 1, 1999, at 44.

32. *See id.*

33. *See Stumo, supra* note 1, at 17.

34. *See id.*

35. *See id.*

36. *See id.*

the world.³⁷ As a result of the development of the Terminator Gene, Monsanto can protect its investment because the seed would not germinate after one year and the farmer would not be able to save seed for planting next year's crop. Therefore, farmers would automatically have to return to Monsanto or another seed company for new seed each year. Monsanto reasons that the Terminator Gene, "is a perfectly legitimate way to protect their intellectual-property rights."³⁸

B. *History of the Seed Industry & Patents*

1. *Patentability of Seed*

Intellectual property rights have been granted by the United States Constitution in article 1, section 8, clause 8.³⁹ The Constitution states the purpose behind patent and copyright protection is, "[t]o promote the progress of science and useful arts, by securing for limited time to authors and inventors the exclusive right to their respective writings and discoveries."⁴⁰ Traditionally, however, plants were not able to receive patent protection.⁴¹

In 1908 George Shull developed "hybridization," which was the crossing of two plant relatives.⁴² This was the first method to keep farmers from saving and developing their own seeds.⁴³ Farmers turned to the seed companies each year in order to purchase this "hybrid" seed because it was financially worthwhile.⁴⁴ Seed development was now in the private sector instead of in the hands of the farmer, who had previously saved some of their own seed to replant each year. However, plants were not able to be patented because they were not "amenable to the written description of the requirement of patent law."⁴⁵

Then in 1930 Congress passed the Townsend-Purnell Patent Act, which was signed into law by President Hoover.⁴⁶ This law, also known as the Plant

37. See Kluger, *supra* note 31, at 44.

38. *Id.*

39. See U.S. CONST. art. I, § 8, cl. 8.

40. *Id.*

41. See Wooster, *supra* note 2, at 281.

42. See Steinbrecher & Mooney, *supra* note 3, at 276.

43. *See id.*

44. *See id.*

45. Debra L. Blair, Note, *Intellectual Property Protection and its Impact on the U.S. Seed Industry*, 4 DRAKE J. AGRIC. L. 297, 310 (1999).

46. See 35 U.S.C.A. §§ 161-164 (West 2001). *See also* Wooster, *supra* note 2, at 273.

Protection Act ("PPA"), granted patent rights to plant breeders.⁴⁷ It allowed plant breeders to receive similar protections and benefits of the patent system as other industries had received.⁴⁸ Congress revised this patent statute in the Patent Act of 1952, which placed plant patents into a separate chapter. The Act defines plant eligibility as, "whoever invents or discovers and asexually reproduces any distinct and new variety of plant, including cultivated spores, mutants, hybrids, and newly found seedlings, other than a tuber-propagated plant or a plant found in an uncultivated state, may obtain a patent therefore."⁴⁹ The Act also retained the three eligibility requirements of plant patentability: novelty, utility, and non-obviousness of the invention.⁵⁰ As a result of intellectual property rights protections that developers were now receiving, the seed industry began slowly moving into the private sector.⁵¹

2. *The Plant Variety Protection Act*

The PPA only provided protection for asexually produced plants.⁵² Genetically modified seeds, however, do not reproduce sexually. To protect sexually reproduced seeds, Congress passed the Plant Variety Protection Act ("PVPA") in 1970.⁵³ The PVPA protects seeds that are sexually reproduced. This Act provides protection for genetically modified seeds since they are sexually reproduced.⁵⁴ The PVPA thus helped to protect commercial crops because they are sexually reproduced. The PVPA protects patents by issuing a plant variety protection certificate for eighteen years. To administer the Act, Congress established an office called the Plant Variety Protection Office in the Department of Agriculture to be administered by the Secretary of Agriculture.⁵⁵

47. See 35 U.S.C.A. § 161. See also Wooster, *supra* note 2, at 273.

48. See 35 U.S.C.A. § 161. See also Wooster, *supra* note 2, at 273.

49. See 35 U.S.C.A. § 161. See also Wooster, *supra* note 2, at 282.

50. See Wooster, *supra* note 2, at 282.

51. See 35 U.S.C.A. § 161.

52. See Wooster, *supra* note 2, at 282. See also Elisa Rives, Comment, *Mother Nature and the Courts: Are Sexually Reproducing Plants and Their Progeny under the Utility Patent Act of 1952?*, 32 CUMB. L. REV. 187, 192-93 (2001-2002) (explaining that after Congress enacted the PPA there still remained the need for protection of sexually reproducing plants).

53. See 7 U.S.C. § 2321 (2000) (passed 1970).

54. See 7 U.S.C. § 2402 (2000).

55. See 7 U.S.C. §§ 2321, 2323 (2000).

The PVPA has two exemptions. The first is the farmer's exemption, which says that farmers can save seed.⁵⁶ The second is the research exemption, which allows for the development of new varieties from protected varieties.⁵⁷

3. *Case Law*

The question of patentability has arisen in the courts. In 1980 the United States Supreme Court decided the case of *Diamond v. Chakrabarty*.⁵⁸ Chakrabarty was denied a patent for a genetically engineered strain of bacteria.⁵⁹ The Supreme Court held that this was patentable.⁶⁰ Therefore, setting the precedent that living organisms are patentable.

In 2001, the question arose of whether plants are patentable under the PVPA, the PPA and utility patent statutes. In *J.E.M. Agricultural Supply v. Pioneer Hi-Bred International*,⁶¹ the defendant, Pioneer Hi-Bred, sued the defendant alleging that they were selling their patented plants.⁶² The plaintiff, J.E.M. claimed that plants were not patentable.⁶³ However, the Supreme Court held that plants are patentable under the PVPA, the PPA, and utility patents if the requirements are met.⁶⁴ The courts have begun to accept and enforce the idea that plants are patentable, which strengthens the position of the holders of the seed patents.

C. *Why the Terminator Gene?*

Intellectual Property Rights were designed to afford protection to inventors.⁶⁵ D& PL and the USDA developed the Terminator Gene as a way to uphold property rights in newly developed GM seed.⁶⁶ This protection is needed because a substantial amount of time and money goes into the research and development of GM seeds.⁶⁷ As a result, those companies, which invest in this type of re-

56. See 7 U.S.C. § 2543 (2000). See also Rives, *supra* note 52, at 201.

57. See 7 U.S.C. § 2544 (2000). See also Rives, *supra* note 52, at 204.

58. See *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

59. See *id.* at 306.

60. See *id.* at 318.

61. *J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int'l. Inc.*, 122 S.Ct. 593 (2001).

62. See *id.* at 597.

63. See *id.*

64. See *id.* at 606.

65. See generally Wooster, *supra* note 2, at 273.

66. See Kluger, *supra* note 31, at 44.

67. See generally *id.* at 44 (explaining that weak patent protection makes a technology like Terminator especially important). See also Knight, *supra* note 30, at 1 (explaining that these

search and development, also have an interest in recovering the cost of their investment. Although Technology Agreements protect the developer, they only protect the developer to the extent that the violator is caught.⁶⁸ The Terminator Gene on the other hand, is a way for developers to create a GM seed and not have to worry about farmers illegally saving the seed for the next year, thereby causing the company to lose money. Clearly the companies that design GM seeds have a right to protect their patented products and it appears they have the law on their side as well.

V. THE AMERICAN FARMER: COMMON LAW RIGHT TO SAVE SEED

A. *The Tradition of Saving Seed*

For farmers, saving seed is a historical and traditional right.⁶⁹ “Ever since humans started farming 10,000 years ago, they have followed a basic tenet: Save some of the harvest as seed for next year’s crop. Saving seed shaped more-modern notions of savings and investment.”⁷⁰ American farmers save seed as a way to save money by not purchasing new seed every year.⁷¹ For example, “Missouri farmer Bill Christianson cuts \$20,000 off the annual cost of growing soybeans by saving seed from one year’s crop so he can plant it the following spring.”⁷²

Saving seed has developed over time and been thought of as a common law right by many farmers.⁷³ However, this notion of a right by farmers to save seed is not compatible with the Terminator Technology.⁷⁴ Farmers argue that Terminator Technology will take away their common law right to save seed to

techniques “protect their billions of dollars of investment into research on biologically-engineered products”).

68. See Knight, *supra* note 30, at 1.

69. See Laurent Belsie, *Features, Ideas, Genetics: Plants Without Seeds Challenge Historic Farming Practices*, CHRISTIAN SCI. MONITOR, July 30, 1998, at B4, available at 1998 WL 2369524.

70. *Id.*

71. See *id.* (stating that millions of poor farmers rely on saved seed).

72. Brasher, *supra* note 23, at A31.

73. See Belsie, *supra* note 69, at B4.

74. See *id.*

replant the next year.⁷⁵ As a result of the Terminator Technology farmers would lose that common law right because they would have to return every year to the seller to purchase new seed because the old seed would die after one season and could not be saved.

B. *The PVPA Crop Exemption*

The PVPA allows an exemption called the “crop exemption.”⁷⁶ This exemption allows farmers to save seed from crops that are grown and protected by the PVPA and use that seed without compensating the owner.⁷⁷ This exemption is not without limits to farmers, however, because the Fifth Circuit held that the exemption applies only when farmers sell seeds directly to other farmers without third party intervention.⁷⁸ While creating a narrow exception to the rule, the court was able to create an exception that allowed farmers to save seed and even sell it to other farmers.⁷⁹

The Supreme Court has also permitted this “brown bagging” of seed.⁸⁰ Therefore, if a farmer saves PVPA protected seed to replant for the next year and he decides to change his plans he can sell that seed to another farmer.⁸¹ The seed amount that the farmer is able to sell, however, is limited to the amount the farmer could replant in the next year, which is the original purpose of the saved seed exception.⁸² A farmer cannot save seed solely for the purpose of selling it.⁸³ Despite this holding, technology agreements can prohibit this saving of seed and impose fines on the farmer if it is done.

75. *See id.*

76. *See* 7 U.S.C. § 2543 (2000).

77. *See* § 2543.

78. *See* *Delta & Pine Land Co. v. Peoples Gin Co.*, 694 F.2d 1012, 1016 (5th Cir. 1983).

79. *See id.*

80. *See* *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179, 182 (1995) (“a brown bag sale occurs when a farmer purchases seed from a seed company, such as Asgrow, plants the seed in his own fields, harvests the crop, cleans it, and then sells the reproduced seed to other farmers (usually in nondescript brown bags) for them to plant as crop seed on their own farms”). *Id.*

81. *See id.* at 191.

82. *See id.* at 185.

83. *See id.* at 188.

C. *The Choice for Farmers*

There is no law, however, that recognizes the right for farmers to save seed.⁸⁴ The Plant Variety Protection Act by its name seems to protect that right, but it “does not, as that title claims and the ensuing text says, reserve any ‘[r]ight to save seed’—since nothing elsewhere in the Act remotely prohibits the saving of seed.”⁸⁵ Farmers’ claims to a common law right to save and replant seed seems to be weak as a result of the Supreme Court decision in *Diamond v. Chakrabarty*, which allowed the right to patent protection for genetically modified life, and restricts the saving of seed.⁸⁶ Without a right to save seed, the Terminator Technology will likely continue to be a legal option for seed developers to pursue and expand.

VI. THE USDA’S POSITION

A. *The Potential Benefit*

On March 3, 1998, the United States awarded patent 5,723,765 to the Agricultural Research Service of the USDA and to Delta and Pine Land Co.⁸⁷ This patent was entitled “Control of Plant Gene Expression.”⁸⁸ Since it was issued, this patent has received a great deal of attention and the USDA has had to respond to many questions as a result. The USDA states that the Terminator Technology has two purposes.⁸⁹ “First, it protects specific plant varieties with genetically engineered desirable traits from unauthorized regeneration and ensures benefits sharing for those who accomplish the improvements.”⁹⁰ The USDA, therefore, is protecting and encouraging companies’ capital investments into research and development with this patent. “Second, TPS provides a way to

84. See Jeremy P. Oczek, *In the Aftermath of the “Terminator” Technology Controversy: Intellectual Property Protections for Genetically Engineered Seeds and the Right to Save and Replant Seed*, 41 B.C. L. REV. 627, 630 (May 2000).

85. See *id.* at 651.

86. See *Diamond*, 447 U.S. at 310.

87. See USDA, Agric. Res. Serv., *The Control of Plant Gene Function*, at <http://www.ars.usda.gov/misc/fact.htm> (last modified Oct. 20, 1999) (link no longer active).

88. *Id.*

89. See *id.*

90. *Id.*

prevent the spread of genes introduced into improved crops.”⁹¹ If a crop has been genetically altered, TPS will prevent it from pollinating with other plants, causing hybridization.⁹² Therefore, traits of plants will not be mixed involuntarily.

B. *Potential Harm to United States Agriculture?*

The USDA states that research will be done to determine if TPS pollen could spread to other fields, which would cause non-engineered plants to also become incapable of reproduction.⁹³ So far, there is no proven research that this will actually happen. The USDA states that TPS is intended to only be used in self-pollinating crops, and not for use in plants that use pollen from other plants.⁹⁴ Therefore, if TPS is used as originally intended, the risk of pollen transfer is diminished.⁹⁵

Another concern surrounding TPS is that it will allow seed companies to overcharge farmers for seeds since all seeds become sterile, and there would not be alternate sources of seeds.⁹⁶ The USDA responds to this by arguing that because TPS is time consuming and expensive, it is likely that seed companies will only introduce TPS into those varieties in which they have already made a heavy investment.⁹⁷ However, if the value is not there for the farmer to buy TPS seeds then he will likely substitute other less expensive seed. Consequently, the seed companies will need to watch their costs to continue to maintain their current sales and profits levels.⁹⁸

C. *The USDA's Plans*

The USDA's stated purpose is “to help develop the technology, not to assist companies to use it.”⁹⁹ Currently the USDA does not have plans to introduce TPS into any germplasm in their research program.¹⁰⁰ “[It] is also commit-

91. *Id.*

92. *See id.*

93. *See id.*

94. *See id.*

95. *See id.*

96. *See id.*

97. *See id.*

98. *See id.*

99. *Id.*

100. *See id.*

ted to making the technology as widely available as possible, so that its benefits will accrue to all segments of society."¹⁰¹

D. *The Message*

To the USDA, the Terminator Technology is a step forward in the history of plant improvement.¹⁰² The USDA states that, "there must be public guidance, not on whether to shun technological advances in crops, but how to manage them to the advantage of humankind."¹⁰³ The USDA sees a potential benefit with this new technology and does not want to lose it.

VII. ORGANIZATION'S RESPONSES

A. *ETC group*

ETC group ("Action Group on Erosion, Technology and Concentration") formerly RAFI ("Rural Advancement Foundation International") is an international civil society organization based in Canada.¹⁰⁴

ETC group is dedicated to the conservation and sustainable advancement of cultural and ecological diversity and human rights. To this end, ETC group supports socially responsible developments of technologies useful to the poor and marginalized and it addresses international governance issues and corporate power.¹⁰⁵

ETC group believes that government action is needed to reject and thus stop the Terminator Technology.¹⁰⁶ ETC group argues that with the Terminator Technology farmers will become dependent and "held hostage" to only a few companies that sell the seed farmers need to plant.¹⁰⁷ "Entire countries could be

101. *Id.*

102. *See id.*

103. *Id.*

104. *See* Action Group on Erosion, Technology and Concentration, ETC group, at <http://www.rafi.org> (last visited Apr. 25, 2002). [hereinafter Action Group on Erosion]

105. *Id.* at <http://www.rafi.org>.

106. *See* *Suicide Seeds on the Fast Track: Terminator 2 Years Later*, RAFI COMMUNIQUÉ, Feb. 28, 2000, available at <http://www.rafi.org> (available under Communiqué link under Publications link). [hereinafter *Suicides Seeds on the Fast Track*]

107. *See id.*, available at <http://www.rafi.org>.

forced to surrender national seed sovereignty and be held in biological bondage."¹⁰⁸

ETC group fears disastrous consequences for farmers, food security and biodiversity as a result of the Terminator.¹⁰⁹ ETC group's proposed policy to solve this problem states,

The future of Terminator/Traitor Technology rests with national governments and multinational corporations. The pressure points for political action are, first and foremost, with national governments around the world. Second, pressure should be applied at key international fora such as the Convention on Biological Diversity, FAO, the World Trade Organization's Trade-Related Intellectual Property(WTO/TRIP's), at the upcoming Global Forum on Agricultural Research in Dresden, and at negotiations in Geneva to strengthen the Biological and Toxin Weapons Convention. RAFI's work in Year Three of the Terminator will be in these international areas.¹¹⁰

ETC group is trying to get government's support for their position by writing letters to countries to encourage them to ban seed sterilization.¹¹¹ Currently, members have written 550 letters and thirty countries have responded.¹¹² These responses range from strong support to indecision to direct opposition.¹¹³

B. *The Rockefeller Foundation*

The Rockefeller Foundation is an organization that funds research to help poor farmers in developing countries.¹¹⁴ In 1999, its director, Dr. Conway, asked Monsanto to stop using and developing the Terminator gene.¹¹⁵ To date, this is the most prestigious organization to take a stance against the Terminator.¹¹⁶ Conway stated "his organization favors biotechnology but not Terminator seeds."¹¹⁷ The Rockefeller Foundation fears an economic disaster because mil-

108. *Id.*, available at <http://www.rafi.org>.

109. *See id.*, available at <http://www.rafi.org>.

110. *Id.*, available at <http://www.rafi.org>.

111. *See id.*, available at <http://www.rafi.org>.

112. *See id.*, available at <http://www.rafi.org>.

113. *See id.*, available at <http://www.rafi.org>.

114. *See* Scott Kilman, *Foundation Asks Monsanto to Kill 'Terminator Gene,'* WALL ST. J., June 28, 1999, at B5C.

115. *See id.*

116. *See id.*

117. *Fair Marketing or the Bad Seed?*, OMAHA WORLD-HERALD, Dec. 24, 1999, at

lions of farmers save seed each year and if that were impossible, famine could occur.¹¹⁸

The Rockefeller Foundation favors biotechnology and is spending \$100 million on crop biotechnology projects.¹¹⁹ These projects include trying to modify rice so it contains more vitamin A, as well as many others.¹²⁰ Conway is concerned that fears over biotechnology, stemming from the projects, will cause countries to cut down on their acceptance of biotechnology, which could help to feed millions of people.¹²¹ Farmers in Africa, Asia, and Latin America are particularly weary of adopting Terminator Technology because over eighty percent of their farmers are dependant upon their ability to save seed from year to year, in order to survive.¹²²

VIII. INTERNATIONAL GOVERNMENTAL RESPONSES

A. India

India is a country that does not allow product patenting in agriculture.¹²³ It became one of the first governments to publicly reject the Terminator Technology, when the Indian government drafted a bill entitled "Protection of Plant Varieties and Farmers Rights."¹²⁴ Although this bill is controversial it demonstrates India's strong anti-Terminator position.¹²⁵ This bill is based upon India's fear of disastrous consequences if it allows the Terminator Technology to enter into its system, since eighty percent of Indian farmers save their own seed.¹²⁶

There has been much disapproval in India against the Terminator Technology, including the development of a "Cremate Monsanto" campaign in India

118. *See id.*

119. Kilman, *supra* note 114, at B5C.

120. *See id.*

121. *See id.*

122. *See* Halweil, *supra* note 26.

123. M. Ahmed, *Terminator III*, BUS. STANDARD, May 22, 1998, at 6.

124. *See* Suicide Seeds on the Fast Track, *supra* note 106, available at <http://www.rafi.org>.

125. *See id.*, available at <http://www.rafi.org>. The bill states that "no variety shall be registered under this Act if such variety contains any gene or gene sequence involving any technology including terminator technology which is injurious to the life or health of human beings, animals, or plants." *Id.*

126. *See id.*, available at <http://www.rafi.org>.

where protesters set fire to company test fields.¹²⁷ It is important to note that in a survey that came out on August 30, 1999 almost half the farmers interviewed said that India needs a new technology, like biotechnology, to increase agricultural yields.¹²⁸ Farmers in India are in favor of biotechnology, and ninety-two percent of farmers think that biotechnology is beneficial.¹²⁹ It is not that farmers and governments do not realize the benefits of biotechnology, they are just opposed specifically to the Terminator Technology.

India is not however, the only country against the Terminator. Ghana, Panama, and Uganda have also declared that their governments will not allow the Terminator Technology into their countries.¹³⁰ More than one billion farmers, mostly small farmers from Africa, Asia, and Latin America, save their seed each year, and the Terminator could mean disaster in those countries.¹³¹

B. *Britain*

In Britain, the company Astra-Zeneca has been secretly developing the Terminator Technology.¹³² Even though Astra-Zeneca wrote to the United Nations in 1992 and stated that they were stopping the development on this research, they continued development in secret.¹³³ A spokeswoman for the company said that having the patent for this technology does not mean that they will commercialize it, and they do not plan to commercialize it.¹³⁴ Astra-Zeneca therefore, is continuing in its development of this technology. Then in 1999, Astra-Zeneca received approval from the British government to conduct a field test, where there would be a release of genetic trait control in tobacco and potato plants.¹³⁵ Therefore, in Britain not only is this technology being developed, it is also being approved by the government.

127. See Kluger, *supra* note 31, at 44.

128. See Lubna Kably, *The Terminator Strikes*, *ECON. TIMES*, Nov. 15, 1999, available at 1999 WL 29163536.

129. See *id.*

130. See Suicide Seeds on the Fast Track, *supra* note 106, available at <http://www.rafi.org>.

131. See Knight, *supra* note 30.

132. See Antony Barnett, 'Junkie' GM Gene Threat to Third World Farmers, *OBSERVER*, Apr. 2, 2000, at 11.

133. See *id.*

134. See *id.*

135. See Suicide Seeds on the Fast Track, *supra* note 106, available at <http://www.rafi.org>.

IX. WHERE ARE WE TODAY?

A. *European Union*

A problem that American companies face as they attempt to spread GM foods is that Europe is resisting the importation of these foods.¹³⁶ In 1998, The European Union ("EU") completely banned the importation of GM foods, and this moratorium has stayed.¹³⁷ In 1999, the EU started to require labels on food that contained GM products.¹³⁸ This rejection of GM foods by the EU led to two of the world's largest food production companies to withdrawal of acceptance of GM foodstuffs (Nestle UK and Unilever). Even Spain's largest supermarket (Pryca) has rejected GM food.¹³⁹ This is based upon European fears of health risks, especially after "mad cow" disease broke out.¹⁴⁰

B. *United States*

There have also been a flurry of bills relating to genetically modified foods and the Terminator gene introduced in legislatures in the United States over the past years.¹⁴¹ There were more than two dozen bills filed in thirteen states in 2000, which reflects the ongoing debate over genetic engineering in the United States.¹⁴²

The United States government has formed an ethics committee to address the issues relating to biotechnology.¹⁴³ President Clinton established the National Bioethics Advisory Commission.¹⁴⁴ This committee will look at the ethical prob-

136. See Belsie, *supra* note 69, at B1.

137. See Richard A. Repp, *Biotech Pollution: Assessing Liability for Genetically Modified Crop Production and Genetic Drift*, 36 IDAHO L. REV. 585, 589 (2000).

138. See Anup Shah, *Genetically Engineered Food: A Huge Wave of Public Concern*, Global Issues, at <http://www.globalissues.org/EnvIssues/GEFood/PublicReaction.asp> (last updated Jan. 18, 2002).

139. *Id.* at <http://www.globalissues.org/EnvIssues/GEFood/PublicReaction.asp>

140. See Belsie, *supra* note 69, at B1.

141. See Bill Lambrecht, *More States Try to Weigh in on Genetically Modified Food*, ST. LOUIS POST-DISPATCH, Apr. 2, 2000, at A12.

142. See *id.*

143. See Thomas Kupper, *Protest Points up Fear of Biotech's Perceived Risks of Genetically Altered Crops*, SAN DIEGO UNION-TRIBUNE, May 22, 1999, at C1.

144. See *id.*

lems faced by genetic research and try to develop answers to the many questions this new technology raises.¹⁴⁵

C. *Monsanto*

The Terminator Technology is currently not being developed.¹⁴⁶ In October 1999, Monsanto announced that it would not commercialize the Terminator Technology.¹⁴⁷ This was a huge victory for the opponents of the Terminator, from the environmental groups to the farmers.

X. CONCLUSION

One thing that is clear is that this new biotechnology is not going away.¹⁴⁸ This is because biotechnology has the potential for much good, such as helping to cure diseases and feed the world's poor. However, the Terminator gene also presents a complicated problem. It is biotechnology that has been designed to help companies. Seed companies put a large investment into research and development, and to continue to profit and stay in business, they need to be able to make a profit. In the United States, where there are strong patent laws, these laws will protect their investment. D & PL has such a patent. Their company researched and developed the Terminator gene and they own the rights to it under the patent laws of the United States. However, in countries that do not have patent laws, like India, companies will lose their investment because there is no way to enforce their ownership rights on their product. There are millions of people however, especially small farmers, who depend on saving seed each year to survive. If this Terminator Technology is sold to them they face potential starvation. These farmers believe that they have a historical right to save seed.

As a result we have two competing beliefs in the laws of mankind. On the one hand there are the laws that have been created by governments and on the other hand there are the traditional rights that people have come to expect that they have. People and organizations feel very strongly about the Terminator Technology. For example in India and other countries it has been banned completely. In the United States and Britain however, it is still being developed and approved by the government. In the United States, the government was even

145. *See id.*

146. *See Halweil, supra note 26.*

147. *See id.*

148. *See Rissing, supra note 18, at 7B.*

involved in the development process because the USDA partnered with Delta and Pine Land Company. ETC group wants governments to take a firm stance and completely ban Terminator development. The Rockefeller Foundation has taken a middle approach and wants Terminator Technology development to be stopped but it still favors biotechnology. It sees the benefit to millions of people of biotechnology research. Biotechnology could help develop vitamin-enriched foods for the malnourished and plants that could survive harsh conditions such as a drought.

There have been many protests across the world over this issue, from the United States to India. People feel very strongly about this issue so it will not be easily solved. In the United States, where there is intellectual property protection, the seed companies have the upper hand because the laws are on their side. This raises the question of whether the laws of countries need to be infused with some ethical consideration. In the United States, this has begun with President Clinton's National Bioethics Advisory Commission. Biotechnology is raising new issues everyday that can be answered by the current laws but also leaves people unsatisfied and leary of the results.

More developed countries, like the United States and Britain, are in favor of this Terminator Technology, while the less developed countries, like India, are opposed to it. As a result, the Terminator Technology is positioning already developed nations against those still developing nations. Clearly developing nations have the most to lose because they save more seed and rely on it more heavily. What will be the impact that the developed nations have on the developing nations is a question that will have to be answered by the governments and ethics committees.

What is apparent is that there are no clear answers for this new technology. It is going to cause lawmakers serious discussion and compromise in the future. It is going to take time to combine laws of biotechnology with ethical considerations, and the United States has just started down that road.