

FIELDS OF CHANGE: MUNICIPAL GMO REGULATION AND THE FEDERAL TAKINGS CLAUSE

INTRODUCTION

Scientific advances in the field of crop modification have ushered in an era of increased skepticism concerning the social, environmental, and economic value of genetically modified crops. Food items derived from these crops have permeated the market as quickly as they have the collective social consciousness, inspiring public debates concerning their benefits and detriments. Reacting to growing health and environmental concerns regarding genetically modified organisms (GMOs), several states, counties, and cities have either enacted or considered enacting regulations banning their growth. These bans—though presumably based on legitimate public welfare concerns—do not escape constitutional demands. The Takings Clause of the Fifth Amendment proposes one such demand.

The municipal regulation of genetically modified crops affects a variety of interests. Many farmers rely on GMO technology for both their economic livelihood and sustenance. The biotechnology industry—the patent holders of GMO technology—has an interest in using land to develop GMOs in field trials to test the viability of their patented genetic sequences. Successful field trials yield marketable GMO seeds to commercial seed sellers, who have an interest in bringing these products to an open market. A municipal GMO ban invariably burdens each of these interests, even if principally aimed at restricting a particular land use. Though the Takings Clause protects against inequitable governmental intrusion on private property, this Note determines that a municipal GMO ban would not diminish these interests substantially enough to warrant a practicable takings claim.

This Note examines the interrelationships between municipal GMO bans and the constitutional requirements of the Takings Clause of the Fifth Amendment. Proceeding in four parts, this Note seeks to analyze whether a federal court would uphold claims for just compensation against a city, county, or state that has banned GMO growth. Part I examines the history and science of GMOs and their potential health and economic threats, considering municipal attempts to ban their introduction and dissemination. Part II briefly explores several recent county and state efforts to ban genetically modified organisms. Part III discusses federal regulatory takings jurisprudence in the context of a ban on GMOs. Finally, Part IV addresses whether such a ban warrants just compensation, and to whom, under the constitutional standard.

I. GENETICALLY MODIFIED ORGANISMS: PERCEIVED THREATS AND BANS

A. What Are Genetically Modified Organisms?

Humans have been modifying the genetic composition of crops for centuries.¹ Despite this, there is a tendency to approach GMOs with skepticism. The typical consumer often feels that products containing GMOs are, in some sense, unnatural.² As confusion remains about exactly what a GMO is, it is important to take a brief look at how the concept has transformed due to recent technological advancements.

In antiquity, rudimentary forms of genetic modification began when farmers saved seeds from crops producing the hardiest specimens, providing the highest yield, or being the most disease resistant.³ The advent of Gregor Mendel's discoveries of predictable genetic inheritance in the 1800s illuminated these crude seed-saving practices by providing elementary knowledge of the transfer of genetic information.⁴ Today, the selective breeding techniques pioneered by Mendelian genetics have improved virtually every food crop.⁵

In the late twentieth century, Mendelian breeding techniques began to give way to more sophisticated—and often criticized⁶—engineering processes. These modern processes involve inserting desirable genes from one organism into another to produce a desired trait in the recipient organism.⁷ One of the primary differences between modern engineering

1. Gregory N. Mandel, *The Future of Biotechnology Litigation and Adjudication*, 23 PACE ENVTL. L. REV. 83, 84 (2006).

2. See Erik Benny, "Natural" Modifications: The FDA's Need to Promulgate an Official Definition of "Natural" That Includes Genetically Modified Organisms, 80 GEO. WASH. L. REV. 1504, 1506 (2012) (noting how the label "natural" does not necessarily mean what it implies).

3. Mandel, *supra* note 1, at 84.

4. *Id.*

5. *Id.* at 84.

6. See, e.g., Stephanie E. Cox, *Genetically Modified Organisms: Who Should Pay the Price for Pollen Drift Contamination?*, 13 DRAKE J. AGRIC. L. 401, 405–08 (2008) (highlighting the problems with GMO pollen drift and its effects on other crops); Margaret Sova McCabe, *Superweeds and Suspect Seeds: Does the Genetically-Engineered Crop Deregulation Process Put American Agriculture at Risk?*, 1 U. BALT. J. LAND & DEV. 109, 155 (2012) (concluding the framework for governing GMO crops is antiquated and producing caustic externalities); Rebecca M. Bratspies, *Is Anyone Regulating? The Curious State of GMO Governance in the United States*, 37 VT. L. REV. 923, 940–41 (2013) (criticizing the lack of federal oversight for the growth and consumption of GMOs); Allison Kopicki, *Strong Support for Labeling Modified Food*, N.Y. TIMES (July 27, 2013), http://www.nytimes.com/2013/07/28/science/strong-support-for-labeling-modified-foods.html?_r=0 (suggesting a strong support for labeling of GMO food products due to mounting skepticism regarding their health effects).

7. Mandel, *supra* note 1, at 85.

techniques and those used in selective breeding is that the transplanted genetic material does not necessarily have to come from an organism of the same species, but may come from the DNA of a plant, animal, insect, bacterium, or virus that has a desired trait.⁸ The artificial introduction of genetic information into an organism's genetic makeup uses recombinant DNA (rDNA) technology,⁹ or more colloquially, "biotechnology."¹⁰ The organisms subject to these cellular-level alterations can be referred to as "genetically modified," "genetically engineered," "bioengineered," "transgenic,"¹¹ or for the purposes of this Note a GMO.

Today, the most commonly grown GMO crops are corn, soybean, cotton, and canola.¹² Indeed, due to the relative ease of production and the economic benefits to the producer, genetically modified crops are becoming more "varied and pervasive."¹³ These GMOs produce a variety of agricultural benefits including pest resistance, herbicide tolerance, increased crop yield, and lower production cost.¹⁴ All of these attributes alleviate the burdens on the producer and supplier of agricultural goods by reducing crop losses. One of the more famous—or perhaps infamous¹⁵—examples of a pest resistant GMO is Bt corn.¹⁶ Corn and other crops engineered with *Bacillus thuringiensis* (Bt), a common soil bacteria, produce proteins known as Bt toxins that kill certain insects.¹⁷ Newer advancements in genetic engineering are certain to enable agriculturalists to produce more nutritious foods, as well as plants that can express different pharmaceutical properties such as vaccines, vitamins, and other industrial

8. *Id.*; see also *Ctr. for Food Safety v. Vilsack*, 718 F.3d 829, 835 (9th Cir. 2013) (noting that "plant pest" bacterium may be used as a part of the engineering process to transfer genetic material from one organism to another and remain a part of the GMOs genetic code).

9. Cox, *supra* note 6, at 402.

10. Mandel, *supra* note 1, at 85.

11. *Id.*

12. Cox, *supra* note 6, at 402.

13. Mandel, *supra* note 1, at 87.

14. *Id.*

15. See Rebecca Bratspies, *The Illusion of Care: Regulation, Uncertainty, and Genetically Modified Food Crops*, 10 N.Y.U. ENVTL. L.J. 297, 304 (2002) ("A significant percentage of corn and cotton planted in the United States is genetically modified to express Bt toxins.").

16. See *In re StarLink Corn Products Liab. Litig.*, 212 F. Supp. 2d 828 (N.D. Ill. 2002) (explaining litigation surrounding the failure of a Bt corn manufacturer to comply with EPA labeling requirements).

17. Bratspies, *supra* note 15, at 304.

compounds.¹⁸ Apart from genetically modified crops, genetic engineering also promises advancements in the field of genetically enhanced fauna.¹⁹

B. The Externalities of Genetic Engineering

Despite genetic engineering's agricultural promise, GMOs contain significant unanticipated harms. In some instances, these harms have been so dire as to force municipalities to ban the growth of GMO crops altogether,²⁰ which may in due course be subject to a takings challenge.²¹ These perceived harms deserve a brief discussion and are divided into two categories: (1) human health and economic; and (2) environmental impacts.²²

1. Human Health and Economic Impacts

The cross-contamination of GMO DNA into food crops is one of the greatest consumer concerns.²³ Apart from the economic harms that GMO cross-contamination may cause to the organic farming industry due to pollen drift,²⁴ experimental GMOs that the Food and Drug Administration (FDA) has not yet approved for human consumption contaminating food crops is a distinct threat to human health due to unknown long-term health effects.²⁵ The 2002 *In re StarLink Corn Products Liability Litigation* case highlights why this threat is so perceptible.²⁶ In this case, genetically modified corn was found to have contaminated corn used in taco shells, though the source of the contamination could not be identified.²⁷ Aventis,

18. Mandel, *supra* note 1, at 87.

19. *See id.* at 88 (discussing developments in genetically engineered fish and mammals to produce various traits such as disease resistance, cold tolerance, increased growth rate, and reduced fat levels); George Kimbrell & Paige Tomaselli, *A "Fisheye" Lens on the Technological Dilemma: The Specter of Genetically Engineered Animals*, 18 ANIMAL L. 75, 76–83 (2011) (discussing the drawbacks of the impending FDA approval of transgenic salmon in 2011).

20. *See* discussion *infra* Part II.

21. *See* discussion *infra* Parts III–IV.

22. *See* Mandel, *supra* note 1, at 89 (suggesting the scientific risks are generally divided into these two categories).

23. Cox, *supra* note 6, at 402.

24. *See id.* at 406–07 (discussing how GMO pollen drift may affect organic farming, although contamination may not necessarily jeopardize a farmer's USDA organic certification). Human health and economic impacts need not be construed as mutually exclusive and are often inextricable.

25. *Id.* at 404; *see also* Mandel, *supra* note 1, at 89 (noting that another health-related effect of gene insertion is the violation of religious or dietary restrictions).

26. *See In re StarLink Corn Products Liab. Litig.*, 212 F. Supp. 2d 828, 833–35 (N.D. Ill. 2002).

27. *Id.*; *see also* Cox, *supra* note 6, at 411 (discussing the facts of the *StarLink* case).

the corporate owner of StarLink, became responsible for the cost of product recalls, settlements with corn farmers who suffered depressed prices from the mistake, and settlements with consumers who allegedly suffered allergic reactions when they consumed the tainted corn.²⁸

GMO cross-contamination causing allergic reactions when contaminated crops are consumed is particularly threatening.²⁹ Genetic modification causes the new expression of proteins, which run the risk of expressing allergens.³⁰ This threat is distinct in both GMO crops and conventional food crops contaminated with GMO pollen.³¹ Consumption of crops expressing these genes may cause anaphylactic shock or in extreme cases death.³² The threat of allergenicity ““is considered one of the most difficult aspects in assessing the safety of transgenic products””³³ as ““there are no reliable ways to test [GMO] foods for allergies.””³⁴

The introduction of GMO crops has also imposed burdensome legal problems on farmers.³⁵ Many genetic engineering processes and products receive patent protection,³⁶ which has been the source of litigation for more than a decade.³⁷ Because intent is not an element of patent infringement claims, patent holders can sue farmers for genetic contamination resulting from GMO pollen drift.³⁸ In this same vein, GMO contamination of food exports has caused international legal issues because international trading

28. Cox, *supra* note 6, at 411–12.

29. See Mandel, *supra* note 1, at 89–90.

30. *Id.* at 89.

31. See *id.* at 90 (remarking that pollen drift is a common method of cross-contamination, postulating that the more GMO crops that are grown, the more likely the incidence of cross-contamination, and concluding that GMOs with pharmaceutical or industrial compounds may be particularly damaging in this respect).

32. *Id.* at 89.

33. *Id.* at 90.

34. Cox, *supra* note 6, at 404 (quoting Debra M. Strauss, *The International Regulation of Genetically Modified Organisms: Importing Caution into the U.S. Food Supply*, 61 FOOD & DRUG L.J. 167, 171 (2006)).

35. See Benjamin Ikuta, *Genetically Modified Plants, Patents, and Terminator Technology: The Destruction of the Tradition of Seed Saving*, 35 OHIO N.U. L. REV. 731, 740–41 (2009) (explaining some of the intellectual property issues brought about by GMOs).

36. See *id.* at 737–38 (providing a terse discussion of patent protection of GMOs).

37. See *id.* at 740 (quoting A. Bryan Endres, *State Authorized Seedsaving: Political Pressures and Constitutional Restraints*, 9 DRAKE J. AGRIC. L. 323, 340 (2004)) (“[B]y 1999, Monsanto filed more than 475 lawsuits against farmers for patent infringement and violation of technology user agreements.”).

38. *Id.* at 741.

partners have refused exports containing GMOs, directly harming farmers who may have been unaware of any contamination.³⁹

2. Environmental Impacts

GMO gene flow may equally have a detrimental impact on the surrounding environment. Wild plants and animals, like food crops, may be as susceptible to the unanticipated effects of pollen drift.⁴⁰ Nonsexual transfer of GMO genetic materials, such as through a bacterial or viral medium, may also put wild plants at risk of contamination.⁴¹ Though the effects of gene transfer on wildlife may be indirect, the effects on ecology as a whole may be more substantial should these plants develop invasive qualities due to their new genetic makeup.

The release of a transgenic organism itself into a natural environment matches the threat of engineered DNA contaminating wild organisms.⁴² These presumably genetically superior species—developed to withstand dire environmental conditions—may have a competitive advantage over native species, causing in some instances substantial disruption in biological diversity⁴³ or even extinction in some fragile ecosystems.⁴⁴ This may be particularly true in the case of genetically modified animals—or those that evolve after developing resistance to plant produced pesticides⁴⁵—that may more rapidly outcompete their non-modified counterparts.⁴⁶

39. See McCabe, *supra* note 6, at 111 (discussing the economic impacts of the *Liberty Link Rice* case).

40. Mandel, *supra* note 1, at 90.

41. *Id.*

42. See Cox, *supra* note 6, at 404 (describing the potential for genetically modified crops to enter into threatened or endangered species' habitats and potentially destroy beneficial insects or create resistant insects).

43. See *id.* (suggesting environmental concerns over the reduction of biological diversity).

44. Mandel, *supra* note 1, at 90–91.

45. See Bratspies, *supra* note 15, at 306–07 (suggesting that one of the biggest environmental threats is the evolution of Bt resistant insects, which will in turn become pervasive and cause an increase in pesticide use and accompanying environmental degradation). In Puerto Rico, which acts as a field test site for many new GMO crops, the fall armyworm became so resistant to Bt maize that producers were forced to remove the crop from the island. See Johnathan M. Babcock et al., *Discovery and Characterization of Field Resistance to Bt Maize: Spodoptera frugiperda (Lepidoptera: Noctuidae) in Puerto Rico*, 103 J. ECON. ENTOMOLOGY 1031, 1031 (2010), available at <http://esa.publisher.ingentaconnect.com/content/esa/jee/2010/00000103/00000004/art00003> (click “Download” link) (discussing how the fall armyworm located in Puerto Rico—which acts as a field test site for many new GMO crops—became so resistant to Bt maize that producers were forced to remove the crop from the island).

46. Bratspies, *supra* note 15, at 306–07.

Increased pesticide and herbicide use may also result from the increased use of GMO technology. Though many crops are modified to express pesticidal properties,⁴⁷ the use of traditional pesticides has only appeared to increase.⁴⁸ This is problematic both because of the effects increased pesticide use may have on human health and the increased incidence of insect resistance to plant produced protectants.⁴⁹ Analogously, species of plants known as “superweeds”—weed plants resistant to glyphosate, an active ingredient in commercial herbicides—have appeared in more than twenty states.⁵⁰ These weeds are particularly difficult to control not only because of their growth rate, but because they force farmers to use increasingly more potent herbicides, which foster even more substantive resistances.⁵¹

II. MUNICIPAL EFFORTS TO BAN GENETICALLY MODIFIED ORGANISMS

The fear of adverse health and environmental effects has spurred several counties to propose or enact legislation banning the planting of GMO crops. This section will examine some of the efforts to ban GMOs and the reasoning, if any, the county supplied to justify their efforts.⁵² Ultimately, the legitimacy of a municipal taking under the constitutional standard depends upon whether the condemnation action is undertaken for a “public use.”⁵³ This discussion may bear some relevance on whether a taking has actually occurred.

A. California

Several California counties have enacted GMO crop bans. In 2004, Mendocino, Marin, and Trinity Counties all enacted a GMO ban, each

47. See, e.g., *id.* at 307 (distinguishing Bt spray applications and Bt crops, the latter of which constantly produce high doses of Bt toxins).

48. See Bratspies, *supra* note 6, at 924 (suggesting that pesticide use has not only increased, but “skyrocketed”).

49. See Bratspies, *supra* note 15, 306–07 (discussing the effects of Bt resistances in insects).

50. Bratspies, *supra* note 6 at 924.

51. McCabe, *supra* note 6, at 111.

52. This Part is by no means meant to be an exhaustive list of municipal attempts to ban GMOs but is a mere sample of efforts and legislative actions.

53. See Robert Meltz, *Takings Law Today: A Primer for the Perplexed*, 34 *ECOLOGY L.Q.* 307, 326 (2007) (“A taking must be for a ‘public use.’ If it is not, the government act is void regardless of whether compensation is paid.”). This Note presumes municipal GMO bans are for a valid public use. See discussion *infra* Part III.C.

embracing varying justifications.⁵⁴ Mendocino County's law makes it "unlawful for any person, firm, or corporation to propagate, cultivate, raise, or grow genetically modified organisms in Mendocino County."⁵⁵ The county justified the prohibition on the basis that "[t]he people of Mendocino County wish to protect the County's agriculture, environment, economy, and private property from genetic pollution by genetically modified organisms."⁵⁶ This ban appears to focus on the issue of pollen drift causing genetic contamination and less on any particular health or tangential environmental effect these crops may cause.

Trinity County's ban makes it "unlawful for any person to propagate, cultivate, raise, or grow genetically engineered organisms in Trinity County" as these acts are "declared to constitute a public nuisance."⁵⁷ Trinity states this ban seeks to "to protect our agricultural industry, our natural environment, the private property rights of our citizens, and the health and safety of our people."⁵⁸ It also observes that GMOs are being developed "with precipitous speed, and have been introduced into the marketplace before the potential risks and long-term effects of these products have been studied."⁵⁹ It further expresses concerns regarding the reduction of "the value of neighboring crops by genetically engineered crops" and the "impact on our natural environment from [GMOs] and contamination from such is unpredictable, ultimately uncontrollable, and has received little study."⁶⁰ This extensive criticism of GMOs highlights the economic and health impacts on humans and the natural environment, dovetailing with the ostensible justifications provided in Part I.

Marin County also enacted legislation to ban GMOs⁶¹ "to protect our agricultural industry, our natural environment, the private property rights of our citizens, and the health, safety and welfare of our people."⁶² Like Trinity County, Marin County cites the "precipitous speed" with which GMOs are being developed and the dangers of pollen drift on health and

54. MENDOCINO COUNTY, CAL., CODE tit. 10A, ch. 15, §§ 010–020 (2004); TRINITY COUNTY, CAL., CODE tit. 8, ch. 8.25, art. I, § 020 (2004), available at https://library.municode.com/HTML/16662/level3/TIT8HESA_CH8.25GEENOR_ARTIGEENOR.html#TOPTITLE; MARIN COUNTY, CAL., CODE tit. 6, ch. 92, §§ 010–020 (2004).

55. tit. 10A, ch. 15, § 020.

56. *Id.* § 010.

57. tit. 8, ch. 8.25, art. I, § 030.

58. *Id.* § 020.

59. *Id.*

60. *Id.*

61. See MARIN COUNTY, CAL., CODE tit. 6, ch. 92, § 020 (2004) (providing a similar ban to that of Trinity County).

62. *Id.* § 010.

economics.⁶³ Instead of GMO use, Marin County favors “sustainable agriculture” and “a positive vision for the future of food.”⁶⁴ Though each of these three California counties has adopted slightly different justifications, they are all concerned about the public health, welfare, and economic livelihood of their citizens.

B. Washington

San Juan County, Washington, a small island-based community that emphasizes organic farming techniques, banned GMO seeds in November 2012.⁶⁵ This ban includes the planting of “landscaping plants as well as seeds planted for food [and] is intended to protect the county’s rich agricultural land.”⁶⁶ Some have questioned this farmer-initiated bill, claiming it is unnecessary on an island that prides itself for a rich organic farming community.⁶⁷ Given the recently discovered contamination of alfalfa with GMO materials found in the state,⁶⁸ the county’s preemptive action may be justified.

C. Oregon

In July of 2013, Lane, Jackson, and Benton Counties sought to put the issue of a GMO crop ban on the 2014 ballot.⁶⁹ The Benton County clerk denied their ballot almost immediately.⁷⁰ Oregon’s rich agricultural land encourages farmers to grow genetically modified sugar beets, alfalfa, and corn which some believe may contribute to genetic contamination of non-GMO crops.⁷¹ Recently, farmers discovered GMO wheat amongst non-GMO wheat crops, prompting an investigation into the origin of the GMO

63. *Id.*

64. *Id.*

65. Amy Pennington, *The San Juans are GMO free. Is Washington Next?*, CROSSCUT (Jan. 23, 2013), <http://crosscut.com/2013/01/23/agriculture/112502/gmo-free-san-juans/>.

66. *Id.*

67. *Id.*

68. See David Knowles, *USDA Weighs Action After Monsanto’s ‘Roundup Ready’ GMO Alfalfa is Found in Washington Field*, N.Y. DAILY NEWS (Sept. 16, 2013, 4:01 PM), <http://www.nydailynews.com/news/national/usda-mulls-action-discovery-gmo-alfalfa-washington-article-1.1457709> (highlighting a recent instance where non-GMO alfalfa growing in Washington was found to have “Roundup Ready” genetic traits).

69. Cassandra Profita, *Three Oregon Counties Seek Petition to Ban Genetically Modified Crops*, OR. PUB. BROAD. (July 11, 2013, 11:40 AM), <http://www.opb.org/news/blog/ecotrope/three-oregon-counties-see-petitions-to-ban-genetically-modified-crops/>.

70. *Id.*

71. *Id.*

crop that may serve to hamper Oregon's exports of non-GMO wheat.⁷² Despite this finding, in October 2013, Oregon lawmakers placed a moratorium on county attempts to ban GMO crops for the stated purpose of supporting a comprehensive state-based approach to controlling local agriculture.⁷³

D. Hawaii

The most recent push to ban GMOs occurred in Hawaii. Hawaii is a "hub for the development of genetically engineered corn and other crops that are sold to farmers around the globe."⁷⁴ In fact, Hawaii is so important to seed developers like Monsanto and DuPont that some have claimed that nearly every corn seed planted in the United States has come by way of Hawaii.⁷⁵ Biotech corporations Monsanto, Pioneer, Syngenta, Dow, and BASF occupy a combined 25,000 out of the state's 280,000 acres of agricultural land, operating on Kauai, Oahu, Maui, and Molokai.⁷⁶ Due to the expansive use of Hawaiian lands for the development of GMO products, the use of pesticides in particular has become an increasing concern.⁷⁷

In October 2013, Kauai County passed Bill 2491 to restrict the use of pesticides around schools, parks, and homes.⁷⁸ The passage of this bill appears to be a concession from a more expansive bill that would have enacted "a moratorium on expansion of biotech cropland and a ban on open-air testing of experimental genetically modified crops."⁷⁹ Legislators

72. See *id.* (discussing the discovery of GMO wheat in Eastern Oregon); see also Amelia Templeton, *Genetically Modified Wheat Found in Oregon Could Hurt Exports*, OR. PUB. BROAD. (May 29, 2013), <http://earthfix.soptv.org/land/article/genetically-modified-wheat-discovered-growing-in-o/> (explaining the details of this finding and its effects on the exports of the crop).

73. Cassandra Profita, *Activists Regroup After Ore. Lawmakers' Trump Local Push to Restrict GM Crops*, OR. PUB. BROAD. (Oct. 3, 2013), <http://earthfix.opb.org/flora-and-fauna/article/activists-regroup-after-ore-lawmakers-trump-local-/>; see also S. 863, 77th Leg. Assembly, Spec. Sess. (Or. 2013), available at <https://olis.leg.state.or.us/liz/2013S1/Measures/Text/SB863/Enrolled> (detailing the provisions of the Act).

74. Andrew Pollack, *Unease in Hawaii's Cornfields*, N.Y. TIMES (Oct. 7, 2013), <http://www.nytimes.com/2013/10/08/business/fight-over-genetically-altered-crops-flares-in-hawaii.html>.

75. *Id.*

76. *Id.*

77. See *id.* (highlighting several events in which locals were exposed to the pesticides used on GMO crops).

78. Michael Marshall, *Hawaiian Island Restricts Genetically Modified Crops*, NEW SCIENTIST (Oct. 23, 2013, 12:25 PM), <http://www.newscientist.com/article/dn24455-hawaiian-island-restricts-genetically-modified-crops.html>.

79. Pollack, *supra* note 74.

removed provisions banning GMOs as the debate appeared to center around the use of pesticides as opposed to genetic modification.⁸⁰

Perhaps capitalizing on the momentum behind Kauai's efforts to restrict GMO growth, in November 2013, Hawaii's Big Island passed a bill prohibiting the growth of any new GMOs.⁸¹ Though this bill is an unprecedented step for the State of Hawaii to restrict the growth of both GMOs and the biotechnology industry, it also appears to have been a legislative concession similar to Kauai's bill. The Big Island previously considered another bill that would have banned the growth of *all* GMOs as opposed to only *new* GMOs.⁸² As farmers have expressed concerns about their ability to access new biotechnology on the island,⁸³ legislators have taken little action in the wake of this effort.

III. REGULATORY TAKINGS: AN OVERVIEW OF THE CONSTITUTIONAL STANDARD

The Fifth Amendment of the United States Constitution states "nor shall private property be taken for public use, without just compensation."⁸⁴ For what this declaration lacks in breadth, it makes up for in lengthy precedent attesting to its core elements and complexities. This Part will examine the takings doctrine's basic elements⁸⁵ through a series of Supreme Court decisions spanning the last century to determine the applicable standards and feasibility for mounting a takings challenge to a GMO ban.

A. Property

The concept of property is central to any takings analysis as "[t]he Takings Clause is not implicated unless the government conduct affects 'property' cognizable under the clause."⁸⁶ Whether a plaintiff alleges a takings-recognized property interest is a threshold issue in any takings

80. *Id.*

81. *Hawaii's Big Island Bans Biotech Companies & GMO Crops*, HUFFINGTON POST (Nov. 19, 2013, 10:01 PM), http://www.huffingtonpost.com/2013/11/19/big-island-bans-gmo_n_4305729.html.

82. *Id.*

83. *Id.*

84. U.S. CONST. amend. V.

85. These elements are: (1) the concept of property; (2) takings tests for a regulatory taking; (3) the "public use" doctrine; and (4) the concept of just compensation. *See generally* Meltz, *supra* note 53 (explaining the Takings doctrine's basic elements).

86. Meltz, *supra* note 53, at 317.

case.⁸⁷ However, property interests themselves “are not created by the Constitution.”⁸⁸ Instead, “they are created and their dimensions are defined by existing rules or understandings that stem from an independent source such as state law,”⁸⁹ or more uncommonly, federal law.⁹⁰

The boundaries of property interests are defined by the laws creating them, existing rules and understandings, and “background principles” including nuisance and property law existing when the property was acquired.⁹¹ However, this list does not illustrate what the term “property” in the Takings Clause was intended to describe. As *Ruckelshaus v. Monsanto Company* explained, the term “property” in the Takings Clause may have been “used in its vulgar and untechnical sense of the physical thing with respect to which the citizen exercises rights recognized by law.”⁹² The generally accepted explanation, though, is that the term “may have been employed in a more accurate sense to denote the group of rights inhering in the citizen’s relation to the physical thing, as the right to possess, use and dispose of it.”⁹³ This distinction has become essentially moot as the Takings Clause has recognized almost all interests in land as being “property.”⁹⁴ Possible exceptions to this principle are the more insubstantial property interests like options to purchase, restrictive covenants, and rights of first refusal, but courts have even recognized these interests as property.⁹⁵

Bringing a takings challenge is difficult. For a takings claim to succeed, the adverse impact of the government action must affect the property directly.⁹⁶ Indirect and consequential injuries go without a Takings Clause remedy.⁹⁷ Often, the examination of a property interest under the

87. *Id.*

88. *Webb’s Fabulous Pharmacies v. Beckwith*, 449 U.S. 155, 161 (1980) (quoting *Bd. of Regents v. Roth*, 408 U.S. 564, 577 (1972)).

89. *Id.*

90. Meltz, *supra* note 53, at 317.

91. *Id.*; This point is particularly important in takings jurisprudence because “a State may not sidestep the Takings Clause by disavowing traditional property interests long recognized under state law.” *Phillips v. Wash. Legal Found.*, 524 U.S. 156, 167 (1998).

92. *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 1003 (1984) (quoting *United States v. Gen. Motors Corp.*, 323 U.S. 373, 377–78 (1945)).

93. *Id.*

94. Meltz, *supra* note 53, at 318.

95. *Id.*; *but see* *Webb’s Fabulous Pharmacies v. Beckwith*, 449 U.S. 155, 161 (1980) (suggesting “mere unilateral expectation or an abstract need is not a property interest entitled to protection”).

96. Meltz, *supra* note 53, at 321.

97. *Id.* The test here is that the owner must show a “substantial cause-and-effect relationship” between the regulation and the taking. *Id.* (quoting *Akins v. State*, 71 Cal. Rptr. 2d 314, 340 (Ct. App. 1998)).

Takings Clause will extend beyond the “metes and bounds” that describe the geographic dimensions and into the temporal aspects of an owner’s interest.⁹⁸ This signifies a substantive difference between the permanent deprivation of a “parcel as a whole” as compared to a temporary restriction that merely causes a diminution in value.⁹⁹ The Court does not recognize the latter as a taking, reasoning that a “temporary prohibition on economic use” does not render the property valueless as “the property will recover value as soon as the prohibition is lifted.”¹⁰⁰ This is not to suggest that the property itself must be of economic value to begin with, as the Court has “never held that a physical item is not ‘property’ simply because it lacks a positive economic or market value.”¹⁰¹ A court then must carefully consider the relationship between the regulation and the property—as well as the temporal aspects involved—but not necessarily whether the property has any substantive economic value to be lost in a taking.

1. Property and Nuisance Law: Prevention of a Harmful Use Through Background Principles

As briefly discussed above, central to the understanding of the concept of property in a takings analysis are the limits imposed by nuisance law. In all takings claims, a court must inquire into relevant background principles surrounding property interests, such as nuisance law.¹⁰² The background principles themselves, like nuisance laws, reflect “common, shared understandings of permissible limitations derived from a state’s legal tradition.”¹⁰³ These principles are particularly relevant in a takings analysis because uses of property that interfere with these laws may conceivably be proscribed without just compensation.¹⁰⁴

98. *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg’l Planning Agency*, 535 U.S. 302, 331–32 (2002).

99. *Id.* at 332.

100. *Id.*

101. *Phillips v. Wash. Legal Found.*, 524 U.S. 156, 169 (1998).

102. Meltz, *supra* note 53, at 353.

103. *Id.* at 354 (quoting *Palazzolo v. Rhode Island*, 533 U.S. 606, 630 (2001)).

104. *See Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1022–24 (1992) (explaining the traditional notion of how “harmful or noxious uses” of property exceed beyond the boundaries of permitted uses and are not compensable under the Takings Clause as state police powers may be used to proscribe such uses); *see also Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 125 (1978) (providing where the state “reasonably conclude[s] that ‘the health, safety, morals, or general welfare’ would be promoted by prohibiting particular contemplated uses of land,” compensation need not accompany prohibition).

For example, in *Lucas v. South Carolina Coastal Council*, the Court notes the owner of a lake-bed would not be entitled to compensation when he is denied a permit to engage in a landfilling operation that would have the effect of flooding another's land.¹⁰⁵ Nor would the corporate owner of a nuclear power plant be entitled to compensation when directed to remove all improvements from its land upon discovery that the plant sits astride an earthquake fault.¹⁰⁶ Though these regulatory actions may eliminate the land's only economically productive use, they do not proscribe a productive use that was previously permissible under relevant property and nuisance principles.¹⁰⁷ When considering whether a taking has occurred, it is vital to consider whether the recently prohibited use has *always* been unlawful, making the regulation a lawful exercise of state police authority and essentially nothing more.¹⁰⁸

B. Regulatory Takings Tests

The heart of a takings inquiry resides in identifying and applying a takings test to a given set of circumstances. Generally, there are two discrete categories of governmental actions recognized as takings.¹⁰⁹ The first is a regulation or physical intrusion that compels a property owner to suffer a physical "invasion" of their property.¹¹⁰ The more categorical of the two rules, this rule requires compensation no matter "how minute the intrusion."¹¹¹ For example, if a city regulation requires a cable wire to run across an apartment rooftop, the intrusiveness of the cable itself is enough to warrant just compensation.¹¹² The second is a regulatory act that either deprives the landowner of all of the value of their land¹¹³ or enough to deprive them of some value based on their reasonable investment-backed expectations regarding the land.¹¹⁴ For the purposes of this Note, there is

105. *Lucas*, 505 U.S. at 1029.

106. *Id.*

107. *Id.* at 1029–30.

108. *See id.* at 1030 ("The use of these properties for what are now expressly prohibited purposes was *always* unlawful, and (subject to other constitutional limitations) it was open to the State at any point to make the implication of those background principles of nuisance and property law explicit.")

109. *Id.* at 1015.

110. *Id.*

111. *Id.*; *see, e.g., Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 426 (1982) (articulating the "physical occupation" standard).

112. *Loretto*, 458 U.S. at 438.

113. *Lucas*, 505 U.S. at 1015–16.

114. *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 124–25 (1978).

little reason to devote much attention to a physical takings analysis, because there is nothing to suggest a GMO ban could constitute a “permanent physical occupation” of a plaintiff’s property. Rather, a ban of this nature is exclusively of a regulatory type, prompting a discussion of the various tests under this rationale.

The Fifth Amendment Takings Clause is designed to “bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole.”¹¹⁵ In the context of a municipal or state regulation, this rule allows the government to regulate property only “to a certain extent.”¹¹⁶ Should that regulation “go too far,” it will constitute a taking under the Fifth Amendment.¹¹⁷ From this basic precept, all takings tests evolve to determine if the impediments of a regulation have gone so far as to burden the property owner for more than their societal share demands.

There are two principle tests that define regulatory takings: the total denial of economically viable use of the property owner’s land test defined by *Lucas v. South Carolina Coastal Council*¹¹⁸ and the economic impact test of *Penn Central Transportation Company v. City of New York* used when the property is not deprived of all of its economic value.¹¹⁹

1. The *Lucas* Test

In *Lucas*, the Court articulated the standard that when a regulation denies a property owner of the “economically viable use of his land,” a taking occurs.¹²⁰ The fundamental difference between this test and the *Penn Central* test discussed *infra* is that a deprivation under the *Lucas* standard must deny “all economically beneficial or productive use of land.”¹²¹ Accordingly, the regulation must deprive the property owner of all economically viable uses of the land, irrespective of whether the regulation is aimed at controlling only one land use.

Though the *Lucas* test sets a very high threshold for a regulatory act to constitute a taking, it is not without a defined logic. This test is predicated

115. *Armstrong v. United States*, 364 U.S. 40, 49 (1960).

116. *Pa. Coal Co. v. Mahon*, 260 U.S. 393, 415 (1922).

117. *Id.* As the Court stated, “a strong public desire to improve the public condition is not enough to warrant achieving the desire by a shorter cut than the constitutional way of paying for the change.” *Id.* at 416.

118. *Lucas*, 505 U.S. at 1015–17.

119. *Penn Cent. Transp. Co.*, 438 U.S. at 124.

120. *Lucas*, 505 U.S. at 1016 (quoting *Agins v. City of Tiburon*, 447 U.S. 255, 260 (1980)).

121. *Id.* at 1015 (emphasis added).

on the notion that the total deprivation of a beneficial use, from the property owner's perspective, is in effect a physical appropriation of their property.¹²² A regulation of this nature leaves the property "economically idle," depriving the property owner of *all* economically beneficial use, and executing a taking in the process.¹²³ Despite the Court's logic, the specific circumstances allowing for the application of this test are infrequent.¹²⁴

The *Lucas* total deprivation standard was not the only judicial wisdom to emanate from this case. In tandem with providing the standard, the Court provides an exception. Even if a regulation deprives a property of all its economic value, a taking has not occurred if the restriction duplicates "background principles of the State's law of property and nuisance" that proscribe a plaintiff's use of the land.¹²⁵ Accordingly, a regulation that is a conceivable exercise of state police powers cannot deprive the landowner of the use in their land that does not accord with applicable state law.¹²⁶

2. The *Penn Central* Test

Due to the *Lucas* test's relative narrowness, the Court supplied another test that embraces a multifactor balancing approach in a takings analysis. This test allows an examination of regulations that *do not* completely deprive a property owner of all economic viability.¹²⁷ The *Penn Central* test, unlike the *Lucas* test, considers whether a "partial" taking has occurred.¹²⁸ In doing so, the Court considers primarily the regulation's: (1) economic impact on the property owner; (2) degree of interference with the owner's reasonable investment-backed expectations; and (3) the character of the governmental action.¹²⁹ Though almost every decision involving the

122. *Id.* at 1017.

123. *Id.* at 1019.

124. *See id.* at 1036 (Blackmun, J., dissenting) (claiming the Court "launches a missile to kill a mouse" in providing a total deprivation takings analysis in a case where the property owner was not in fact deprived of all economically viable use of his property). This suggests that even in *Lucas*, a total deprivation of all economic value had not occurred.

125. *Id.* at 1029; Meltz, *supra* note 53, at 329; *see also supra* Part III.A.1.

126. Meltz, *supra* note 53, at 329. For example, should the regulation prevent activities that constitute a nuisance that otherwise deprive the landowner of all economically viable uses of his land, a taking has not occurred as the landowner never had an affirmative right to conduct activities constituting a nuisance. *See, e.g.,* Hadacheck v. Sebastian, 239 U.S. 394, 411–12 (1915) (suggesting the legitimate use of police power to prevent a nuisance does not violate recognized constitutional property rights).

127. *See* Meltz, *supra* note 53, at 329–30, 333 (suggesting very few cases involve *Lucas*'s "per se" takings approach and instead *Penn Central*'s approach is the test most often seen in the courts).

128. *Id.* at 329.

129. *Id.* at 329; *see also* Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 124–27 (1978) (highlighting these considerations in the multifactor balancing).

Penn Central test leads to an evaluation of all three factors, these factors are neither formulaic nor exhaustive and are instead emanations of an “essentially ad hoc, factual inquiry.”¹³⁰

The economic impacts on a property owner and interference with investment-backed expectations have been described as the primary considerations under the *Penn Central* test.¹³¹ The existence of any factor, though, can be conclusive evidence that a taking has occurred.¹³² Courts generally measure the impact on a property’s economic use by what makes the property “commercially marketable.”¹³³ This analysis blurs the distinction between an economic impact and a reasonable investment-backed expectation, because often the Court views the two considerations together to determine the overall impact of a governmental action.¹³⁴ The Court in *Penn Central* went as far as to recognize that economic harm, by itself, may not be enough to show a taking when the governmental action “did not interfere with interests that were sufficiently bound up with the reasonable expectations of the claimant to constitute ‘property’ for Fifth Amendment purposes.”¹³⁵ This blurring of factors is in line with the notion that the test itself is not formulaic but merely suggests “guidelines” that pose often “vexing subsidiary questions.”¹³⁶

Though arguably less important than the query into economic harm and interference with investment-backed expectations, the character of the governmental action plays a significant role in the *Penn Central* test. The character of the governmental action may have a substantive impact on the

130. Meltz, *supra* note 53, at 330 (quoting *Penn Cent. Transp. Co.*, 438 U.S. at 124); *see also* Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 538 (2005) (“The Court in *Penn Central* acknowledged that it had hitherto been unable to develop any set formula for evaluating regulatory takings claims, but identified several factors that have particular significance.” (quoting *Penn Cent. Transp. Co.*, 438 U.S. at 124) (internal quotations omitted)).

131. *E.g.*, Lingle, 544 U.S. at 538–39.

132. Meltz, *supra* note 53, at 330.

133. *Id.* at 336.

134. *See* Lingle, 544 U.S. at 538–39 (“Primary among [takings] factors are ‘[t]he economic impact of the regulation on the claimant and, particularly, the extent to which the regulation has interfered with distinct investment-backed expectations.’ In addition, the ‘character of the governmental action’—for instance whether it amounts to a physical invasion or instead merely affects property interests through ‘some public program adjusting the benefits and burdens of economic life to promote the common good’—may be relevant in discerning whether a taking has occurred.” (citations omitted) (quoting *Penn Cent. Transp. Co.*, 438 U.S. at 124)).

135. *Penn Cent. Transp. Co.*, 438 U.S. at 125.

136. Lingle, 544 U.S. at 539; Another wrinkle in this analysis is the concept of Average Reciprocity of Advantage, which suggests that a taking may not have occurred if a restriction burdening a landowner, *also benefits them indirectly* by burdening similarly situated landowners. *See* Meltz, *supra* note 53, at 344 (discussing Average Reciprocity of Advantage).

takings analysis if the action promotes the health, safety, morals, or general welfare by prohibiting particular uses of land.¹³⁷ This could still be true even if the restriction prevents the “most beneficial use of the property.”¹³⁸ The character of the governmental action is itself blurred with the notion of “public use,” as a governmental action must be predicated on a public use to be recognized as a taking.¹³⁹ Nevertheless, the character of the governmental action focuses on the severity of the burden placed on the property owner, whether that burden is economic or expectation-based.¹⁴⁰

C. Public Use

The requirement that a governmental action be for a public use is fundamental in considering whether or not a regulation constitutes a taking.¹⁴¹ A taking *must* be for a public use, or the act is void regardless of whether compensation is paid.¹⁴² The public use requirement itself is “coterminous with the scope of a sovereign’s police powers,”¹⁴³ permitting the exercise of the eminent domain authority only when it is for a public use.

The concept of what constitutes a public use has blossomed in recent takings jurisprudence, allowing a much more expansive recognition of takings than otherwise had previously existed. A public use has a

137. *Penn Cent. Transp. Co.*, 438 U.S. at 125. This notion runs parallel to *Lucas*’s illumination of the fact that certain background principles may void the need to offer just compensation for certain restrictions. *See supra* Part III.B.1.

138. *See id.* at 126–27 (“[T]he State had not exceeded ‘its constitutional powers by deciding upon the destruction of one class of property [without compensation] in order to save another which, in the judgment of the legislature, is of greater value to the public.’” (quoting *Miller v. Schoene*, 276 U.S. 272, 279 (1928))). *Miller v. Schoene* presents an interesting takings analysis in the context of land use burdens for the public health. In that case a state statute called for red cedar trees to be felled in order to protect nearby apple trees from cedar rust, which ultimately depreciated the value of the property where the red cedars once stood. *Id.* at 125–26 (citing *Miller*, 276 U.S. at 272). The Court held that “the State had not exceeded ‘its constitutional powers by deciding upon the destruction of one class of property [without compensation] in order to save another which, in the judgment of the legislature, is of greater value to the public.’” *Id.* (quoting *Miller*, 276 U.S. at 279).

139. *See Lingle*, 544 U.S. at 540–43 (rejecting the logic of *Agins v. City of Tiburon* that suggests a taking must advance a substantial public interest and instead recognizing that the core of the governmental action must instead be for a public use); *see also infra* Part III.C.

140. *See Lingle*, 544 U.S. at 539 (suggesting each of the takings tests are unified by “focus[ing] directly upon the severity of the burden that government imposes upon private property rights”).

141. *See id.* at 543 (suggesting a government action is impermissible when the government fails to meet the “public use” requirement).

142. Meltz, *supra* note 53, at 326.

143. *Haw. Hous. Auth. v. Midkiff*, 467 U.S. 229, 240 (1984).

particularly “low” hurdle in a contemporary takings analysis.¹⁴⁴ The Court has done away with the literalist interpretation of “public use” that would require public access to whatever property is taken.¹⁴⁵ Instead, a taking for a “public purpose”—whatever a court takes this term to mean—is the appropriate standard.¹⁴⁶ The Court has given particular deference to legislatures acting according to what they believe is a “public purpose” under this standard because “legislatures are better able to assess what public purposes should be advanced by an exercise of the taking power.”¹⁴⁷ Despite the legislative deference, determining whether a taking has occurred for a public use as opposed to a private use often poses some interpretative difficulties.¹⁴⁸

As discussed above, a taking or condemnation action may *only* be undertaken for a “public” use.¹⁴⁹ Any taking that is for a *private* use, even if that property owner is paid just compensation, violates the public use requirement.¹⁵⁰ A taking that transfers a private benefit to a particular private party would “serve no legitimate purpose of government and would thus be void.”¹⁵¹ Equally, when a taking is ostensibly justified by a public use but *actually* merely bestows a private benefit, the eminent domain authority is abused.¹⁵² As the distinction between public and private use depends largely on the facts of a given case, courts in many instances have only a circumscribed role in determining the legitimacy of a use once they have established it is for a public purpose.¹⁵³

144. See Meltz, *supra* note 53, at 326 (explaining that “[t]he public use hurdle in the federal constitution is a low one”); see also *Midkiff*, 467 U.S. at 240 (explaining that the Court’s role in judging what constitutes a public use is narrow).

145. Meltz, *supra* note 53, at 326.

146. See *Kelo v. City of New London*, 545 U.S. 469, 479–80 (2005) (explaining the Court’s embrace of the broad public purpose in lieu of the narrow or literal public use).

147. *Midkiff*, 467 U.S. at 244; see also *Kelo*, 545 U.S. at 483 (“For more than a century, our public use jurisprudence has wisely eschewed rigid formulas and intrusive scrutiny in favor of affording legislatures broad latitude in determining what public needs justify the use of the takings power.”).

148. See, e.g., *Kelo*, 545 U.S. at 477 (articulating the difficulty in determining whether a taking has occurred for a public or private purpose in the context of redevelopment).

149. *Id.*

150. See *id.* (“[I]t has long been accepted that the sovereign may not take the property of *A* for the sole purpose of transferring it to another private part *B*, even though *A* is paid just compensation.”).

151. *Midkiff*, 467 U.S. at 245.

152. See *Kelo*, 545 U.S. at 478 (explaining “[n]or would the City be allowed to take property under the mere pretext of a public purpose, when its actual purpose was to bestow a private benefit”).

153. *Id.* at 489 (“It is not for the courts to oversee the choice of the boundary line nor to sit in review on the size of a particular project area. Once the question of the public purpose has been decided, the amount and character of land to be taken for the project and the need for a particular tract to complete the integrated plan rests in the discretion of the legislative branch.” (quoting *Berman v. Parker*, 348 U.S. 26, 35–36 (1954))).

D. Just Compensation

Once a municipality decides to engage in a taking, or a court decides an inverse condemnation has occurred, just compensation is owed to the burdened property owner.¹⁵⁴ Just compensation, generally, requires a comparison of what has been taken from the property with what remains in the property.¹⁵⁵ This analysis ultimately determines the property's remaining commercial value. As this is intrinsically a fact-based inquiry, just compensation varies depending on the facts and circumstances of a given case.¹⁵⁶

IV. A MEASURE OF COMPENSATION?: DETERMINING THE VIABILITY OF
GMO INVERSE CONDEMNATION CLAIMS

A plaintiff to an inverse condemnation action must necessarily prove that a taking has, in fact, become effective to succeed.¹⁵⁷ Before determining whether a land use restriction targeted at GMOs is an effective taking, an antecedent threshold question must first be addressed: What “property” has the alleged taking “directly” affected?¹⁵⁸ As it has been predetermined that the cause of the “substantial cause-and-effect relationship”¹⁵⁹ between the regulation and the property interest is a municipal regulation on GMO growth, analysis may begin with what or whom the regulation targets.

Given what is known about municipalities that have either enacted this manner of regulation¹⁶⁰ or those that may seek to enact similar restrictions in the future, regulation may ostensibly target—either directly or indirectly—three primary parties: (1) landowners growing or planning to grow GMO food crops; (2) biotechnology companies field testing potential

154. See *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency*, 535 U.S. 302, 322 (2002) (providing “[w]hen the government physically takes possession of an interest in property for some public purpose, it has a categorical duty to compensate the former owner”).

155. *Keystone Bituminous Coal Ass'n v. DeBenedictis*, 480 U.S. 470, 497 (1987).

156. As this Note does not set out to make a determination as to what just compensation will be owed, but rather *if* just compensation will be owed, no more time will be spent examining this concept. For further discussion on just compensation, see generally Christopher Serkin, *The Meaning of Value: Assessing Just Compensation for Regulatory Takings*, 99 NW. U. L. REV. 677 (2005).

157. See Gregory M. Stein, *Regulatory Takings and Ripeness in the Federal Courts*, 48 VAND. L. REV. 1, 27 (1995) (explaining that proof that a taking has become “effective” is the main substantive hurdle a plaintiff must overcome in a takings challenge).

158. See Meltz, *supra* note 53, at 321 (explaining that only regulations that directly affect a property interest are subject to a takings claim).

159. See *id.* (providing that a takings claim must seek to prove this manner of relationship).

160. See *supra* Part II (addressing similar existing regulations).

GMO food crops on land they own or lease;¹⁶¹ and (3) individuals who sell or use GMO seeds grown or developed within a municipality issuing a GMO regulation.¹⁶² Each of these parties may invariably have different interests affected by a regulatory GMO ban. Both farmers and developers have an interest in using their land to grow GMO crops either for consumption or other commercial purposes.¹⁶³ GMO developers may also have an interest in the intellectual property contained in the GMOs grown on developmental plots.¹⁶⁴ Those who sell GMO seeds also have an interest in making their product available to the commercial market.¹⁶⁵ Each of these parties, and their respective interests, will be discussed in turn.

A. Land Used to Grow Commercial or Developmental GMOs

Landowners who grow GMO food crops, most prominently commercial farmers, are most clearly the objects of the direct effects of a land use restriction aimed at the growth of GMOs. Farming, both commercial and for private consumption, is a cognizable property interest whether used “in its vulgar and untechnical sense” or its “more accurate sense.”¹⁶⁶ By preventing a property owner or individual with an interest in the property from using the property for the purposes of farming GMOs, there is a clear obstruction of a “use” of a property, especially when the property has been used exclusively or predominantly to grow GMO crops.¹⁶⁷

161. See, e.g., *supra* Part II.D. Though all of the regulations described in Part II are likely to directly affect farming, those in Hawaii are arguably more directly targeted at biotechnology companies due to Hawaii’s status as a test site for the development of new GMOs. It is unclear whether the recent restriction on Hawaii’s Big Island could be a taking as it does not restrict any previous use of the land, merely new uses. *Hawaii’s Big Island Bans Biotech Companies & GMO Crops*, *supra* note 81. Though the restriction described may not be a taking, other similar restrictions may indeed affect a taking, which is why this analysis is provident.

162. See Peter Whitefield, *Opposition to Genetically Engineered Crops Goes Local: Municipal Laws Seek to Ban GMOs*, ENVTL. LAW STRATEGY (Oct. 25, 2013), <http://www.environmentallawstrategy.com/2013/10/opposition-to-genetically-engineered-crops-goes-local-municipal-laws-look-to-ban-gmos/> (referencing municipalities that have drafted regulations that prohibit genetically engineered seeds for sale or personal use).

163. See discussion *infra* Part IV.A.

164. See discussion *infra* Part IV.B.

165. See discussion *infra* Part IV.C.

166. *Ruckelshaus v. Monsanto*, 467 U.S. 986, 1003 (1984) (quoting *United States v. General Motors Corp.*, 323 U.S. 373, 377–78 (1945)).

167. Courts have recognized that almost any interest in property—in the present case either ownership or lease—is cognizable and subject to a taking. Meltz, *supra* note 53, at 319.

Inextricably linked to GMO farming is the process of developing those organisms for sale to farmers for commercial growth. Before a GMO becomes a commercial product sold to farmers for growth and sale as a food product, the FDA or the United States Department of Agriculture (USDA) must first certify it for human consumption and environmental safety.¹⁶⁸ This process often involves a series of field tests or trials lasting a period of months or longer, where the GMO is grown in test plots under the supervision of the corporation responsible for its development and the agency responsible for determining its safety.¹⁶⁹ Irrespective of the purposes for the organism's growth, it is unclear how a municipal restriction affects field tests or trials in a manner any different than it would a farmer growing these crops commercially. The question at issue remains whether the direct effects of municipal restrictions on GMO growth for either farming or development rises to the level of a regulatory taking under *Lucas* or *Penn Central*.

1. Going Too Far?: Determining the Applicable Takings Test

a. Of Mice and Missiles: *Lucas*'s Total Deprivation Standard

When a landowner is called upon to sacrifice all economically beneficial uses of land, leaving it "economically idle" in the name of the common good, he has suffered a taking under *Lucas*.¹⁷⁰ Even so, it is difficult to imagine a scenario where a municipal GMO ban focused on a single use would *completely* deprive a property owner of all economically beneficial use of his land.¹⁷¹ In the context of all other *potential* agricultural uses of the land, a municipal GMO ban appears comparatively like a surgical instrument. For instance, the restriction does not target any *particular or specified crop*, but merely targets a *variation* of otherwise viable crops, leaving a landowner free to plant non-GMO varieties of the same crop that is subject to a ban. This consideration does not even

168. See McCabe, *supra* note 6, at 113–15 (explaining that the FDA is primarily responsible for determinations related to consumption whereas the USDA regulates GMOs relative to the health of other plants).

169. *Id.* at 119–25 (explaining the FDA and USDA procedures for deregulating GMO crops).

170. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1019 (1992); see also Meltz, *supra* note 53, at 331 (explaining that although there is some confusion as to whether *Lucas* focuses on the deprivation of the value or use of land, it appears that the issue has been settled in favor of value).

171. See *Lucas*, 505 U.S. at 1015 (noting that the Court's categorical treatment in a takings examination is reserved only for when the regulation "denies all economically beneficial or productive use of land").

contemplate what other potential uses of the land remain subsequent to the GMO ban.¹⁷²

Though a restriction on a specific crop variety—genetically modified crops—appears on its face to only minimally deprecate a property’s use and subsequent value, in *Lucas*, the entirety of the parcel’s value was predicated on a *specific* use.¹⁷³ However unlikely a contemporary court is to define a parcel’s value based on a specific use,¹⁷⁴ it is worth considering this possibility in light of the circumstances in *Lucas*. For example, to consider an abstract scenario, a GMO ban could deprive a property owner of the economically beneficial use of her land if it were impossible to grow an unmodified crop on agriculturally zoned land. Perceivably, this scenario is similar to the circumstances in *Lucas*, where Lucas was unable to build a residential home zoned for such a use due to a municipal restriction.¹⁷⁵ However, this hypothetical is itself unrealistic. Though the circumstances of *Lucas* and this hypothetical bear similarities, it is highly unlikely that a bill restricting the use of GMOs in an agricultural municipality where growing *anything other than* GMO crops is virtually impossible could be passed.¹⁷⁶ Where a municipal GMO ban has the ability to be a surgical instrument, as in this hypothetical, the instrument would be a blunt tool unlikely to be capable of achieving the municipal agenda without political and economic recourse. Currently, it is unclear that any such locality even exists. Perhaps even more unlikely is a court’s willingness to apply the *Lucas* standard as

172. Here, it seems important to recall Justice Blackmun’s dissent in *Lucas*, where he highlights that although the Coastal Council did not allow Lucas to build a permanent structure on his land, this did not meet the standard of a total deprivation of economically viable uses of the land. *Id.* at 1036 (Blackmun, J., dissenting). Even if the land is zoned exclusively for agricultural purposes, there is likely to remain a panoply of economically viable agricultural uses in the land despite the GMO exclusion.

173. See *id.* at 1009 (explaining that the trial court found that Lucas’s two parcels were deprived of their economic value because they were in an area zoned for single family residential construction, which the Beachfront Management Act explicitly prevented after he had purchased the land).

174. See Meltz, *supra* note 53, at 332 (explaining that the *Lucas* test has met with little success in the courts, often due to the fact that a parcel often retains value based on the “speculation that the restriction someday will be lifted” or as an “open space for a neighbor”).

175. *Lucas*, 505 U.S. at 1009.

176. As an interesting analogue to this hypothetical, consider the noted observations on the lack of biodiversity—and the inability to grow anything but corn—in corn fields. See Robert Krulwich, *Cornstalks Everywhere but Nothing Else, Not Even a Bee*, NPR (Nov. 30, 2012, 8:09 AM), <http://www.npr.org/blogs/krulwich/2012/11/29/166156242/cornstalks-everywhere-but-nothing-else-not-even-a-bee> (highlighting the effect of monoculture on the land and biodiversity). Even in these instances, it is unclear that a ban on the growth of the only viable crop deprives the land of all of its value. Once a GMO—or in the case of a corn field, corn—is removed, it is possible the land may be regenerated for other agricultural uses.

rigidly as had been done in *Lucas* when considering Justice Blackmun's observations about valuation and subsequent precedent.¹⁷⁷

The biotechnology industry has distinguishable interests in land when compared to commercial farming,¹⁷⁸ though these interests don't appear to fare any differently in a *Lucas* total deprivation analysis. As far as the use or value of the land is concerned, the interests regarding GMO field testing are not substantively different from commercial growth because in both instances, the property is being used to grow GMO crops, albeit for different economic purposes.

For the same reasons a GMO ban does not deprive farming of all economically viable uses of that land, the biotechnology industry is unlikely to succeed under a *Lucas* theory. This does not suggest that the biotechnology industry could not seek to apply *Lucas* in a different manner when it comes to concerns not over land, but intellectual property.¹⁷⁹

b. Exploring *Penn Central*: Partial Takings and Investment-Backed Expectations

As *Penn Central* provides an “essentially ad hoc, factual inquiry,”¹⁸⁰ analysis under this standard will necessarily glean some understanding of a potential municipal GMO restriction from those that already exist,¹⁸¹ as well as other plausible facts and circumstances. Nonetheless, “vexing subsidiary questions”¹⁸² are likely to remain and may inevitably be unanswerable until all facts arise in a specific claim. However, given what has been provided in *Penn Central* and subsequent cases, there is enough to suggest a likely outcome for a claim under this standard.

i. Character of the Governmental Action

During much of the analysis in *Penn Central*, the Court discussed the relationship between zoning law and takings to determine whether the New York statute seeking to preserve historical beauty was more akin to a

177. See *Lucas*, 505 U.S. at 1036 (Blackmun, J., dissenting) (discussing that the Court failed to recognize subsequent value in the property, ignoring the property's value outside of the realm of residential construction).

178. For example, biotechnology has an interest in the intellectual property contained within GMOs. See discussion *infra* Part IV.B.

179. See discussion *infra* Part IV.B.

180. Meltz, *supra* note 53, at 330 (internal quotations omitted).

181. See discussion *supra* Part II.

182. *Lingle v. Chevron U.S.A. Inc.*, 544 U.S. 528, 539 (2005).

zoning law than a land use restriction.¹⁸³ Zoning law, which may promote “the health, safety, morals, or general welfare,” may prohibit “particular contemplated uses of land” destroying or adversely affecting real property interests without need for just compensation.¹⁸⁴ Importantly, it would appear that for a takings claim to succeed, it cannot be equated to a zoning measure, which “generally do not affect existing uses of real property.”¹⁸⁵

A municipal GMO ban is different from a zoning ordinance as it *explicitly* affects existing uses of real property.¹⁸⁶ In a county where GMOs are grown commercially or developmentally, a GMO ban appears to target all crops of a certain type on particular landholdings, as opposed to uniform and undifferentiated restrictions on particular communities.¹⁸⁷ Such a restriction engenders two consequences that demarcate a taking: an inequitable distribution of benefits and burdens of governmental action¹⁸⁸ and discriminatory or “spot” zoning producing substantial individualized harm.¹⁸⁹ Though these criteria are not necessarily mutually exclusive, they may produce drastic implications on the economic value of properties that are perhaps best bared by the public as a whole.

Legislation producing inequitable effects on landowners is alone not necessarily a hallmark of a taking. “Legislation designed to promote the general welfare commonly burdens some more than others.”¹⁹⁰ The critical inquiry remains focused on whether the legislation provides a burden forcing some alone “to bear public burdens which, in all fairness and justice, should be borne by the public as a whole.”¹⁹¹ Preventing farming

183. *See Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 125–32 (discussing the relationship between takings and zoning, which has historically been held to not produce a taking under the Fifth and Fourteenth Amendments).

184. *Id.* at 125 (internal quotations omitted).

185. *Id.*; *see also Euclid v. Ambler Realty Co.*, 272 U.S. 365, 397 (1926) (holding zoning ordinances are a reasonable exercise of legislative power).

186. *See Penn Cent. Transp. Co.*, 438 U.S. at 136 (discussing that in this case, the legislation does not disrupt any present uses of the property, which helps the Court decide against finding a taking). This statement, however, may not be true in all cases. In a county where no GMOs are grown, this ordinance may be more akin to a zoning measure than a taking. *See discussion supra* Part II.B (detailing San Juan County, Washington). However, in this circumstance, there is no danger of such a restriction becoming a taking, as it does not “take” any use that presently exists, namely, a use with any present economic value.

187. *See id.* at 133 (noting that the zoning law at issue in *Penn. Central* did not “impose identical or similar restrictions on all [property] located in particular physical communities”).

188. *See id.* (providing that zoning laws are characterized by “fair and equitable distribution of benefits and burdens of governmental action”).

189. *See id.* at 125–26, 132 (discussing substantial individualized harm and spot zoning). This factor may be analyzed under the “character of the governmental action” prong.

190. *Id.* at 133.

191. *Armstrong v. United States*, 364 U.S. 40, 49 (1960).

and biotechnology agribusiness from conducting their respective economic activities on their land presents a substantial burden, though it remains unclear if this burden is weighty enough to be considered a taking.¹⁹² Certainly, the economic burdens between the different interests are similar, but perhaps not identical, in how they correspond to others who are similarly burdened. Though the character of the governmental action appears to create hefty burdens for landowners in the business of growing GMOs, the inquiry must turn to economic impacts to determine the likelihood of a taking.

ii. The Economic Impact of GMO Regulation

The economic impact of a regulation on a claimant is particularly significant in assessing the existence of a regulatory taking.¹⁹³ Certainly, farmers principally employing the use of GMO technology will suffer distinct economic impacts when they are no longer able to make use of GMOs. The transition from GMO crops to non-GMO crops may cause losses in income due to reduced crop yield and crop loss.¹⁹⁴ As discussed earlier, it is *possible* that a farmer will be completely unable to grow *some* crops that are not genetically modified, but it remains unlikely a farm will be incapable of growing *any* non-GMO crops.¹⁹⁵

As all farming in a region where a municipal GMO ban has been enacted is similarly burdened by the restriction, farmers are likely to benefit from an average reciprocity of advantage. Farmers making use of GMOs in a restricted municipality are similarly situated in that they can no longer use GMOs, making their burdens identical, save for the type of crop they may have been farming. In this way, a GMO restriction puts *all* farmers, including those who do not make use of GMOs, in relatively the same position as *no one* can gain the ostensible economic benefits of the technology. The Court has recognized that causing substantial individualized harm to one class of property—in this case farming making use of GMOs—is a constitutional use of authority by ordering “the destruction of one class of property [without compensation] in order to save another which, in the judgment of the legislature, is of greater value to the

192. See *Penn Cent. Transp. Co.*, 438 U.S. at 131 (rejecting the proposition that diminution in property value, standing alone, can establish a taking).

193. *Id.* at 124.

194. See Mandel, *supra* note 1, at 87 (noting that increased crop yield and pest resistances are recognized advantages of using GMO seeds).

195. Even if this is the case, however unlikely, the land is likely to retain value unrelated to farming.

public.”¹⁹⁶ Although some farmers may feel “more burdened than benefited by the law,”¹⁹⁷ the Court has taken the position that the gross benefits equal to those received by every other member of the community are enough to prove an average reciprocity of advantage is achieved.¹⁹⁸

Biotechnology development, unlike commercial farming, may suffer more distinct burdens at the hands of municipal regulation without gaining an average reciprocity of advantage. Where a municipal ban affects all commercial farmers in a region on an equal basis by preventing them all from growing GMO crops, but retaining the advantage of growing non-GMO crops, the same cannot be said for biotechnology developers. Unlike farming, there is no substitute for GMOs when it comes to biotechnology development as the principal economic incentive is the growth and development of the GMO itself. Though the municipal ban may be facially neutral, it arguably has a more distinct economic impact on GMO development than it does on GMO farming, leaving developers with no suitable alternative.

Considered from the point of land value, though, the analysis is more equitable. A GMO ban impacts both endeavors—as well as every other land parcel in the municipality—in the same way: by eliminating the use of the property to grow GMOs. Seen in this way, the restriction is, like with commercial farming, non-discriminatory and leaves the land with almost all of its value.¹⁹⁹ Despite this, the economic impact on GMO development appears to be greater than farming and still seemingly lacks an average

196. *Penn Cent. Transp. Co.*, 438 U.S. at 126 (quoting *Miller v. Schoene*, 276 U.S. 272, 279 (1928)).

197. *Id.* at 135.

198. Lynda J. Oswald, *The Role of the “Harm/Benefit” and “Average Reciprocity of Advantage” Rules in Comprehensive Takings Analysis*, 50 VAND. L. REV. 1447, 1512 (1997). In this instance, though the GMO farmer is burdened, he is in no worse position than any other farmer and the community reaps whatever benefit comes from regulating GMOs. *Cf. Pa. Coal Co. v. Mahon*, 260 U.S. 393, 412, 415–17 (1922) (holding the legislative deprivation of the right to mine coal was so specific and substantial as to effect a taking).

199. Recall, one of the most significant factors in determining an economic depreciation in land is its commercial marketability. Meltz, *supra* note 53, at 336. The ban will only impact the land itself insofar as it relates to the growth of GMOs. Assuming the land is useable for other purposes—agricultural or otherwise—the land itself is unlikely to lose much value. If the land can be used *solely* for the growth of GMOs, not only would this analysis have a different outcome, but the standard would ostensibly be the one provided in *Lucas*. *Penn Cent. Transp. Co.*, 438 U.S. at 130–31 (“‘Taking’ jurisprudence does not divide a single parcel into discrete segments and attempt to determine whether rights in a particular segment have been entirely abrogated. In deciding whether a particular governmental action has effected a taking, this Court focuses rather both on the character of the action and on the nature and extent of the interference with rights in the *parcel as a whole*” (emphasis added)).

reciprocity of advantage. Therefore, it is essential to turn to other factors to properly examine the extent of the impact.

iii. Disruption of Investment-Backed Expectations

To determine whether a regulation disrupts an investment-backed expectation in a manner significant enough to constitute a taking, it is helpful to consider the property owner's primary expectations concerning the use of the land.²⁰⁰ Unlike the circumstances of *Penn Central* where the facility was still a viable transportation hub after the regulatory restriction,²⁰¹ land used for GMO farming or biotechnological development are both likely to be significantly disrupted by legislative restriction of GMOs. This alone suggests that investment-backed expectations will be diminished.

In assessing the disruption of investment-backed expectations, a pertinent starting point is determining whether the expectation was reasonable.²⁰² Weighing greatly against both farmers and developers in this circumstance is the notion that GMOs are perceivably a matter of public concern, making them a potential nuisance threat to the community as a whole.²⁰³ The issue, then, is not only whether it is reasonable to have an investment-backed expectation in a technology that is perceived to be harmful and can expect to be regulated, but whether these entities are even engaging in a previously permissible land use.²⁰⁴

Courts will quickly dispose of an inverse condemnation claim involving uses of land conflicting with relevant "background" principles like state nuisance laws as measures to restrict these uses plainly do not interfere with permissible uses of land.²⁰⁵ Though no state has gone as far

200. See *Penn Cent. Transp. Co.*, 438 U.S. at 136 (noting that in the primary expectations for the terminal were not disrupted as the law did not interfere with any present uses).

201. *Id.*

202. See *id.* at 124–25 (providing that a takings challenge may be dismissed if the regulation did not interfere with reasonable property expectations).

203. It is unclear whether the biotechnology industry would willingly accept this characterization. Nevertheless, there is a reasonable basis to suggest this characterization has merit. See discussion *supra* Part I.B.

204. See *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1029–30 (1992) (explaining that relevant background principles such as nuisance law prevent property owners from claiming a taking has occurred when the regulated activity was itself impermissible).

205. See *id.* at 1029 (providing that a land use restriction cannot be a taking if it provides what could have been achieved under "background principles of the State's law of property and nuisance").

as to declare a GMO a nuisance,²⁰⁶ courts *may* nonetheless recognize a GMO as a nuisance due to its threat to public health and welfare.²⁰⁷ Moreover, due to the widely recognized public concern about GMOs, farmers and industries using this technology should at least have a bare expectation that they may be regulated, diminishing the reasonableness of the investment-backed expectation. This would remain true even if the property was acquired before the advent of GMO technology as municipalities have the authority to recognize new and existing nuisances. Seen from this perspective, a court may be hesitant to even recognize GMO growth as a permissible land use due to its human health and ecological impacts.

Even if a court goes as far as to recognize the land use as legitimate, investment-backed expectations in land can be recognized as more broad than mere GMO growth. In both farming and GMO development, landowners arguably have invested primarily in the *land* itself, not merely its use for a specific purpose. Taken as true, a GMO restriction still results in the land retaining significant economic value, even if the land was purchased with GMO farming in mind. As these circumstances are unlikely to fall under the umbrella of a *Lucas* analysis, where a regulatory act deprives an owner of virtually all uses of the land, much of the investment-backed expectations in regard to the land itself are likely to remain post-regulation.²⁰⁸

Investment-backed expectations in regard to the *use* of land, however, are more significantly diminished, especially for GMO development. As the primary expectation for farmers in regard to their land is crop growth for commercial purposes, their investment is only partially diminished because they can still use their land for these purposes after a GMO ban, but with non-GMO crops. For GMO developers, however, a GMO ban completely deprives the use of the land for that purpose, rendering their investment-

206. In this respect, the history of plant regulation is illuminating. Several states have recognized that plants that either cause or transfer disease to other plants may constitute either a private or public nuisance. *See, e.g.*, *Los Angeles Cnty. v. Spencer*, 59 P. 202, 202 (Cal. 1899) (examining a statute declaring pests to plants a public nuisance); *Balch v. Glenn*, 119 P. 67, 67 (Kan. 1911) (declaring any plant infested with pests a public nuisance and subject to state police powers); *Gray v. Thone*, 194 N.W. 961, 962–63 (Iowa 1923) (authorizing the destruction of any disease infected plant). Though GMOs may potentially escape a farm or field test site and become invasive, arguing that GMOs cause “disease” to other plants through pollination has already been attempted in the Ninth Circuit and subsequently failed. *See Ctr. for Food Safety v. Vilsack*, 718 F.3d 829, 841 (9th Cir. 2013) (holding that GMO cross-pollination is not a plant pest harm under the Plant Protection Act).

207. *See supra* Part I.B.1 and Part I.B.2 (discussing these threats).

208. *See Lucas*, 505 U.S. at 1015 (holding that a taking may exist where regulation denies all economically beneficial or productive use of land).

backed expectations in regard to the use of the land wholly diminished. Though this may be the case, an investment-backed expectation in the *use* of the land alone is not enough to suggest a taking has occurred.²⁰⁹ As the predominant value of the land *itself* remains after a regulatory GMO ban—apart from the singular circumscribed land use—it is unlikely that a court would find that a taking has occurred, despite the existence of significant investment-backed expectations in land use.

B. Use of Intellectual Property

Much of the genetic material used in GMO engineering has received patent protection, making GMOs subject to intellectual property interests.²¹⁰ A more intricate concern than a taking in regard to land use—though equally important in the context of the biotechnological development of GMOs—is whether a municipal GMO restriction may constitute a taking of a patent. To answer this question, it is important to analyze potential claims by biotechnology agribusiness related to the predictably restricted use of their intellectual property. In this vein, it is important to consider: (1) whether patents are property subject to the Takings Clause of the Fifth Amendment; and (2) whether a municipal regulation of a GMO is sufficient to regulate intellectual property in a direct and non-consequential manner.²¹¹

1. Patents as Property Subject to a Taking

The Federal Circuit, the Federal Court of Claims, and the United States Supreme Court have all recognized that patent rights are property rights.²¹² This basic precept has been settled for over a century²¹³ and should otherwise put to rest whether a patent is, in and of itself, property. The issue of whether a patent is the kind of property that is subject to a taking, and under what circumstances, are wholly different issues.

209. This is assuming that the expectation was ever permissible and reasonable.

210. *See Ikuta, supra* note 35, at 337–41 (discussing the intersection of intellectual property and GMOs).

211. Meltz, *supra* note 53, at 317, 321.

212. *Zoltek Corp. v. United States*, 58 Fed. Cl. 688, 696 (Fed. Cl. 2003).

213. *See, e.g., Cammeyer v. Newton*, 94 U.S. 225, 226 (1876) (explaining “an invention so secured is property in the holder of the patent, and that as such the right of the holder is as much entitled to protection as any other property, during the term for which the franchise or the exclusive right or privilege is granted” (citation omitted)).

As a general matter, courts have recognized that when the United States uses a patent without permission of the patent owner, it constitutes an exercise of eminent domain.²¹⁴ In *Ruckelshaus v. Monsanto Company*, the Supreme Court made clear “the appropriation of an intellectual property interest by a government action requires just compensation for its use when a federal law deprives the intellectual property owner of virtually all investment-backed expectations in the intellectual property.”²¹⁵ In *Ruckelshaus*, however, the issue related to the Environmental Protection Agency’s disclosure of trade secrets to the public in the interest of public welfare.²¹⁶ Despite the different intellectual property interests, *Zoltek Corporation v. United States* appears to hold that, at a minimum, in some circumstances a patent may be subject to a taking.²¹⁷ The issue in regard to land use restrictions on GMOs is whether such a restriction can make an effective taking on a patent either on the land or intended to be used on the land.

Municipal land use restrictions banning the growth of a GMO target land where the organism containing a patent is grown, not the patent itself. For a plaintiff to claim a taking has occurred, the regulation must have a direct effect on the property, in this case, the patent itself.²¹⁸ As the focus of the legislation is unlikely to itself be aimed at intellectual property, but real property in the form of a land use restriction for GMO crops,²¹⁹ analysis of whether this constitutes a direct appropriation is necessary to determine the viability of a takings claim.

214. *Zoltek*, 58 Fed. Cl. at 696; *see also* *Leesona Corp. v. United States*, 599 F.2d 958, 964 (Ct. Cl. 1979) (“When the government has infringed, it is deemed to have ‘taken’ the patent license under an eminent domain theory, and compensation is the just compensation required by the fifth amendment.”).

215. *Zoltek*, 58 Fed. Cl. at 705 (summarizing the holding of *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 1003–04 (1984)).

216. *Ruckelshaus*, 467 U.S. at 1008–09.

217. *See Zoltek*, 58 Fed. Cl. at 696 (claiming a patent has been taken when the United States uses it without permission).

218. Meltz, *supra* note 53, at 321.

219. It is theoretically possible that a municipality may seek to outlaw just one type of GMO—for example plants with Bt genes—by directly targeting only those plants. This may be more near to an intellectual property taking, though it would be difficult to differentiate from any other claim for a taking of real property, as it may still be argued that the focus of the regulation is not on the intellectual property itself but rather the effects it has on the plant, and therefore the taking is more appropriately classified as focused on real property.

2. Direct or Consequential?: Analyzing Intellectual Property Takings Through the Lens of a Land Use Restriction

Direct causation of an adverse impact on property is a necessary element to any successful takings claim.²²⁰ Though a land use restriction targeted directly at a crop does not particularly concern itself with any intellectual property contained within a crop, a takings claim for the secondary-effects of such a restriction has never been heard by the courts and deserves critical examination under direct causation criteria. To begin, in proving a government action directly caused a taking a claimant must, at a minimum, assert that its property interest was *actually* taken by the government action.²²¹ To extend a hypothetical, a claim could be relatively simple: By way of land use regulation aimed at a GMO crop, the municipality has deprived the property owner of the economic use of both the land itself and the intellectual property contained thereon. Here, already the link between the crop and the patent appear somewhat inseparable as it would be difficult—or perhaps impossible—to restrict the use of one without implicating the other.

What is clear is that the land use regulation inextricably affects both the crop and the patent. What remains unsettled is whether such a regulation *directly caused* the taking effect on the patent when aimed at the land, or more specifically, the crop. The issue of what causation standard courts should use in a takings analysis is, at best, muddled and perhaps not altogether important in and of itself.²²² The threshold consideration is that the subsequent loss or injury resulting from the governmental action cannot merely be consequential damages resulting from the alleged taking.²²³

220. Meltz, *supra* note 53, at 321.

221. *Air Pegasus of D.C., Inc. v. United States*, 424 F.3d 1206, 1215 (Fed. Cir. 2005).

222. *See* Meltz, *supra* note 53, at 321 (explaining that a discussion of causation itself is not common in takings jurisprudence, and when it is discussed, courts have been known to vary in applying standards).

223. *Omnia Commercial Co. v. United States*, 261 U.S. 502, 510 (1923); *see also* *N. Transp. Co. of Ohio v. City of Chicago*, 99 U.S. 635, 642 (1878) (“[A]cts done in the proper exercise of governmental powers, and not directly encroaching upon private property, though their consequences may impair its use, are universally held not to be a taking within the meaning of the constitutional provision.”); *Yuba Natural Res., Inc. v. United States*, 904 F.2d 1577, 1581 (Fed. Cir. 1990) (“It is a well settled principle of Fifth Amendment taking law . . . that the measure of just compensation is the fair value of what was taken, and not the consequential damages the owner suffers as a result of the taking.”); *Klein v. United States*, 375 F.2d 825, 829 (Ct. Cl. 1967) (“It is settled law that . . . compensation under the Fifth Amendment may be recovered only for property taken and not for incidental or consequential losses, the rationale being that the sovereign need only pay for what it actually takes rather than for all that the owner has lost.”).

Though a municipal ban of GMOs does not appear to concern itself with patents, it would be difficult to suggest that they are not affecting their use. Consequential damages are typically demarcated by some secondary harm, but seemingly have nothing to do with the secondary-effect of the taking. For example, if federal law protects an animal which invasively destroys the value of a property owner's land, a governmental taking cannot have occurred on the land because the diminution of the value of property *is a consequence of the protection* but was not itself *caused* by the protection.²²⁴ To compare with a GMO restriction, the law itself is aimed at crops grown within the municipality, but as a consequence, the patents within those crops are also limited in the scope of their use. Seemingly, a restriction aimed at land use affects not only the property interest in land, but the use of patented materials—a subsequent property interest—on that land. As such, a ban of GMO crops directly affects the patents contained within the crops in the same manner they affect the crops themselves. The value of both properties therefore, may be considered in a takings claim, especially when the regulation is aimed at crops in a field trial.²²⁵

Though the patented material in the crop is perhaps indistinguishable from the crop itself, this alone is not dispositive of a taking when a regulation limits the use of the crop in a localized region. Patent rights themselves include far more than the material located within a particular crop at a particular time. Even with a regional restriction, the patent remains viable outside of the region where the ban has been enacted. Although in theory a GMO restriction touches on the patented material within a crop, it does not wholly appropriate the patent in the manner described in *Zoltek*.²²⁶ At best, under these circumstances a plaintiff would be left attempting to claim that the restriction limited the value of the patent and interfered with investment-backed expectations for the use of the patent. Even so, a court is unlikely to be convinced that a state's use of police powers to enact regulations in a certain location is enough to suggest that a patent holder—

224. See *Christy v. Hodel*, 857 F.2d 1324, 1334–35 (9th Cir. 1988) (explaining in detail how various courts have ruled on the issue of wildlife destroying real property in a takings context).

225. This is perhaps where this issue becomes immensely more puzzling. Though this may not be an issue when dealing with approved food crops, a court must consider what value, if any, a patent has outside of both the location where it is being planted in a test crop and what value that patent may have even if it has not achieved its purpose of being used in food products or otherwise. Though it may be the case that there is no value outside of the crop itself, this determination alone is not without intrinsic difficulties.

226. Recall, in this case, the United States used the patent right itself within permission. *Zoltek Corp. v. United States*, 58 Fed. Cl. 688, 696 (Fed. Cl. 2003). Here, the circumstances appear to be much more narrow in scope, as the government is merely limiting the use of the patent right.

who *still retains the exclusionary rights of patent ownership*—has been so adversely affected by the law as to render their investment-backed expectations depleted. Patent rights are not themselves intrinsically economically valuable, and arguments suggesting restrictions diminishing the value of these rights are a taking are unlikely to succeed, unless the patent itself is impermissibly appropriated.²²⁷

*C. The Takings Clause and Commercial Products:
Genetically Modified Seeds*

Seed sellers and developers, similar to farmers producing crops from seed, have an interest in bringing GMO seeds to market. Where a municipal GMO ban has been enacted, these parties are no longer capable of selling their commercial product, making the regulation—once again—open to an inverse condemnation claim. A takings claim related to personal property, though, is likely to receive less constitutional protection than other types of property.²²⁸ In *Lucas*, the Court provides:

[I]n the case of personal property, by reason of the State's traditionally high degree of control over commercial dealings, [a person] ought to be aware of the possibility that new regulation might even render his property economically worthless (at least if the property's only economically productive use is sale or manufacture for sale).²²⁹

Despite the interests weighed in favor of regulation, the regulation itself may still constitute a taking depending on the other *Penn Central* factors.

On balance, a court must consider the character of the governmental action, the economic impact, and the investment-backed expectations of the claimant under *Penn Central*.²³⁰ A comparative analysis took place in *Rose Acre Farms, Inc. v. United States*. In that case, the Federal Circuit analyzed whether a USDA regulation of eggs constituted a taking by removing a significant portion of these eggs from the market due to salmonella risk.²³¹ The court determined that the claimant's investment-backed expectations were reasonable, despite a long history of egg regulation, because the type

227. It would appear that takings in the context of patent rights are currently limited to circumstances approximating those in *Zoltec*.

228. Meltz, *supra* note 53, at 320.

229. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1027–28 (1992).

230. *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 124 (1978).

231. *Rose Acre Farms, Inc. v. United States*, 559 F.3d 1260, 1262–65 (Fed. Cir. 2009).

of regulation at issue was relatively unprecedented for the time.²³² Despite their economic losses due to the regulation, the court ultimately determined the character of the governmental action was manifestly in favor of the public interest, outweighing the otherwise substantial economic harm.²³³

Returning to the circumstances at hand, it is unquestionable that a claimant in the business of selling GMO seeds will suffer economic harm due to a ban of GMO seeds in a municipality. A claimant may argue, similar to *Rose Acre*, that their investment-backed expectations in GMO seeds were reasonable as no federal regulation has gone as far as to restrict their sale. Though they have been restricted in a number of municipalities, this argument appears to contain enough truth to weigh in favor of the claimant. Whether the *Penn Central* factors weigh against the claimant is again in the character of the governmental action. As the *Rose Acre* court noted:

“[T]he character of the governmental action factor requires a court to consider the purpose and importance of the public interest underlying a regulatory imposition, by obligating the court to ‘inquire into the degree of harm created by the claimant’s prohibited activity, its social value and location, and the ease with which any harm stemming from it could be prevented.’”²³⁴

This analysis reinvigorates the longstanding notion that a governmental action that does not remove a right that a property owner never had cannot constitute a taking.²³⁵ A claimant selling GMO seeds certainly has the right to engage in commercial activities, but is unlikely to be able to sustain a takings claim if the good itself is, or is likely, a public nuisance. In this case, a state’s “traditionally high degree of control over commercial dealings”²³⁶ in conjunction with the public interest in nuisance prevention will likely outweigh the economic harms associated with a GMO ban in a localized region. If a GMO ban does ever reach a federal level, however, the balance of interests will depend on the facts and circumstances of the claims.

232. *Id.* at 1276.

233. *Id.* at 1283.

234. *Id.* at 1283 (quoting *Maritrans Inc. v. United States*, 342 F.3d 1344, 1356 (Fed. Cir. 2003) (quoting *Creppel v. United States*, 41 U.S. F.3d 627, 631 (Fed. Cir. 1994)).

235. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1022–24 (1992).

236. *Id.* at 1027–28.

CONCLUSION

Municipal legislative efforts to deal with problems associated with GMOs have only just begun. The issue of how best to deal with the environmental, economic, and human health threats associated with these organisms is unlikely to dissipate in the foreseeable future, crystalizing the need for novel measures to deal with these issues. A flat ban on the planting of GMO crops appears to be a viable option in some circumstances under the constitutional takings standard, so long as the ban allows for subsequent uses of land and patents associated with the GMO. Where commercial products are concerned, a GMO ban is unlikely to rise to the level of a taking at a local level, but a federal ban may tip the balance of interests differently. Despite the ostensible lack of a viable takings claim, the prognosis for the availability of a GMO ban appears somewhat bleak, as industry and farmers alike combat what they see as a threat to both agriculture and their livelihood.²³⁷ Nevertheless, with the constitutional standard requiring just compensation potentially evadable, municipalities may gain confidence in dealing with local problems with local legislation.

—*Kenneth F. Noga*^{*†}

237. See, e.g., Profita, *supra* note 73 (discussing failed legislation in Oregon to restrict GMO crops); Sophie Cocke, *Apocalyptic Talk Takes over Hawaii GMO Debate*, HUFFINGTON POST (Sept. 9, 2013, 3:40 PM), http://www.huffingtonpost.com/2013/09/05/hawaii-gmo-debate_n_3875044.html (discussing various difficulties to pass GMO legislation in Hawaii).

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