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NOTE

WE ARE WHAT WE EAT: SECURING OUR FOOD SUPPLY BY AMENDING INTELLECTUAL PROPERTY RIGHTS FOR PLANT GENETIC RESOURCES

MEGHAN MARRINAN FELICIANO

INTRODUCTION

While many may ponder the consequences of global warming, perhaps the biggest single environmental catastrophe in human history is unfolding in the garden. While all are rightly concerned about the possibility of nuclear war, an equally devastating time bomb is ticking away in the fields of farmers all over the world. Loss of genetic diversity in agriculture – silent, rapid, inexorable – is leading us to a rendezvous with extinction – to the doorstep of hunger on a scale we refuse to imagine. . . . Reducing the diversity of life, we narrow our options for the future and render our own survival more precarious.¹

Around the world, an amazing array of plants have been cultivated and developed over many thousands of years, adapting to diverse climates and evolving to withstand various diseases and pests. The genetic resources found in the germplasm² of these plants are invaluable, as these diverse traits offer the means for plants to survive and thrive under a multitude of conditions. Today, crop genetic diversity is at great risk, and its diminishing existence threatens the sustainability of the world's food supply. The danger is real: between 1903 and 1983, more than 95% of U.S. tomato varieties were lost.³ If we want tomatoes, as well as other crops, to remain on the table, we must act to preserve the diverse genetic resources found in agriculture around the globe.

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

2. Plant germplasm is described as “the genetic information encoded in the seed.” Jack Kloppenburg, Jr. & Daniel Lee Kleinman, *The Plant Germplasm Controversy*, 37 *BIOSCIENCE* 190, 190 (1987).

3. *FATAL HARVEST: THE TRAGEDY OF INDUSTRIAL AGRICULTURE* 59 (Andrew Kimbrell ed., 2002) [hereinafter *FATAL HARVEST*].

The legal approach to plant genetic resources (PGRs) has undergone a seismic shift in the past eighty years. Historically, germplasm was regarded as the “common heritage of [hu]mankind,”⁴ meaning anyone could acquire seed and cultivate it as they wished.⁵ Despite the fact that germplasm could not be commodified, it was consistently regarded as a prized resource,⁶ recognized as a cornerstone of life. Until the early 1900s, the U.S.’s investment in PGRs was primarily the role of the government, in collaboration with farmers around the country. However, in 1930, the United States created, and has since increasingly strengthened, intellectual property (IP) rights in plants.⁷ This shift has transferred PGR investment and innovation from the public sector to the private sector.

The goals of IP law are noble. The Constitution gives Congress the power to grant authors and inventors exclusive rights to their writings and discoveries, for a limited time, in order to “promote the Progress of Science and useful Arts.”⁸ By creating incentives for people to invent and discover, IP law is intended to promote innovation and further the common good. However, in the context of PGRs, the current constellation of IP protections fails to meet these underlying goals. This failure is burdening farmers, benefiting large corporations, and endangering the sustainability of our food supply. To address these concerns, this Note urges Congress to restructure the legal treatment of PGRs in the United States; Congress is advised to evaluate proposals based on how well they (1) preserve crop genetic diversity and (2) equitably reward agricultural innovation and labor. This Note provides four suggestions to further these goals.

Part I of this Note demonstrates the vital role of PGRs and exposes the current crisis related to these resources. Part II traces the legal treatment of PGRs in the United States, beginning with the “common heritage” attitude of our nation’s founders through the creation of, and steady increase in, plant breeders’ rights. Part III analyzes the connection between the precarious state of our food supply and the current legal treatment of PGRs. Part IV addresses the asymmetrical rights currently vested in PGRs, and examines some of the costs of this inequity. Part V concludes with a plea to Congress and offers suggestions for the restructuring of plant-related IP rights, focusing on justice and long-term food security.

4. Keith Aoki, *Weeds, Seeds & Deeds: Recent Skirmishes in the Seed Wars*, 11 CARDOZO J. INT’L & COMP. L. 247, 305 (2003) [hereinafter *Weeds, Seeds & Deeds*].

5. *See id.* at 257.

6. *See id.*

7. In 1930, with its passage of the Plant Patent Act, Congress first recognized certain plants as patentable subject matter. 35 U.S.C. § 161 (2006). Since then, Congress and the Courts have expanded IP protection for plants.

8. U.S. CONST. art. I, § 8, cl. 8.

I. PLANT GENETIC RESOURCES ARE AT THE CORE OF FOOD SECURITY

As the opening quote of this Note states, a “devastating time bomb is ticking away in the fields of farmers all over the world.”⁹ This time bomb is the rapid loss of agricultural genetic diversity.¹⁰ This section initially explains the importance of cultivating diverse PGRs. It then exposes the current, undesirable state of agriculture in terms of crop genetic diversity. This provides the backdrop for the legal analysis to follow.

A. *Diverse Plant Genetic Resources are Essential for Healthy, Sustainable Crops*

Genetic diversity is crucial to agriculture, contributing to healthy crops and sustainable farming practices.¹¹ When large amounts of crops are genetically uniform, they are collectively vulnerable to the same diseases and pests and “a single instance of disease or infestation of a pest can spread rapidly, practically unchecked, amongst the entire crop.”¹² For example, the Irish potato famine of the 1840s (which lasted for five years and killed one to two million people, as well as induced another one to two million to migrate to North America) was caused by a potato fungus called *Phytophthora infestans*.¹³ At the time, all of the potatoes grown in Europe were descended from two lines of potatoes, brought over from the Andes.¹⁴ These genetically-similar potatoes were not resistant to the fungus, and the disease spread rapidly, reaching epidemic proportions.¹⁵ Thankfully, diverse local varieties (often referred to as landraces) around the world have co-evolved with pests and diseases, and thus offer a wealth of potential genetic resistance to various agricultural challenges.¹⁶ During the potato famine, resistance to *Phytophthora infestans* was eventually located amongst the thousands of distinct types of potatoes in the Andes and Mexico.¹⁷ “Without it, potatoes probably would not be a major crop in the developed world today.”¹⁸

In agriculture, plant breeders continue to lean on the diverse genetic resources developed in plants around the world. For example, a wide array of PGRs will likely be necessary to combat the “superweeds” — “weeds that can tolerate herbicides because of crossbreeding via airborne pollen

9. FOWLER & MOONEY, *supra* note 1, at ix.

10. *See id.*

11. *See* Susan E. Gustad, *Legal Ownership of Plant Genetic Resources: Fewer Options for Farmers*, 18 *HAMLIN L. REV.* 459, 459 (1995).

12. Keith Aoki, *Seeds of Dispute: Intellectual-Property Rights and Agricultural Biodiversity*, 3 *GOLDEN GATE U. ENVTL. L.J.* 79, 124 (2009) [hereinafter *Seeds of Dispute*].

13. *See* FOWLER & MOONEY, *supra* note 1, at 45.

14. *Id.* at 43.

15. *See id.* at 45.

16. *See Seeds of Dispute, supra* note 12, at 125.

17. *See* FOWLER & MOONEY, *supra* note 1, at 45.

18. *Id.*

with herbicide-tolerant crops”¹⁹ — which have begun to evolve in the wake of industrial agriculture. However, modern industrial agriculture is increasing crop monocultures throughout the globe, which “not only limits what we can eat today, but also reduces the choices of future generations.”²⁰ As crops continue to face threats from disease, pests, and weeds, the preservation of PGRs is crucial, because “[d]esirable genetic traits cannot be created from whole cloth; they can only be copied from other plants.”²¹

For some crops, genetic variation is important for effective evolution; without variation, these crops may eventually become extinct.²² As two prominent authors state, “The genetic diversity being lost today is the foundation of future plant breeding, of future plant evolution. If enough diversity is lost, the ability of crops to adapt and evolve will have been destroyed.”²³

Uniform, genetically engineered crops, commonplace in modern industrial agriculture, do offer some agricultural benefits. For example, crops can be engineered for resistance to environmental stresses and a decreased need for chemical pesticides.²⁴ However, as the evolution of superweeds foreshadows, it is crucial to preserve the world’s treasure-trove of diverse PGRs which have evolved over thousands of years, keeping in mind that a loss in genetic diversity “eliminates the only defense against disease that farmers and plant breeders may have.”²⁵

B. The Crisis: Crop Genetic Diversity Has Been Slashed Dangerously Low

Industrial agriculture is a term which describes a method of food production which “depends on massive chemical and biological inputs, huge monocultures, and factory-like farms and that results in huge corporate profits.”²⁶ This industrial culture is quite different from the world’s traditional agrarian way of local, fully integrated food systems.²⁷ The practices of industrial agriculture have “brought a staggering number of negative side effects, many of them unanticipated,”²⁸ including an alarming loss of crop

19. *Seeds of Dispute*, *supra* note 12, at 142.

20. FATAL HARVEST, *supra* note 3, at 58–59.

21. Peter J. Goss, *Guiding the Hand That Feeds: Toward Socially Optimal Appropriability in Agricultural Biotechnology Innovation*, 84 CAL. L. REV. 1395, 1402 (1996).

22. *See Seeds of Dispute*, *supra* note 12, at 126.

23. FOWLER & MOONEY, *supra* note 1, at 89.

24. *See* Goss, *supra* note 21, at 1400–01; Anne E. Crocker, *Will Plants Finally Grow into Full Patent Protection on an International Level? A Look at the History of U.S. and International Patent Law Regarding Patent Protection for Plants and the Likely Changes After the U.S. Supreme Court’s Decision*, in *J.E.M. Ag. Supply v. Pioneer Hi-Bred*, 8 DRAKE J. AGRIC. L. 251, 289 (2003).

25. *Seeds of Dispute*, *supra* note 12, at 125.

26. FATAL HARVEST, *supra* note 3, at 1.

27. *See* Douglas Tompkins, *Prologue* in FATAL HARVEST, *supra* note 3, at xi.

28. *Id.*

biodiversity. “The U.N. Food and Agricultural Organization (FAO) estimates more than three-quarters of agricultural genetic diversity was lost in this past century.”²⁹ Prior to the “Green Revolution” of industrial agriculture, seeds were selected for and adapted to diverse local conditions, “a process that drew upon and contributed to broad genetic diversity.”³⁰ However, industrial agriculture takes a different approach, seeking to adapt a uniform, monocultured seed to the stresses of various environments.³¹

When commercial plant breeders began selecting plants for certain characteristics (such as yield or a particular type of taste) until they arrived at a uniform “pure line” that reproduced uniformly, they inadvertently and unintentionally opened a Pandora’s box leading to widespread crop monoculture and increased vulnerability to pests and diseases.³²

In a study conducted by the Rural Advancement Foundation International (RAFI), it was found that between the years 1903 and 1983, the United States lost nearly 93% of its lettuce varieties, over 96% of sweet corn, about 91% of field corn, more than 95% of tomato, and almost 98% of asparagus.³³ During the last century, over 7,000 named varieties of apples were grown in the United States.³⁴ Today, less than fifteen percent of these varieties survive,³⁵ and “two varieties alone account for more than 50 percent of the current apple market.”³⁶ Likewise, at the close of the twentieth century, “73 percent of all the lettuce grown in the United States was iceberg. This relatively bland variety is often the only choice consumers have. Meanwhile, we have lost hundreds of varieties of lettuce with flavors ranging from bitter to sweet and colors from dark purple to light green.”³⁷ As this diminishing diversity suggests, monocultures are spreading through farm fields around America: “Six types of corn now occupy 71 percent of the acreage in the United States, while two types of peas occupy 96 percent of the national acreage.”³⁸ Of the over 5,000 varieties of potatoes found worldwide, only four are major commercial varieties.³⁹ With this growing crop monoculture, “[g]enetic erosion threatens to cause the degradation of the ability of agriculture to meet global food demand.”⁴⁰

29. *Id.* at 59.

30. *Seeds of Dispute*, *supra* note 12, at 128.

31. *See id.*

32. *Id.* at 124.

33. FATAL HARVEST, *supra* note 3, at 59.

34. *Id.* at 71.

35. *See id.* at 79.

36. *Id.* at 58.

37. *Id.*

38. *Id.* at 71.

39. *See id.* at 81.

40. *Seeds of Dispute*, *supra* note 12, at 127.

II. UNITED STATES LEADS THE DRIFT OF PLANT GENETICS INTO THE REALM OF INTELLECTUAL PROPERTY

Coinciding with the steep decline in crop genetic diversity is a historical shift in the legal treatment of PGRs. This shift is contributing to the crisis. The creation and growth of U.S. intellectual property rights in PGRs is chronicled below. The issue of IP protection for plants is also an important and controversial discussion topic among nations.⁴¹ While this Note focuses on the United States' domestic policy towards PGRs, it is worth noting that on the international scene the United States is one of the strongest advocates of patent protection for plants.⁴² In general, "developed countries are greatly in favor of uniformity of intellectual property standards that offer strong protections for inventor rights."⁴³ Though this Note addresses the nation's domestic IP rights in plants, the policy considerations presented in this Note apply to international debates as well, and the United States would be wise to reconsider its international positions on PGRs in addition to restructuring its domestic approach.

A. *Before Commodification of the Seed: Communal Innovation*

Until 1930, "germplasm was not legally viewed as something susceptible to characterization as property."⁴⁴ Rather, the germplasm of staple crops was viewed as the "common heritage of [hu]mankind," freely accessible for all to use.⁴⁵ Despite the fact that germplasm could not be commodified, people did regard it as a valuable resource. For thousands of years, cultivators around the world labored intensely to develop and improve crops.⁴⁶ Nations treated germplasm "as a strategic and valuable natural resource akin to land or water."⁴⁷ For example, in the late eighteenth century, Brazil controlled 95% of the world's rubber market, and in an attempt to protect this national resource, Brazil prohibited the export of rubber tree germplasm.⁴⁸

41. See generally Convention on Biological Diversity, *opened for signature* June 5, 1992, Hein's No. KAV 3747 (entered into force Dec. 29, 1993) (the Convention on Biological Diversity is an international, legally binding treaty dedicated to conservation and sustaining biodiversity); International Treaty on Plant Genetic Resources, *opened for signature* Nov. 3, 2001, Hein's No. KAV 8291 (entered into force June 29, 2004) (the International Treaty on Plant Genetic Resources is an international agreement aimed at guaranteeing food security through sustainable agriculture); Agreement on Trade-Related Aspects of Intellectual Property Rights, *effective* Jan. 1, 1995, Hein's No. KAV 4054 (TRIPS is an agreement administered by the World Trade Organization that sets international intellectual property standards).

42. See Crocker, *supra* note 24, at 254.

43. *Id.* at 285.

44. *Weeds, Seeds & Deeds*, *supra* note 4, at 257.

45. *Id.* at 305.

46. See *Seeds of Dispute*, *supra* note 12, at 110.

47. *Weeds, Seeds & Deeds*, *supra* note 4, at 257.

48. See *id.* at 263.

Historically, like many regions in the Northern Hemisphere, the United States as a whole was a relatively gene-poor nation. It lacked the drastically diverse collection of PGRs common in many areas of the Southern Hemisphere. For example, “[o]f crops of economic importance, only sunflowers, blueberries, cranberries, pecans, and the Jerusalem artichoke originated in what is now the United States and Canada.”⁴⁹ Though colonists traveled to the “new world” with seeds from Europe, many of these seeds were ill-suited to the different growing conditions of America, and early settlers relied on the crops of American Indians to survive.⁵⁰ Early on, the founders of the United States recognized the crucial role of PGRs in the country’s sustainability.

As the young nation worked to establish itself, the government invested heavily in the collection and distribution of exotic germplasm, relying on farmers to experiment with and adapt crops to “thousands of diverse ecological niches.”⁵¹ In 1819, the U.S. Secretary of the Treasury, William L. Crawford, requested assistance from the country’s foreign consuls and naval officers in this endeavor.⁵² The effort grew, and the Navy eventually authorized official plant exploration expeditions; throughout the mid-1800s, plant germplasm poured in from around the globe.⁵³ In 1839, the Commissioner of Patents, Henry Ellsworth, obtained congressional funding for the distribution of seed around the country.⁵⁴ This free seed distribution program proved extremely popular and effective, and remained intact until 1924.⁵⁵ In 1850, the Patent Office Division of Agriculture was elevated to department status, and the U.S. Department of Agriculture (USDA) was created in 1862.⁵⁶ In addition to establishing agricultural colleges (land-grant universities) and state agricultural experiment stations,⁵⁷ the federal government continued to fund national seed distributions: “As late as 1878, fully a third of the department’s annual budget was being spent on germplasm collection and distribution.”⁵⁸ In 1897, the seed distribution program reached an all-time high, with the government sending American farmers 22,195,381 packages of seed, each package containing five packets of different seed varieties.⁵⁹

The broad distribution of diverse seeds was crucial to the success of American agriculture, as “it was the farmers of the nation who molded [the

49. JACK RALPH KLOPPENBURG, JR., *FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY, 1492–2000*, at 46 (1988).

50. *See id.* at 51.

51. *Id.* at 56.

52. *See id.* at 53.

53. *See id.* at 55.

54. *See id.* at 55.

55. *See id.* at 71.

56. *See id.* at 58.

57. *See Seeds of Dispute*, *supra* note 12, at 85.

58. KLOPPENBURG, *supra* note 49, at 58, 60.

59. *Id.* at 63–64.

foreign germplasm] into useful form.”⁶⁰ Through “thousands of experiments by thousands of farmers committing millions of hours of labor . . . over a period of many decades,”⁶¹ U.S. farmers succeeded in adapting exotic germplasm to the diverse environments of the United States, and developed “a firm agricultural foundation prepared for the rise of industrial capitalism.”⁶² As the Commissioner of Agriculture, Norman Colman, noted in 1885, “the increased production of wheat, oats, and other cereals and grasses, has, by reason of the wide distribution of improved varieties, paid tenfold the entire amount expended by the Department of Agriculture since it was established.”⁶³

As the United States government and the nation’s farmers developed the country’s strong agricultural identity, the private seed industry played only a minimal role.⁶⁴ There are various reasons for this lack of private investment in plant breeding. First, the nature of seeds allows a purchaser to not only acquire a breeder’s plant, but the means to reproduce the variety independently. At the time, “it occurred to no one that the [Patent Act] might cover plants,”⁶⁵ so it was difficult for breeders to recover financial investments in crop development.⁶⁶ Additionally, not only did the government distribute large quantities of seed free of charge, government-certified seed was regarded as the high-water mark for quality, resulting in tough competition for private breeders.⁶⁷

Around 1900, the work of Augustinian monk Gregor Mendel (1822–1884) was re-discovered.⁶⁸ Mendel’s work in plant genetics opened the door for a major transformation in plant breeding; in essence, a shift from breeding as an “art” to a “science.”⁶⁹ With a better understanding of plant genetics, “for the first time the plant breeder had a clear idea of how to proceed with crop improvement.”⁷⁰ Plant explorers and breeders began to look for superior characteristics, rather than superior varieties; it became a “search not for useful *plants* but for useful *genes*.”⁷¹ Research began in hybrid plants (which at that time involved merely “the cross-breeding or

60. *Id.* at 56.

61. *Id.*

62. *Id.* at 57.

63. *Id.* at 60 (quoting 1885 U.S.D.A. ANN. REP. OF THE COMM’R OF AGRIC.).

64. *See Weeds, Seeds & Deeds, supra* note 4, at 260.

65. KLOPPENBURG, *supra* note 49, at 54.

66. *See Weeds, Seeds & Deeds, supra* note 4, at 260; *see also* Debra L. Blair, *Intellectual Property Protection and its Impact on the U.S. Seed Industry*, 4 DRAKE J. AGRIC. L. 297, 302 (1999) (“Because of the perceived lack of protection for seed collectors’ investment or the plant breeders’ efforts and insight, there was little incentive to introduce and adapt new varieties.”).

67. *See* KLOPPENBURG, *supra* note 49, at 64, 81.

68. *See Weeds, Seeds & Deeds, supra* note 4, at 268.

69. *See id.*

70. KLOPPENBURG, *supra* note 49, at 70 (quoting Garrison Wilkes, *Current Status of Crop Germplasm*, CRITICAL REVIEWS IN PLANT SCIENCES (citation omitted)).

71. KLOPPENBURG, *supra* note 49, at 80.

sexual combination of two varieties of plant.”),⁷² and yields, such as corn, were increased.⁷³

Unlike open-pollinated varieties, seeds from hybrid plants lack the vigor of the first generation, thus requiring farmers to re-purchase rather than save hybrid seeds.⁷⁴ The private seed industry was quick to take advantage of this opportunity.⁷⁵ Some modern geneticists are skeptical of the value of hybrid techniques versus traditional methods of “population improvement,” and believe research efforts were shifted to hybrids purely because of the “enormous profit opportunities for private enterprises.”⁷⁶ Through the hybrid seed market, the private seed industry ultimately discovered a means to compete with public breeders. In order to expand its role in the agricultural sector, the private seed industry, through its lobby association, the American Seed Trade Association (ASTA), also sought IP protection for crop developments.⁷⁷

B. The Plant Patent Act of 1930: Creation of IP Protection for Plants

In 1930, the private seed industry won a major victory: congressional acknowledgment of certain plants as patentable subject matter. That year, the United States passed the ground-breaking Plant Patent Act (PPA). The PPA was the first legislation in the world to specifically allow IP protection for plants.⁷⁸

The PPA created a new type of patent, a “plant patent.” Like § 101 utility patents and § 171 design patents, plant patents are administered by the Patent and Trademark Office (PTO).⁷⁹ The PPA grants patent protection to the inventor or discoverer of a qualifying asexually reproduced plant variety.⁸⁰ Asexual reproduction is reproduction “by grafting, budding, or the like, and produces an offspring with a genetic combination identical to that of the single parent – essentially a clone.”⁸¹ A patent under the PPA grants the “right to exclude others from asexually reproducing the plant, and from using, offering for sale, or selling the plant so reproduced, or any of its parts, throughout the United States, or from importing the plant so reproduced, or any parts thereof, into the United States.”⁸² The PPA requires an eligible variety to be asexually reproduced and only offers protection

72. *Id.* at 68.

73. *Id.* at 91.

74. *Id.* at 93.

75. *Id.*

76. *Id.* at 93–94.

77. Blair, *supra* note 66, at 307.

78. *Seeds of Dispute*, *supra* note 12, at 96; W. Lesser, *From Penury to Prodigal: Protection Creep for U.S. Plant Varieties*, 14 VA. J.L. & TECH. 235, 243 (2009).

79. *J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int'l*, 534 U.S. 124, 125, 133 n.5 (2001).

80. 35 U.S.C. § 161 (2006).

81. *J.E.M. Ag. Supply, Inc.*, 534 U.S. at 132.

82. 35 U.S.C. § 163 (2006).

against further asexual reproduction of a patented variety; thus, another is not barred from *sexually* reproducing a protected variety.⁸³

In addition to the asexual reproduction requirement, the PPA requires a plant to be “new” and “distinct,”⁸⁴ and “[t]he provisions of Title 35 that apply to utility patents also apply to plant patents granted under the PPA to the extent not otherwise provided. Therefore, the provisions of Title 35 relating to novelty, utility, and non-obviousness are theoretically equally applicable to plant patents and utility patents.”⁸⁵ The PPA relaxes the typical written description required for a patent: “No plant shall be declared invalid for noncompliance with section 112 of this title if the description is as complete as is reasonably possible. The claim in the specification shall be in formal terms to the plant shown and described.”⁸⁶ Alternatively, a deposit of a biological specimen is accepted in place of the typical written description.⁸⁷

Congress introduced IP protection for certain plants in an attempt to provide incentives to invest in breeding, and allow researchers to recoup their investment.⁸⁸ “One rationale for the bill was to ‘remove the existing discrimination between plant developers and industrial inventors.’”⁸⁹ Although the PPA created new and innovative IP rights for plant developers, Congress specifically tailored a separate, narrow patent specifically for plants. Although history has taken a different course, as shown below, some argue that this Act evidences Congress’ intent to exclude sexually reproduced staple crops — which do not qualify for plant patents — from patent protection.⁹⁰

C. *The Plant Variety Protection Act of 1970: Expanding IP Rights for Plants*

Although the PPA was a significant breakthrough for the private seed industry, breeders were not satisfied with the IP protection granted to them by the PPA; the private seed industry sought a form of protection for sexually reproduced plants, meaning plants reproduced by seed.⁹¹ The ASTA drafted legislation which became known as the Plant Variety Protection Act (PVPA) and lobbied heavily for its passage.⁹² In 1970, Congress passed the

83. *Seeds of Dispute*, *supra* note 12, at 98.

84. 35 U.S.C. § 161.

85. Nicholas J. Seay, *Protecting the Seeds of Innovation: Patenting Plants*, 16 AIPLA Q.J. 418, 421 (1989).

86. 35 U.S.C. § 162 (2006).

87. *Seeds of Dispute*, *supra* note 12, at 97.

88. *See Lesser*, *supra* note 78, at 243.

89. Seay, *supra* note 85, at 420 (quoting S. Rep. No. 315, 71st Cong., 2d Sess. 1 (1930)).

90. *See Weeds, Seeds & Deeds*, *supra* note 4, at 281.

91. 7 U.S.C. § 2401(a)(6) (2003).

92. Blair, *supra* note 66, at 307.

PVPA.⁹³ In 1994, this Act was amended, further strengthening plant breeders' rights.⁹⁴

The PVPA extends IP protection to qualifying, sexually reproduced plant varieties (including tubers, but excluding fungi and bacteria).⁹⁵ "Since the 1994 amendments, the PVPA also protects 'any variety that is essentially derived from a protected variety,' . . . and 'any variety whose production requires the repeated use of a protected variety.'"⁹⁶ Although the protection created by this Act is patent-like, including the right to exclude,⁹⁷ there are some important distinctions. Rather than a patent, breeders are issued Plant Variety Protection certificates (PVP certificates).⁹⁸ The rights associated with a PVP certificate include two important exemptions, one for research purposes and one for farmers who save and sell seeds.⁹⁹ Also, unlike the PPA, the PVPA is administered by the USDA rather than the PTO.¹⁰⁰ Additionally, protection is generally granted for twenty years from the date the certificate is issued, but twenty-five years in the case of a tree or vine.¹⁰¹

To qualify for a PVP certificate, a variety must be new, distinct, uniform, and stable.¹⁰² It must also be sexually reproduced and include a description which is as complete as possible.¹⁰³ "Nothing in the PVPA . . . precludes the patenting of newly 'discovered' plants in addition to those bred by researchers."¹⁰⁴ This may include IP protection for the "discoverer" of a "crop variety used for centuries by native people in a less developed country."¹⁰⁵

Congress expanded IP protection for plants to bolster agricultural development. "The purpose of the PVPA is 'to encourage the development of novel varieties of sexually reproduced plants and to make them available to the public, providing protection available to those who breed, develop, or discover them, and thereby promoting progress in agriculture in the public interest.'"¹⁰⁶ In other words, Congress hoped "to provide developers of novel plant varieties with 'adequate encouragement for research, and for

93. 7 U.S.C. §§ 2321–2582 (2006).

94. Plant Variety Protection Act of 1970, Pub. L. No. 103–349, § 1406, 108 Stat. 3136 (1970) (amended 1994).

95. 7 U.S.C. § 2402 (2003).

96. J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int'l, 534 U.S. 124, 139–40 (2001) (quoting 7 U.S.C. §§ 2541(c)(1), 2541(c)(3)).

97. 7 U.S.C. § 2483(a)(1) (2003).

98. See Gustad, *supra* note 11, at 465.

99. *Seeds of Dispute*, *supra* note 12, at 100.

100. See *id.*

101. 7 U.S.C. § 2483(b)(1) (2003).

102. 7 U.S.C. § 2402(a)(1)–(4) (2003).

103. Gustad, *supra* note 11, at 465.

104. *Id.* at 472.

105. *Id.* at 472 n.159.

106. *Id.* at 464–65 (quoting H.R. REP. NO. 1605, 91st Cong., 2d Sess., 84 Stat. 1542 (1970), reprinted in 1970 U.S.C.C.A.N. 1793).

marketing when appropriate, to yield for the public the benefits of new varieties.’”¹⁰⁷

In the PVPA, Congress attempts to balance the investment incentives offered through IP protection with other valuable aspects of crop development through two important exemptions, the research exemption and the farmers’ exemption. The research exemption provides that “[t]he use and reproduction of a protected variety for plant breeding or other bona fide research shall not constitute an infringement of the protection provided under this Act.”¹⁰⁸ The farmers’ exemption allows farmers to continue the age-old tradition of selecting, harvesting, cleaning, and saving seed from their crop for replanting.¹⁰⁹ It also “allows farmers to make some sales of protected variety seed to other farmers.”¹¹⁰

Despite its original breadth, the scope of the farmers’ exemption was severely limited by Congress’ 1994 amendments to the PVPA¹¹¹ and by a 1995 Supreme Court decision, *Asgrow Seed Co. v. Winterboer*.¹¹² In 1990, Iowa farmers Denny and Becky Winterboer planted 265 acres of their 800-acre farm with PVP-protected Asgrow soybeans.¹¹³ This crop produced enough seed to plant 10,000 acres.¹¹⁴ Participating in a practice arguably covered by the farmers’ exemption (“brown-bag” sales)¹¹⁵ the Winterboers sold their entire soybean crop as seed.¹¹⁶ Asgrow filed suit against the Winterboers, seeking damages and a permanent injunction against selling seeds harvested from their protected varieties.¹¹⁷ While the Winterboers argued that their brown-bag sales fell within the statutory exemption,¹¹⁸ Asgrow argued “the exemption allows a farmer to save and resell to other farmers only the amount of seed the seller would need to replant his own

107. *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179, 181 (1995) (quoting 7 U.S.C. § 2581).

108. 7 U.S.C. § 2544 (2003). See also Crocker, *supra* note 24, at 261; Blair, *supra* note 66, at 313–31; Goss, *supra* note 21, at 1409–10.

109. See 7 U.S.C. § 2543 (2003).

110. *Asgrow*, 513 U.S. at 181. See also Gustad, *supra* note 11, at 465–66; David G. Scalise & Daniel Nugent, *International Intellectual Property Protections for Living Matter: Biotechnology, Multinational Conventions and the Exception for Agriculture*, 27 CASE W. RES. J. INT’L L. 83, 94–95 (1995).

111. Goss, *supra* note 21, at 1410, 1413–14.

112. *Asgrow*, 513 U.S. at 179. See also *Weeds, Seeds & Deeds*, *supra* note 4, at 290–92; Crocker, *supra* note 24, at 267–68; Blair, *supra* note 66, at 313; Goss, *supra* note 21, at 1410–14; Gustad, *supra* note 11, at 466–69. The Court decided *Asgrow* after Congress passed the 1994 amendments, but before the amendments were effective.

113. *Asgrow*, 513 U.S. at 181–82.

114. *Asgrow*, 513 U.S. at 182.

115. “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.* On average, the Winterboers’ brown-bag seed sold for \$8.70 per bushel, while seed directly from Asgrow sold for \$16.20 to \$16.80 per bushel. *Id.*

116. See *id.*

117. See *id.*

118. See *id.* at 183–84.

fields.”¹¹⁹ Looking at the language of the exemption,¹²⁰ the Court hinged its decision on “whether the Winterboers’ planting and harvesting were conducted ‘as a step in marketing’ Asgrow’s protected seed varieties for growing purposes.”¹²¹ Disagreeing with the Federal Circuit, the majority concluded that “marketing” does not require “extensive or coordinated selling activities, such as advertising, using an intervening sales representative, or similar extended merchandising or retail activities.”¹²² The Court specified that a farmer does not qualify for the exemption “if he plants and saves seeds for the purpose of selling the seeds that they produce for replanting.”¹²³ Consequently, the exemption applies only “if a farmer saves seeds to replant his acreage, but for some reason changes his plans.”¹²⁴ The Court adds, in footnote 5, that

[f]or crops such as soybeans, in which the [seed and the harvest are one and the same, this will mean enough seeds for one year’s crop on that acreage [For crops] in which the seed is not the harvest, and a portion of the crop must be permitted to overripen (‘go to seed’) in order to obtain seeds,¹²⁵

the Court accepted the practice of “growing” seeds only every four to five years, noting that

[a] vegetable farmer who sets aside protected seed with subsequent replantings in mind, but who later abandons his plan (because he has sold his farm, for example), would under our analysis be able to sell all his saved seed, even though it would plant (in a single year) four or five times his current acreage.¹²⁶

In his dissent, Justice Stevens reasons “[t]here must be a reason Congress used the word ‘marketing’ rather than the more common term ‘selling.’”¹²⁷ He believes “Congress wanted to allow any ordinary brown-bag sale from one farmer to another.”¹²⁸ The majority disagreed, however, and their interpretation of the pre-amendment statute severely limited one of the Act’s unique exemptions. This decision evidences judicial support for strong IP rights for plant breeders, at the expense of farmers.

119. *Id.* at 185.

120. A “farmer does not qualify for the exemption from infringement liability if he has ‘(3) sexually multiplied the novel variety as a step in marketing (for growing purposes) the variety.’” *Asgrow*, 513 U.S. at 186 (quoting 7 U.S.C. § 2541(3) (2006)).

121. *Asgrow*, 513 U.S. at 186–87.

122. *Id.* at 187 (quoting *Asgrow Seed Co. v. Winterboer*, 982 F.2d 486, 492 (Fed. Cir. 1992)).

123. *Asgrow*, 513 U.S. at 188.

124. *Id.* at 191.

125. *Id.* at 191 n.5.

126. *Id.*

127. *Id.* at 193 (Stevens, J., dissenting).

128. *Id.* at 194.

D. *Utility Patents: Litigation Further Expands the Scope of IP Rights for Plants*

In 2001, the United States Supreme Court solidified the growing IP protection available to plant breeders through its recognition of plants as eligible subject matter for utility patents. This section first provides a brief overview of utility patents, followed by a comparison between utility patents and PVP certificates. Finally, this section traces the judicial decisions which caused plants to migrate within the scope of utility patents.

“The Constitution grants Congress broad power to legislate to ‘promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.’”¹²⁹ Based on this grant of power, a patent board (which evolved into the present-day PTO) was established in 1790.¹³⁰ One form of patent offered by the PTO, a utility patent (UP), is available to “[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof.”¹³¹ In addition to the “new and useful” requirements, an eligible invention or discovery must be non-obvious¹³² and there must be a written description that includes

the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.¹³³

Qualifying inventions and discoveries receive patent protection for twenty years from the date on which the application for the patent was filed.¹³⁴

In regard to plants, UPs confer greater rights of exclusion than a PVP certificate.¹³⁵ First, there are no exemptions for research and development or for farmers to save seed.¹³⁶ Second, while both the PPA and the PVPA offer IP protection through a single claim on a plant or variety, multiple UPs may be issued for various aspects of a single plant, including different parts or processes, resulting in “the opportunity for greater and broader exclusionary rights.”¹³⁷ Given these advantages, plant breeders eventually

129. *Diamond v. Chakrabarty*, 447 U.S. 303, 307 (1980) (quoting U.S. CONST. art. I, § 8).

130. U.S. Nat’l Archives and Records Admin., *Guide to Federal Records: Records of the Patent and Trademark Office*, <http://www.archives.gov/research/guide-fed-records/groups/241.html> (last visited Dec. 20, 2010).

131. 35 U.S.C. § 101 (2006).

132. *Id.*; see also 35 U.S.C. § 103 (2006).

133. 35 U.S.C. § 112 (2006).

134. See 35 U.S.C. § 154(a)(2) (2006).

135. *J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int’l*, 534 U.S. 124, 143 (2001).

136. *Id.* at 129 n.1; *Ex parte Hibberd*, No. 645–91, 227 U.S.P.Q. 443, 446 (B.P.A.I. Sept. 24, 1985).

137. See *Ex parte Hibberd*, 227 U.S.P.Q. at 446.

sought UP protection for their crop developments. This effort was controversial, as UPs “cannot issue for the discovery of the phenomena of nature.”¹³⁸

Congress has never specifically qualified plants for UP protection, and legislative intent is debatable. However, plants are currently eligible for UP protection in addition to plant patents and Plant Variety Protection (PVP) certificates. Unlike the IP rights granted under the PPA and the PVPA, plants migrated into the realm of UP protection via the judicial branch.

In 1980, the United States Supreme Court issued a landmark patent decision, *Diamond v. Chakrabarty*.¹³⁹ In a five-four opinion, the Court found a live, genetically engineered bacterium as eligible subject matter for a utility patent. The majority concluded that Chakrabarty’s micro-organism, engineered to break down multiple components of crude oil, constituted a “manufacture” or “composition of matter” within the meaning of the statute.¹⁴⁰ The majority found that Congress’ enactment of the PPA and the PVPA does not demonstrate a congressional understanding that living things are outside the scope of utility patents.¹⁴¹ The dissent disagreed, stating “[t]hese Acts strongly evidence a congressional limitation that excludes bacteria from patentability.”¹⁴²

Following the Supreme Court’s decision in *Chakrabarty*, the Board of Patent Appeals and Interferences addressed the issue of granting utility patents for plants, including seeds, plants, and tissue cultures.¹⁴³ Referencing *Chakrabarty*, the Board found that “neither the PPA nor the PVPA expressly excludes any plant subject matter from protection under Section 101 [the UP section].”¹⁴⁴ The Board concluded that plants which meet the specific requirements of Section 101 may concurrently receive plant-specific IP protection (under the PPA or the PVPA) and UP protection.¹⁴⁵ Following this decision, it became “the unbroken practice of the PTO . . . to confer utility patents for plants.”¹⁴⁶

Sixteen years later, in 2001, plants’ eligibility for UP protection was challenged and the issue reached the Supreme Court.¹⁴⁷ In a six-two decision, the Court found that the PPA and the PVPA do not provide exclusive forms of IP protection for plants; citing *Chakrabarty*, the Court held that plants may be issued UPs.¹⁴⁸ Unlike the majority, the dissent distinguished

138. See *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948).

139. 447 U.S. 303 (1980).

140. *Id.* at 305, 307–10.

141. *Id.* at 310–12.

142. *Id.* at 318–19 (Brennan, J., dissenting).

143. Ex parte Hibberd, No. 645–91, 227 U.S.P.Q. 443, 443 (B.P.A.I. Sept. 24, 1985)

144. *Id.* at 445.

145. See *id.* at 446.

146. *J.E.M. Ag. Supply, Inc. v. Pioneer Hi-Bred Int’l*, 534 U.S. 124, 131 (2001).

147. *Id.* at 124.

148. *Id.* at 126–27, 130–32.

the holding in *Chakrabarty* from the question presented in the case at hand, *J.E.M. Ag. Supply v. Pioneer Hi-Bred*, noting that bacteria are not the subject of either the PPA or the PVPA.¹⁴⁹ The dissent compellingly analyzes the language, structure, history, and purpose of the plant-specific Acts and concludes that it is “clear that the Utility Patent Statue does not apply to plants. Nothing in *Chakrabarty* holds to the contrary.”¹⁵⁰ Since the Supreme Court handed down this decision, Congress has not provided a different answer to the question of whether plants are eligible for UP protection. Therefore, plants are currently eligible for UP protection, as well as PPA and PVPA protection.

III. CURRENT INTELLECTUAL PROPERTY PROTECTIONS ARE CONTRIBUTING TO THE RAPID DECLINE IN CROP GENETIC DIVERSITY

There is a connection between IP rights in plants and the erosion of genetic diversity. This section examines this relationship in the context of the United States. As one professor notes,

[A]s private companies move into the seed and agricultural sector, they avail themselves of different types of intellectual-property protection to secure their investment. . . . [T]he presence of intellectual-property protection encourages certain types of activity and investment that, while not antagonistic to biodiversity, may give rise to patterns that erode biodiversity.¹⁵¹

Given the precarious state of crop genetic diversity in the U.S., it would be prudent for the legislature to seriously consider how modern IP protection for plants is contributing to the destabilization of the nation’s food supply, and to readjust IP rights in plants to better serve the goals of the patent system.

The very guidelines for IP protection promote the development of uniform crops. The United States has developed a “legal regime . . . [which treats] uniform varieties bred for industrial agriculture as intellectual property.”¹⁵² In other words, breeders are encouraged to cultivate uniform crops with stable traits; in fact, these characteristics are necessary for breeders to reap the benefits of IP protection. For example, breeders may develop patentable plants by crossing “plants with desirable characteristics and then inbreeding the resulting plants for several generations until the resulting plant line is homogenous.”¹⁵³ In order to benefit from the financial incentives of IP protection, plant breeders are likely to cultivate monocultures, rather than diverse crops. Additionally, IP protection incentivizes redirec-

149. *Id.* at 147–48 (Breyer, J., dissenting).

150. *Id.* at 156 (Breyer, J., dissenting).

151. *Seeds of Dispute*, *supra* note 12, at 159.

152. *Id.* at 130.

153. *J.E.M. Ag. Supply*, 534 U.S. at 127.

tion of research to cash crops, while other crop varieties are neglected.¹⁵⁴ Again, the result is a loss in crop genetic diversity.

IP protection is intended to encourage innovation by protecting the fruits of one's labor. Despite the goals of IP law, there is concern that the current array of IP protection for plants is actually inhibiting innovation.¹⁵⁵ By decreasing plant breeders' access to germplasm, IP protection tends to decrease development of new varieties, and thus overall crop diversity.¹⁵⁶ Even the ASTA, the seed industry lobbyist, acknowledges problems with utility patents "locking up" germplasm.¹⁵⁷ Some scholars believe the United States' web of IP protection for plants is creating an "anti-commons," described as "a situation where there are too many parties holding a right to exclude with respect to a particular property/resource, thereby giving rise to underutilization of the property or resource."¹⁵⁸ Under current IP protections, researchers and farmers are excluded from working with patented plant elements and processes, likely stalling crop development. Proponents of strong IP protection for plants argue that such protection provides incentive for private plant breeding research, with the ultimate goal being better seed cultivars and varieties for farmers.¹⁵⁹ The "knowledge-property systems [of IP law, however,] incentivize and protect mass-market, seller-based innovation," dismissing user innovation.¹⁶⁰ This is especially unfortunate in agriculture, as the shift of farmers from developers to consumers is linked with the loss of crop genetic diversity, as, unlike seed companies, farmers adapted crops to their particular ecological niche rather than pursuing a one-size-fits-all seed.¹⁶¹

The development and continual increase of IP protection for plants has resulted in a skewed balance of public and private benefits, with the balance strongly favoring private benefits.¹⁶² Following the Supreme Court's decision in *Chakrabarty*, there was increased investment in the seed industry,¹⁶³ coupled with a "merger-mania . . . 'driven primarily by the need to avoid high transaction costs associated with [clearing] multiple intellectual prop-

154. Keith Aoki, "Free Seeds, Not Free Beer": Participatory Plant Breeding, Open Source Seeds, and Acknowledging User Innovation in Agriculture, 77 *FORDHAM L. REV.* 2275, 2298 (2009) [hereinafter *Free Seeds, Not Free Beer*].

155. See Peter Carstensen, *Post-Sale Restraints via Patent Licensing: A "Seedcentric" Perspective*, 16 *FORDHAM INTELL. PROP. MEDIA & ENT. L.J.* 1053, 1079 (2006); Goss, *supra* note 21, at 1399.

156. See Goss, *supra* note 21, at 1423; Justin T. Rogers, *The Encroachment of Intellectual Property Protections on the Rights of Farmers*, 15 *DRAKE J. AGRIC. L.* 149, 165 (2010).

157. Goss, *supra* note 21, at 1428–29.

158. *Free Seeds, Not Free Beer*, *supra* note 154, at 2296 (citing Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 *HARV. L. REV.* 621 (1998)).

159. Blair, *supra* note 66, at 298.

160. *Free Seeds, Not Free Beer*, *supra* note 154, at 2276–77.

161. See *id.* at 2275.

162. Lesser, *supra* note 78, at 236.

163. *Seeds of Dispute*, *supra* note 12, at 136; see *Weeds, Seeds & Deeds*, *supra* note 4, at 252.

erty rights.’”¹⁶⁴ As companies merge, competition is reduced, and the resulting monopolies may contribute to genetic uniformity and erosion.¹⁶⁵ While seed companies profit from IP protection for their crop developments, farmers and consumers pay a high price. The public cost of UP protection for economically important crops is “preliminary estimated to be in excess of \$150 million annually for soybeans and cotton, and is not clearly offset by additional public benefits. Indeed, the role of UP in further limiting entry to plant breeding by restricting access to germplasm can have greater long term public costs.”¹⁶⁶

To serve the patent system’s goals of promoting innovation and furthering the public good, Congress should reexamine the contours of IP protection for plants and work to ensure that access to these valuable resources is not unduly restricted. Congress should keep in mind that agribusiness giants are not the only innovators in seed development; farmers have been contributing to this field since the practice of agriculture took root, and their wisdom should not be overlooked.

IV. INEQUITABLE RIGHTS: IP LAW’S SELECTIVE RECOGNITION OF AGRICULTURAL INNOVATION AND LABOR

In agriculture, where the current diversity of PGRs represents thousands of years of human ingenuity and labor,¹⁶⁷ IP law fosters a distorted balance between initial and follow-on innovation.¹⁶⁸ The IP system focuses on a particular moment and individual, rewarding a specific development while minimizing the agency and intervention of thousands.¹⁶⁹ This failure to recognize collective and incremental labor¹⁷⁰ is particularly detrimental in the context of agriculture, where “farming practices developed around the globe and over millennia, [while] plant breeding as an organized industry has only been in existence for a little over a century.”¹⁷¹ The consequences of current IP protections deplete crop genetic diversity around the globe and raise serious concerns about justice and fairness. This section presents a brief description of some of the inequities, abroad and within the nation’s borders, stemming from the United States’ IP practices related to PGRs.

164. *Free Seeds, Not Free Beer*, *supra* note 154, at 2297–98 (alteration in original) (quoting Janet Elizabeth Hope, Open Source Biotechnology 50 (Dec. 2004) (unpublished Ph.D. dissertation, Austl. Nat’l Univ.) (available at http://papers.ssm.com/sol3/papers.cfm?abstract_id=755244)).

165. Goss, *supra* note 21, at 1423.

166. Lesser, *supra* note 78, at 272.

167. *Seeds of Dispute*, *supra* note 12, at 110.

168. *Free Seeds, Not Free Beer*, *supra* note 154, at 2276 n.2.

169. *Weeds, Seeds & Deeds*, *supra* note 4, at 258–59.

170. *Id.* at 313.

171. *Free Seeds, Not Free Beer*, *supra* note 154, at 2302.

A. *International Asymmetry*

As the legal status of PGRs has shifted, so has their distribution around the globe. In general, these resources have flowed out of the historically gene-rich regions of the equatorial Southern Hemisphere and into the industrial nations of the North. This shift has not happened in an equitable manner. Despite ten thousand years of human intervention,¹⁷² the genetic resources produced in the South have typically been described as “raw” materials.¹⁷³ With this mindset, Northern industrial nations have regularly acquired these resources without offering any compensation to plant breeders.¹⁷⁴ Once in the hands of industrial nations, these “raw” genetic resources are “worked” “to produce staple crops (and, more recently, plants and seeds) that are protected by intellectual-property laws.”¹⁷⁵ Through this practice, it is possible “that people in less developed areas will be denied recognition for the use of plants they have been using for generations . . . [as there] is the possibility that more developed countries will patent their native resources.”¹⁷⁶

One modern development is the emergence of seed banks, which store large amounts of germplasm in an effort to preserve PGRs.¹⁷⁷ A disproportionate amount of these seed banks have been established in the industrialized North.¹⁷⁸ As a result, gene-poor nations such as the United States have become

a net exporter of seed germplasm to supposedly ‘gene-rich’ countries. Conversely, the least-developed countries . . . are net importers of seed germplasm, left dependent on access to seed banks in the industrial nations, even though they may have been the sources of the very seeds now collected in seed banks.¹⁷⁹

As one scholar summarized,

[t]he skewed asymmetry whereby supposedly “primitive” plant germplasm is legally constructed as the “common heritage of (hu)mankind” allows removal from genetically rich regions of the world for the cost of gathering a few samples. These “free” genetic resources then flow into the gene banks of the North and laboratories of agrichemical giants, where their diverse traits improve and safeguard proprietary and patented cultivated varieties that are then sold at a premium in newly-created markets fueling

172. Rogers, *supra* note 156, at 160.

173. See *Seeds of Dispute*, *supra* note 12, at 107.

174. See *id.*

175. *Id.*

176. Gustad, *supra* note 11, at 472, 472 n.159.

177. See *Weeds, Seeds & Deeds*, *supra* note 4, at 308.

178. *Seeds of Dispute*, *supra* note 12, at 107–08.

179. *Id.* at 108.

industrial agriculture in the countries where the genetic resources originated.¹⁸⁰

The common distinction between “raw” and “worked” germplasm does not provide an accurate understanding of the agricultural contributions of our ancestors or present-day farmers. For millennia, farmers have been improving crop varieties, developing the genetic resources on which plant breeders now rely. Agricultural communities throughout history have produced PGRs of great value, and recognition of their efforts is warranted.

The rubber tree provides an economically poignant example. As noted in Part I, in the late eighteenth century, Brazil enjoyed 95% of the world’s rubber market.¹⁸¹ In an attempt to protect this resource, the government banned the export of rubber tree germplasm.¹⁸² However, British agents managed to smuggle out a few rubber seedlings.¹⁸³ Britain subsequently established successful rubber plantations in some of their equatorial colonies, and their evasion of Brazilian law continues to impact today’s world economy: in the twenty-first century, “the global rubber industry is dominated by British and U.S. companies that get their supplies of raw latex from former colonial possessions.”¹⁸⁴ Similar exploitation happens with staple crops, as industrial nations including the United States have set an inequitable double standard, acquiring PGRs from underdeveloped nations without compensation while demanding IP protection for their own crop developments.

B. *Domestic Inequities*

As described in Part II of this Note, United States farmers played a crucial role in adapting diverse germplasm to the nation’s unique ecosystems. Their efforts helped to establish food security and a strong agricultural base for the country. Despite countless contributions to crop development, these very same stakeholders — farmers — are now paying the price of IP protection, while seed companies reap the benefits.

In the United States, the seed industry is dominated by two agribusiness giants: Monsanto and DuPont.¹⁸⁵ Monsanto Company manufactures the popular ROUNDUP® herbicide, as well as ROUNDUP READY® genetic-modification technology, which enables modified seeds to withstand ROUNDUP® herbicide and allows the herbicide to be “sprayed over the top of an entire field, killing the weeds without harming the ROUNDUP READY®” crops.¹⁸⁶ Monsanto licenses their “ROUNDUP READY® tech-

180. *Weeds, Seeds & Deeds*, *supra* note 4, at 312.

181. *Id.* at 263.

182. *Id.*

183. *Id.*

184. *Id.*

185. Rogers, *supra* note 156, at 159.

186. *Monsanto Co. v. McFarling*, 363 F.3d 1336, 1338 (Fed. Cir. 2004).

nology through two interrelated licensing schemes.”¹⁸⁷ First, it licenses its patented gene to seed companies, in exchange for a royalty or “technology fee.”¹⁸⁸ Second, it requires seed companies to execute licenses, or “Technology Agreements,” between Monsanto and the seed companies’ farmer customers.¹⁸⁹ These Technology Agreements include a no-replant restriction, meaning farmers must buy new seed from a licensed seed company each year, rather than following the age-old tradition of seed saving.¹⁹⁰ Monsanto’s Technology Agreements have been challenged in court,¹⁹¹ and thus far, “[d]espite the obvious exploitation of buyers by this form of license, the Federal Circuit found no objection to it.”¹⁹²

Farmers worry about the impact of increased IP rights on “the structure of farming practice and their relationship with seed suppliers.”¹⁹³ With seed developers having legal ownership of PGRs, farmers experience “a general reduction in the availability of a variety of crops”¹⁹⁴ and “lack a voice in the decisions affecting the direction of future research regarding the development of new plants.”¹⁹⁵ Farmers are being transformed from developers into mere consumers, and society is rapidly losing valuable farmer know-how.¹⁹⁶

Techniques such as no-replant policies are also increasing production costs for farmers.¹⁹⁷ For example, the royalty or “technology fee” paid by a seed company to a patent holder for use of a patented trait in soybean seeds may be \$6.50 for every fifty-pound bag of seed containing the trait,¹⁹⁸ while farmers may be required to purchase the same amount of seed containing the patented trait for up to \$14.¹⁹⁹ If farmers were allowed to save patented seed for replanting, and pay a royalty to the patent holder, they could save approximately \$7.50 per bag. The patent holder would still receive the same compensation, diminishing only the current economic benefit to seed companies. Interestingly, Monsanto itself owns several subsidiary seed companies — in the soybean market, for example, its subsidiaries “comprise approximately 20 percent of the market for ROUNDUP READY®”

187. *Id.* at 1339.

188. *Id.*

189. *Id.*

190. *Id.*; Carstensen, *supra* note 155, at 1071.

191. *See* Monsanto Co. v. Scroggs, 459 F.3d 1328 (Fed. Cir. 2006); *McFarling*, 363 F.3d at 1336.

192. Carstensen, *supra* note 155, at 1072.

193. Goss, *supra* note 21, at 1426.

194. Gustad, *supra* note 11, at 471.

195. *Id.*

196. *See* *Free Seeds, Not Free Beer*, *supra* note 155, at 2298.

197. *See* Lesser, *supra* note 78, at 237.

198. *Monsanto Co. v. McFarling*, 363 F.3d 1336, 1339 (Fed. Cir. 2004).

199. *See* *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179, 182 (1995) (a bushel of soybeans is approximately sixty pounds, resulting in a fifty-pound bag costing up to \$14).

seeds.²⁰⁰ Allowing saved seed also “provides a cap on the pricing freedom of sellers of certified (new) seed.”²⁰¹ In contrast, “[w]hile a seed company has an absolute monopoly on a patented seed variety, there is no competition to drive down the price, which allows the seed company to charge the maximum possible price that the buyer is willing to pay.”²⁰² Decreasing the seed industry’s concentration of power would benefit farmers, as increasing seed costs may threaten the viability of small farms.²⁰³

Considering the invaluable crop developments made by generations of farmers around the world, Congress should act in the interest of equity and structure agricultural IP rights in such a way as to acknowledge past labor and innovation of these stakeholders, and encourage future contributions. Farmers and society would both benefit from greater farmer involvement in seed selection, rather than leaving the power in the hands of seed companies.

V. CONCLUSION: A PLEA TO CONGRESS

In *Chakrabarty*, the Supreme Court acknowledged that “genetic research and related technological developments . . . may result in a loss of genetic diversity.”²⁰⁴ While recognizing that the eligibility of *Chakrabarty*’s bacteria for a patent “may determine whether research efforts are accelerated by the hope of reward or slowed by want of incentives,”²⁰⁵ the Court clarified its role of interpreting the statute²⁰⁶ and called on the legislature to analyze this “matter of high policy.”²⁰⁷ Congress has not responded since *Chakrabarty* or its progeny.

The time is ripe for Congress to heed the Court’s call. This Note urges Congress to contrast the principles behind the patent system to the present-day tapestry of IP protection for plants. In light of the modern crisis surrounding PGRs, as well as agriculture’s unique historical development, the author asks Congress to re-articulate the contours of IP protection for plants, evaluating proposals in light of how well they (1) protect crop genetic diversity and (2) equitably recognize the contributions and innovations of various stakeholders. To begin the dialogue, the author suggests four possibilities. First, in order to increase access to germplasm for crop development, Congress could create a research exemption for plants covered by UPs. Second, no-replant policies could be prohibited. By creating a system in which farmers make equitable royalty payments to patent holders in ex-

200. *McFarling*, 363 F.3d at 1339.

201. Carstensen, *supra* note 155, at 1072.

202. Rogers, *supra* note 156, at 160.

203. See Goss, *supra* note 21, at 1399, 1425.

204. *Diamond v. Chakrabarty*, 447 U.S. 303, 316 (1980).

205. *Id.* at 317.

206. *Id.* at 318.

207. *Id.* at 317.

change for the ability to save seeds year to year, Congress could protect the interests of both patent holders and farmers. Third, Congress could protect farmers who opt not to plant genetically modified seeds, including organic farmers, by passing a law which clearly holds patent holders accountable for the spread of their genetically modified crops. If a patented trait contaminates a farmer's field, the farmer should receive compensation for the damage done to his or her enterprise, and not be held strictly liable for patent infringement.²⁰⁸ Finally, Congress could reexamine the distinction between "raw" and "worked" germplasm. Considering the incremental developments made by countless people throughout the history of agriculture, Congress could consider either holding the germplasm in seed banks as the common heritage of humankind, rather than as sovereign national property, or create a system for compensating the communities which originally developed the multitude of PGRs now incorporated into commodified seeds.

These ideas merely begin the conversation. The author begs Congress to address the question of wise IP protection for plants before the world loses the genetic resources necessary to cope with future environmental stresses and unforeseen pests and diseases — before the time bomb in our farmers' fields leads us to a rendezvous with extinction.

208. For a Canadian case addressing this question, and finding the farmer strictly liable, see *Monsanto Canada Inc. v. Schmeiser*, [2004] 1 S.C.R. 902 (Can.).