KING CORN: WILL THE RENEWABLE FUEL STANDARD EVENTUALLY END CORN ETHANOL'S REIGN?

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TABLE OF CONTENTS

Introduction 668
I. An Overview of Biofuels 674
II. The Rise of the Biofuels Industry and King Corn 677
A. Early Efforts to Promote Ethanol 678
B. Ongoing Subsidies and Tax Credits..........679
C. Renewable Fuel Standards..........681
D. Putting It Together: Corn Is King..........682
III. The Unintended Consequences of Biofuels Development..........682
A. Foreseeable Impacts: Environmental and Economic..........683
B. Global Food Shortages 686
C. Increased Greenhouse Gas Emissions 687
IV. Weak Initial Efforts to Address the Unintended Consequences 688
A. 2005 EPAct and Equivalence Values 689
B. The Waiver Policy 690
C. Corn Is Still King..........693
V. A Stronger Response: EPA's Regulation Implementing EISA..........697
A. Life-cycle Analyses and Advanced Biofuels..........698
B. New Versus Old Corn Ethanol Production..........701
C. Will New Ethanol Become Old Ethanol?..........705
VI. A Sustainable Biofuels Policy or More of the Same?..........707

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INTRODUCTION

Since the late 1970s, the United States has promoted the use of biofuels in an effort to achieve energy independence from the major oil-producing countries.[1] By many accounts, these promotional efforts have met with wild success. Various tax subsidies and tax credits aimed at promoting corn ethanol[2] led to an increase in corn ethanol production from 175 million gallons in 1980 to 1.4 billion gallons in 1998[3] to 3.9 billion gallons in 2005.[4] In 2005, Congress adopted a more direct approach to promote biofuels by establishing the first federal Renewable Fuel Standard (RFS).[5] The RFS required gasoline importers, blenders, and refiners to blend up to four billion gallons of biofuels into gasoline in 2005 and to increase the amount to 7.5 billion gallons by 2012.[6] The RFS did better than expected, leading Congress to include increased biofuel-blending requirements in the Energy Independence and Security Act of 2007 (EISA).[7] Under EISA, the petroleum industry must, by 2022, blend at least thirty-six billion gallons of biofuels into gasoline.[8] Industry experts have little doubt that the biofuel industry will be able to satisfy this requirement. To the extent that U.S. biofuel policy aims to promote domestic energy production, it appears to be well on its way.

However, U.S. biofuel policy also aims to mitigate climate change by reducing greenhouse gas emissions,[9] and on this front, it has not lived up to

1. *See generally* Christine C. Benson, Note, *Putting Your Money Where Your Mouth Is: The Varied Success of Biofuel Incentive Policies in the United States and the European Union*, 16 TRANSNAT'L L. & CONTEMP. PROBS. 633 (2007).

2. *See* John A. Sautter et al., *Construction of a Fool's Paradise: Ethanol Subsidies in America*, SUSTAINABLE DEV. L. & POL'Y 26, 26 (2007) (describing subsidies, tariffs, tax credits, and legislation designed to promote ethanol production and use).

3. JOSEPH DIPARDO, ENERGY INFO. ADMIN., OUTLOOK FOR BIOMASS ETHANOL PRODUCTION AND DEMAND 1 (2002), *available at* http://tonto.eia.doe.gov/FTPROOT/features/biomass.pdf.

4. Office of Energy Efficiency & Renewable Energy, U.S. Dep't of Energy, *Ethanol Production Reaches Nearly 4 Billion Gallons in 2005*, EERE NETWORK NEWS, Mar. 8, 2006, http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=9816.

5. Energy Policy Act of 2005 § 1501, 42 U.S.C. § 7545(o) (2006) (amending the Clean Air Act).

6. § 7545(o)(2)(B)(i).

7. Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 202, 121 Stat. 1492, 1522 (2007).

8. *Id.*

9. Climate change, also called global warming, results from an overabundance of greenhouse gases in the atmosphere. The most important naturally occurring greenhouse gases are carbon dioxide, methane, and nitrous oxide. While these gases occur naturally, human activities, including fossil fuel combustion, deforestation, and agricultural practices, have increased the concentrations of greenhouse gases in the atmosphere and thus increased their heat-trapping potential. *See* EPA, Climate Change – Basic Info., http://www.epa.gov/climatechange/basicinfo.html (last visited Dec. 23, 2009).

its promises. In theory, biofuels should be "carbon-neutral," because the amount of carbon dioxide they release during combustion should be offset by the amount of carbon dioxide the plants sequester during their growth.[10] However, these emissions offsets do not necessarily account for all greenhouse gas emissions that could directly result from agricultural and production practices.[11] For example, fertilizer use and soil tilling can result in high emissions of nitrous oxide, a potent greenhouse gas.[12] Converting corn starch into ethanol usually requires a substantial amount of energy, and if coal-fired power plants supply the energy, ethanol production can emit large quantities of greenhouse gases.[13] Thus, depending upon various factors, direct emissions from biofuels may exceed emissions from fossil fuels.

More importantly, when the global consequences of U.S. agricultural and biofuels policies are considered, crop-based biofuels—and corn ethanol, in particular—appear likely to cause significant increases in greenhouse gas emissions.[14] The United States is one of the world's largest exporters of agricultural crops, and many developing countries depend on U.S. food imports to meet their basic food needs.[15] U.S. biofuel policy has prompted many agricultural interests to shift away from food production in favor of domestic biofuel production.[16] This, combined with several other

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10. *See* Union of Concerned Scientists, Biofuels: Biodiesel Basics, http://www.ucsusa.org/clean_vehicles/technologies_and_fuels/biofuels/biodiesel-basics.html (last revised Jan. 7, 2010) [hereinafter Biodiesel Basics].

11. P.J. Crutzen et al., *N_2O Release from Agro-Biofuel Production Negates Global Warming Reduction by Replacing Fossil Fuels*, 7 ATMOS. CHEM. & PHYS. DISCUSSIONS 11,191, 11,197 (2007), *available at* http://www.atmos-chem-phys-discuss.net/7/11191/2007 (global warming effects from corn ethanol would be 0.9–1.5 times worse due to emissions of nitrous oxide). Some scientists calculate that corn ethanol will lower greenhouse gas emissions by 11–39%, even when emissions from ethanol refining and inputs of petroleum and fertilizer are factored in. Bruce A. Babcock et al., *Is Corn Ethanol a Low-Carbon Fuel?*, 13 IOWA AG REV. 1, 3 (2007). However, this study considered only direct inputs and emissions associated with ethanol production and did not consider the indirect effects associated with land clearing. *Id.*

12. Crutzen et al., *supra* note 11, at 11,197.

13. Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 74 Fed. Reg. 24,904, 25,042 (proposed May 26, 2009) (to be codified at 40 C.F.R. pt. 80) [hereinafter EPA RFS2 Proposal].

14. FRIENDS OF THE EARTH EUROPE, AGROFUELS: FUELING OR FOOLING EUROPE? THE PROBLEMS OF USING PLANT-BASED OILS IN POWER STATIONS AND VEHICLES 3–4, http://www.foe.co.uk/resource/briefings/agrofuels_fuelling_or_fool.pdf (last visited April 12, 2010).

15. U.N. ENV'T PROGRAMME, TOWARDS SUSTAINABLE PRODUCTION & USE OF RESOURCES: ASSESSING BIOFUELS 23 (2009), *available at* http://www.unep.org/pdf/Assessing_Biofuels-full_report-Web.pdf [hereinafter UNEP]; James Kanter, *Europeans Reconsider Biofuel Goal*, N.Y. TIMES, July 8, 2008, http://www.nytimes.com/2008/07/08/business/worldbusiness/08fuel.html.

16. Food & Agric. Org. of the U.N. [FAO], High-Level Conference on World Food Security: The Challenges of Climate Change & Bioenergy, *Soaring Food Prices: Facts, Perspectives, Impacts,*

factors, has contributed to soaring global food prices and food shortages in developing countries.[17] In response, many developing countries have begun or will begin clearing forests and peatlands to increase their own food production.[18] Additionally, other countries have begun clearing land to produce their own biofuels to export to the United States and Europe.[19] These land use changes, particularly where they would convert rainforests and peatlands into agricultural lands, could release massive amounts of carbon dioxide and other greenhouse gases.[20] One study found that U.S. biofuels policy would "double[] greenhouse [gas] emissions over 30 years and increase[] greenhouse gases for 167 years."[21] Many other studies have concluded that any U.S. biofuels policy that allows biofuels to come from food crops will result in more greenhouse gas emissions than it will prevent.[22] Policymakers have therefore begun to propose changes to U.S. biofuels policy to align it with its overarching goal of reducing emissions.

Since its creation, the federal RFS has had several provisions that could promote non-food biofuels and mitigate the effects associated with indirect land use changes spurred by corn ethanol production and development of other crop-based biofuels. However, none achieved meaningful results. For example, the 2005 Energy Policy Act (EPAct) attempted to promote the use of biofuels other than corn ethanol through various market mechanisms that allow producers to buy and trade credits, rather than actual biofuels, to meet their RFS requirements.[23] Under the 2005 EPAct, the Environmental Protection Agency (EPA) assigned different values (called "equivalence values") to various biofuels based on their energy values and environmental benefits.[24] The 2005 EPAct itself assigned cellulosic biofuels[25] and biofuels

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and Actions Required, ¶ 18, U.N. Doc. HLC/08/INF/1 (June 3–5, 2008) [hereinafter FAO *Soaring Food Prices*].

17. *Id.* at ¶¶ 7, 18 n.11 (explaining the linkages between agriculture and fuel prices), ¶ 22 (discussing how corn ethanol production in the United States will draw down U.S. corn supply), ¶¶ 33–63 (discussing impacts of high food prices on developing countries); *see* UNITED NATIONS FOOD AND AGRICULTURAL ORGANIZATION, THE STATE OF FOOD & AGRICULTURE, BIOFUELS: PROSPECTS, RISKS AND OPPORTUNITIES, 43–44 (2008) [hereinafter FAO BIOFUELS REPORT].

18. FAO BIOFUELS REPORT, *supra* note 17, at 60–61.

19. UNEP, *supra* note 15, at 63–65.

20. *Id.* at 67–68.

21. Timothy Searchinger et al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change*, 319 SCI. 1238, 1238 (2008).

22. Joseph Fargione et al., *Land Clearing and the Biofuel Carbon Debt*, 319 SCI. 1235, 1235 (2008).

23. Regulation of Fuels and Fuel Additives: Renewable Fuel Standard Program, 72 Fed. Reg. 23,900, 23,904 (May 1, 2007) [hereinafter EPA RFS1 Final Rule].

24. *Id.* at 23,909, 23,919–22.

25. Cellulosic ethanol is derived from plant materials, including wood waste, corn stover (leaves, stalks, and cobs), and other plant parts. Cellulosic ethanol may produce seven to eight times

derived from waste an equivalency value 2.5 times higher than corn ethanol.[26] In other words, an oil producer, importer, or refiner would need to purchase only one gallon of waste-derived fuel for every 2.5 gallons of corn ethanol to meet its RFS. EPA assigned other biofuels equivalence values that ranked them above corn ethanol.[27] Yet, despite the higher equivalence values, corn ethanol has continued to dominate the biofuels industry because subsidies and tax breaks make corn ethanol much cheaper than other biofuels.[28] Thus, the market approach under the RFS proved inadequate to spur production of biofuels with lower greenhouse gas emissions.

Congress included another element in the RFS that EPA could theoretically use to restrict corn ethanol production. EPA has the authority to suspend the RFS in whole or in part if a state petitions for a waiver and can demonstrate that meeting the RFS will "severely harm the economy or environment of a State, a region, or the United States."[29] In theory, a state could petition EPA to suspend the RFS requirement on the basis that it promotes the use of corn ethanol, which contributes to climate change, and that this, in turn, harms the environment of the United States and individual states. To date, EPA has declined to develop regulations implementing the RFS waiver.[30] However, in responding to a waiver request filed by Texas, EPA stated it would grant waiver requests only where a state can show that the RFS requirement is the exclusive cause of harm to the economy or environment.[31] Since corn ethanol production thrived before Congress developed an RFS, and since many additional factors contribute to climate change, EPA's existing articulation of the waiver requirement makes it extremely unlikely that a state could petition EPA to suspend the RFS on the basis that it causes increased greenhouse gas emissions due to indirect land use changes.

While these initial measures do little to curb greenhouse gas emissions, EISA presented EPA with new opportunities to improve U.S. biofuels

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more energy than corn starch, and it would not affect food supply. However, technology to produce cellulosic ethanol has not developed to a point where cellulosic ethanol production is commercially viable. L. Leon Geyer et al., *Ethanol, Biomass, Biofuels and Energy: A Profile and Overview*, 12 DRAKE J. AGRIC. L. 61, 73–74 (2007).

26. EPA RFS1 Final Rule, *supra* note 23, at 23,909; 42 U.S.C. § 7545(o)(4) (2006).

27. EPA RFS1 Final Rule, *supra* note 23, at 23,921.

28. *See* Roberta F. Mann & Mona L. Hymel, *Moonshine to Motorfuel: Tax Incentives for Fuel Ethanol*, 19 DUKE ENVTL. L. & POL'Y F. 43, 45 (2008).

29. § 7545(o)(7)(A)(i).

30. EPA RFS1 Final Rule, *supra* note 23, at 23,928.

31. Notice of Decision Regarding the State of Texas Request for a Waiver of a Portion of the Renewable Fuel Standard, 72 Fed. Reg. 47,168, 47,182 (Aug. 13, 2008) [hereinafter Texas Waiver Denial].

policy and reduce resulting greenhouse gas emissions. Most significantly, EISA mandates the use of new types of biofuels, including cellulosic and other "advanced biofuels" that do not come directly from food crops and that will likely result in far fewer greenhouse gas emissions.[32] Between 2016 and 2022, advanced biofuel use must increase by almost fourteen billion gallons.[33] In addition, all new renewable fuel production—defined as renewable fuel produced in facilities built after December 2007—would need to achieve greenhouse gas emissions reductions of 20%, compared to baseline emissions from fossil fuels.[34] This 20% requirement would apply to most new corn ethanol produced in facilities built after December 31, 2009.[35] These changes could significantly improve the environmental benefits of biofuels at some point in the future.

However, EISA and EPA's recent regulation implementing the new biofuel requirements would grandfather existing corn ethanol production from the greenhouse gas reductions requirement, perhaps indefinitely.[36] In its proposed rule implementing EISA, EPA explored the possibility of phasing out the exemption for existing corn ethanol within fifteen years in a potential effort to expedite the climate change benefits of biofuel use.[37] This phase-out would have limited the grandfathering effects under EISA and perhaps created a broader opening for other, more beneficial biofuels to gain a greater share of the market. EPA's final rule, however, rejected the phase-out.[38] Based on EPA's estimates, the grandfathering provision will allow existing facilities to produce about fifteen billion gallons of corn ethanol annually[39] and will therefore allow corn to continue its dominance over the U.S. biofuels industry for years to come. Thus, while EISA signals

32. *See* EPA RFS2 Proposal, *supra* note 13, at 24,911.

33. Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 202, 121 Stat. 1492, 1522 (2007).

34. EPA RFS2 Proposal, *supra* note 13, at 24,924.

35. Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 75 Fed. Reg. 14,670, 14,688–89 (Mar. 26, 2010) (to be codified at 40 C.F.R. pt. 80), *available at* http://www.epa.gov/otaq/fuels/renewablefuels/regulations.htm [hereinafter EPA RFS2 Final Rule Preamble].

36. *Id.* at 14,688.

37. EPA RFS2 Proposal, *supra* note 13, at 24,929–30; EPA RFS2 Final Rule Preamble, *supra* note 35, at 24,946.

38. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,689–90.

39. *Id.* at 14,746. EPA calculated that facilities online as of November 2009 had the capacity to produce more than twelve billion gallons. *Id*. It further estimated that eleven new facilities and two facility expansions—all of which were under construction and thus subject to the grandfathering provisions—would come online and increase overall corn ethanol production to fifteen billion gallons. *Id.* at 14,746 n.60 (citing industry publications listing facilities under construction as of October 2009); *id.* at 14,746 n.63 (explaining why two coal-powered ethanol plants would qualify for grandfathering based on the date construction began).

a significant shift in biofuels policy toward more environmentally beneficial biofuels, it does not go far enough to limit the existing harmful effects of corn ethanol production.

Moreover, EPA's final rule may send signals to the corn ethanol industry that could trigger new investment in corn ethanol production facilities, despite Congress's intent to transition away from corn ethanol. In developing its rule, EPA made the controversial decision to incorporate indirect land use emissions into its calculations of lifecycle greenhouse gas emissions from various biofuels.[40] EPA's proposed rule then determined that future corn ethanol production would not meet EISA's requirement that new corn ethanol reduce greenhouse gas emissions by at least 20%.[41] In its final rule, however, EPA reassessed its assumptions and concluded that most types of corn ethanol production would, in fact, meet the 20% reduction requirement.[42] In so doing, EPA created a road map for future corn ethanol producers to follow if they want to increase future corn ethanol manufacturing under EISA.

To the extent EPA based its conclusions on accurate scientific data, EPA's final rule represents a legally defensible shift. Yet, as EPA acknowledges, uncertainty abounds whenever the agency attempts to assess future greenhouse gas emissions resulting from biofuel production.[43] By establishing expectations that certain types of new corn ethanol production may qualify under EISA's 20% standard, EPA may have foreclosed the possibility of limiting that production in the future, even if EPA's estimates prove inaccurate. As EISA's grandfathering provisions indicate, Congress seems unlikely to prohibit ongoing production of corn ethanol. EPA's suggestions that new corn ethanol facilities can meet the 20% reduction requirement may therefore set the stage for future grandfathering provisions and perpetuate the dominance of corn ethanol, even if the science ultimately shows that corn does more harm than EPA currently expects.

While the existing grandfathering provisions and EPA's new rule suggest that the corn ethanol industry will remain a strong player in the U.S. biofuels industry, other requirements under EISA and EPA's new rule could signal a longer-term shift towards a sustainable biofuels policy. Existing corn ethanol production capacity dominates the industry for now, but advanced and cellulosic biofuels may surge ahead of corn ethanol in the near future. By 2022, these superior biofuels must account for more than

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40. *Id.* at 14,765 (explaining why EPA would continue to consider indirect land use changes).

41. EPA RFS2 Proposal, *supra* note 13, at 25,048 tbl.VI.C.2-1.

42. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,785–86.

43. *Id.* at 14,777–81 (discussing the uncertainty involved with assessing greenhouse gas emissions resulting from land use changes caused by U.S. biofuels production).

half of all biofuel production under EISA.[44] While EPA's new rule may send signals to the corn ethanol industry to increase production, EISA simultaneously indicates to the biofuels industry at large that advanced biofuels will assume a dominant place in the future U.S. biofuels market. Ultimately, the climate change benefits of U.S. biofuels policy may depend on which signals the biofuels industry receives and acts upon.

Part I of this article briefly introduces the different types of biofuels to provide the reader with a foundation for the rest of the article and to emphasize the important distinctions between first-generation, second-generation, and third-generation biofuels. Part II of this article explores the development of the U.S. biofuels industry and explains why corn ethanol has come to dominate U.S. biofuel production. It discusses subsidies under various energy laws and the Farm Bill, which have enabled corn farmers to dominate the agricultural and renewable fuels markets. It also explains how the RFS has favored corn ethanol. Part III then describes the unintended consequences of corn ethanol production, including its impacts on the global food supply and increased greenhouse gas emissions. Part IV reviews the initial attempts under the 2005 EPAct to limit some of these unintended consequences and explains why they failed to reduce production and use of corn ethanol. Part V turns to EPA's recent rulemaking implementing EISA and analyzes how it will affect corn ethanol production. Finally, Part VI addresses whether EISA and EPA's regulations could lead the way to a sustainable biofuels policy. This paper, while concluding that U.S. biofuels policy is not yet sustainable, argues that EISA and EPA's regulations represent a significant step forward and provide a reason to hope for more improvements in the future.

I. AN OVERVIEW OF BIOFUELS

Not all biofuels are created alike. The term biofuel means any kind of fuel produced from biomass (except fossil fuels), such as plants, woody material, organic wastes, and the like.[45] Yet, until recently, policymakers drew little distinction between different types and sources of biofuels.

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44. Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 202, 121 Stat. 1492, 1522 (2007).

45. Cymie Payne, *Local Meets Global: The Low Carbon Fuel Standard and the WTO*, 34 N.C. J. INT'L L. & COM. REG. 891, 895 (2009) (citing FOOD & AGRIC. ORG. OF THE U.N., UNIFIED BIOENERGY TERMINOLOGY: UBET 14, 30–31 (2004), *available at* ftp://ftp.fao.org/docrep/fao/007/j4504e/j4504e00.pdf). Although biofuels can refer to any type of energy derived from organic material, such as energy produced from burning wood, this paper focuses on biofuels intended to replace transportation fuels, such as gasoline and diesel.

Today, however, scientists and policymakers tend to distinguish biofuels as first-generation, second-generation, and third-generation biofuels.[46] The different monikers reveal key distinctions between the types of fuels produced, their overall energy efficiency, and the potential side-effects of their production and use.[47]

First-generation biofuels use relatively simple technology to extract fuels from plants that typically also serve as food crops.[48] Two main types of first-generation biofuels—ethanol and biodiesel—serve as replacements for transportation fuels.[49] Ethanol is an alcohol produced from the sugars found in plants.[50] Ethanol production "works best" using plants that concentrate simple sugars, such as starch, in their seeds.[51] Corn kernels serve as ideal starch-delivery systems and therefore account for about 95% of all ethanol production in the United States.[52] Other countries, like Brazil, manufacture ethanol from sugar cane, which provides a much more efficient source of ethanol than corn.[53] Biodiesel comes from plant or animal oils that undergo a minimal level of processing to make the oils less dense and thus more compatible with vehicle engines.[54] Biodiesel makes up a small fraction of U.S. biofuels,[55] but Europe has embraced biodiesel to a much greater extent.[56] Like ethanol, most biodiesel comes from food crops, such as soy, rapeseed, and sunflower plants.[57] Many developing countries with tropical climates have also begun producing biodiesel from palm oil plantations.[58] Worldwide, first-generation biofuels dominate the biofuels market.[59]

Second-generation biofuels include both ethanol and biodiesel produced from cellulosic materials, instead of from food.[60] Cellulosic materials include any of the woody or fibrous waste materials that remain after the harvest of the food parts of a plant.[61] For example, the stalks of

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46. *See* UNEP, *supra* note 15, at 25 (distinguishing first-, second-, and third-generation biofuels).
47. *Id.*
48. *Id.* at 25, 26 tbl.2.1.
49. CHRIS WOLD ET AL., CLIMATE CHANGE AND THE LAW 754 (2009).
50. Geyer, *supra* note 25, at 69.
51. *Id.*
52. *Id.*
53. *Id.* at 73.
54. WOLD ET AL., *supra* note 49, at 756.
55. Biodiesel Basics, *supra* note 10.
56. UNEP, *supra* note 15, at 34.
57. *Id.* at 26 tbl.2.1.
58. *Id.*
59. *Id.* at 34.
60. *Id.* at 25.
61. Geyer, *supra* note 25, at 73–74.

wheat plants and corn stover are cellulosic materials that could produce second-generation biofuels.[62] Some studies suggest that second-generation biofuels could serve as replacements for fossil fuels without creating the unintended consequences associated with using food crops for fuels, and without expending the same amount of energy that corn ethanol production demands,[63] although this latter point remains subject to dispute.[64]

Third-generation biofuels include several experimental alcohols developed from crops[65] and the more promising and proven technology of algae-based biodiesel (called, alas, oilgae).[66] Algae-based biofuels have the potential to provide large amounts of biodiesel using a relatively small amount of land (when compared to traditional crops) and few resources.[67] Several industries and some cities have invested in algae-based fuels,[68] but it may take time for this nascent technology to develop into a commercially viable biofuel.

Collectively, policymakers tend to refer to second- and third-generation biofuels as advanced biofuels.[69] While the United Nations Environment Programme (UNEP) cautions that this label may incorrectly suggest that advanced biofuels have absolute superiority over first-generation biofuels,[70] advanced biofuels do at least appear to have a few advantages. First, to the extent that the advanced biofuels come from waste and materials not used as food, advanced biofuels may avoid the conflicts between fuel and foods that the world witnessed in 2008.[71] Second, if algae-based biofuels live up to their promise, they could supply localized sources of transportation fuels without significantly affecting other land uses.[72] Finally, unlike first-generation biofuels, and corn ethanol in particular, certain advanced biofuels could yield significant net reductions in greenhouse gas emissions.[73] While advanced biofuels require much more study and development, they have the potential to deliver on the promise of carbon-

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62. UNEP, *supra* note 15, at 25.

63. *See* Geyer, *supra* note 25, at 75 (discussing the concern over increased ethanol production on world food supplies).

64. David Pimentel & Marcia Pimentel, *Corn and Cellulosic Ethanol Cause Major Problems*, 8 ENERGIES 35, 36 (2008).

65. UNEP, *supra* note 15, at 25.

66. *Id.*

67. Katie Howell, *Is Algae the Biofuel of the Future?*, SCI. AM., Apr. 28, 2009, http://www.scientificamerican.com/article.cfm?id=algae-biofuel-of-future.

68. *Id.*

69. UNEP, *supra* note 15, at 25.

70. *Id.*

71. FAO BIOFUELS REPORT, *supra* note 17, at 18.

72. Howell, *supra* note 67.

73. FAO BIOFUELS REPORT, *supra* note 17, at 18–19.

neutral fuels. To date, however, this promise has gone unfulfilled due to the dominance of first-generation biofuels, and corn ethanol in particular, in the United States.[74]

II. THE RISE OF THE BIOFUELS INDUSTRY AND KING CORN

Well before Congress began mandating the use of biofuels as a way to achieve energy independence or reduce greenhouse gas emissions, corn growers and producers began promoting corn ethanol as a fuel source. U.S. farm policy likely created a greater incentive for corn growers to promote ethanol.[75] Beginning in the 1970s, farmers received payments for increased corn production and thus created a glut of low-priced corn.[76] As more corn flooded the marketplace, producers developed new uses for the cheap commodity, one of which was ethanol.[77] Once ethanol producers convinced politicians that ethanol could serve as a substitute for foreign oil, politicians increased the already significant incentives for ethanol production by creating new subsidies and tax credits for corn and corn ethanol.[78] By the time Congress passed the first renewable fuel standard in the 2005 EPAct,[79] corn ethanol had already gained a dominant position in the biofuels market. Five years later, despite policies aimed at promoting other biofuels—including biodiesel and more advanced biofuels—corn retains its status as the king of biofuels.

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74. Corn ethanol is not the only first-generation biofuel that presents risks to food sources and potentially emits more greenhouse gases than fossil fuels. Biodiesel derived from soy, rapeseed, and sunflower plants presents some of the same risks. In addition, many developing countries have increased their production of biodiesel from palm oil, and, in so doing, likely increased greenhouse gas emissions due to converting rainforests into palm plantations. The European Union responded to these developments by suspending its renewable fuel requirements until it could verify that its policies were not causing more harm than good. *See* UNEP, *supra* note 15, at 25 (discussing the unintended consequences of first-generation biodiesel production and use). This paper does not explore those developments. Instead, it focuses only on U.S. biofuel policy and, by necessary implication, corn ethanol production and use.

75. *See* Michael Pollan, *The Great Yellow Hope*, N.Y. TIMES, May 26, 2006, http://pollan.blogs.nytimes.com/2006/05/24/the-great-yellow-hope/?scp=1&sq=pollan%20corn%20ethanol&st=cse (describing the corn industry's monetary incentive to promote a federal government policy to increase ethanol production with tax incentives).

76. Jedediah Purdy & James Salzman, *Corn Futures: Consumer Politics, Health, and Climate Change*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10,851–52 (2008).

77. *Id.*

78. Mann & Hymel, *supra* note 28, at 44.

79. 42 U.S.C. § 7545(o) (2006).

A. Early Efforts to Promote Ethanol

Early corn ethanol production resulted from a change in farm policy that began in the 1970s. During the Great Depression, President Franklin D. Roosevelt initiated the country's first comprehensive farm policy aimed at addressing the boom-and-bust cycle that had dominated the agricultural industry for decades.[80] President Roosevelt created a new loan program to even out food production and increase security in the U.S. food supply.[81] The program provided farmers with guaranteed loans to purchase agricultural supplies and allowed farmers to defer payment on the loans until their crops produced.[82] When crop prices were low, farmers could store their crops and defer payment on loans.[83] Whenever the crop prices rose, farmers could then sell their surplus at the higher rates and then repay the government.[84] Farmers also had the option of making payments in the form of grains, thereby increasing the government's direct access to crops.[85] This system evened out the boom-and-bust cycle by providing farmers with guaranteed access to loans and allowing farmers to store crops when market prices were low.[86] In short, the system freed farmers from the whims of the market and created a more stable agricultural economy.

In the early 1970s, however, a series of events unrelated to the loan program led to the first decline in food production since the 1930s. In response, President Nixon's Secretary of Agriculture substantially revised the farm payment system so that farmers received a guaranteed payment for every bushel of grain they produced.[87] Production-based subsidies created the sought-after increase in food production.[88] However, because the system included no cap in the amount of subsidies available, over-production and plunging market prices for the subsidized grains soon followed.[89] Perhaps as a cynical ploy to ensure continued receipt of subsidies, or perhaps as an innovative response to the new abundance of corn, corn growers teamed up with consumers to create new corn-intensive

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80. DANIEL IMHOFF, FOOD FIGHT: THE CITIZEN'S GUIDE TO A FOOD AND FARM BILL 33–34 (2007).

81. *Id.* at 34.

82. *Id.* at 35.

83. *Id.*

84. *Id.*

85. *Id.*

86. Purdy & Salzman, *supra* note 76, at 10,852.

87. MICHAEL POLLAN, THE OMNIVORE'S DILEMMA: A NATURAL HISTORY OF FOUR MEALS 51–52 (2006).

88. *Id.* at 91.

89. *Id.* at 52–54, 62.

products.[90] The most dominant product, high-fructose corn syrup, quickly took hold within the fast food industry.[91] Other food manufacturers embraced other corn products and quickly added them to their foods as cheap fillers.[92] As a result, more than one-quarter of all supermarket food contains corn.[93] As Professors Purdy and Salzman have quipped, based on the amount of corn consumed by the typical American, "[i]f we are what we eat, then we're corn on legs."[94]

Ethanol became the other major corn product developed to take advantage of the surplus crops. Initially, corn ethanol entered the scene as a novelty; the Arab oil embargo of the early 1970s, however, followed by the energy crisis that lasted for several more years, created an opening for corn ethanol to fill.[95] As discussed in the next section, Congress quickly acted to create more subsidies and tax credits, as well as certain mandates, to spur increased production of corn ethanol and to lead the United States further down its path to energy independence. While energy independence and environmental benefits ultimately became the goals undergirding U.S. biofuels policy, it is important to remember that U.S. farm policy initially created the ethanol industry.

B. Ongoing Subsidies and Tax Credits

Once the corn-growers' industry convinced Congress that corn ethanol could lead the United States toward energy independence, Congress passed several laws to promote corn ethanol.[96] Concerns about clean air further enabled the growth of the ethanol industry, as gasoline that contained ethanol released fewer pollutants into the air and thus enabled various cities to meet their air quality requirements.[97] Once ethanol gained a more stable foundation, Congress once again used subsidies and tax incentives to prop

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90. *Id.* at 91–92.

91. *Id.* at 103–06.

92. *Id.* at 95–98.

93. Bonnie Azab Powell, *Journalism Professor Michael Pollan's New Book on the U.S. Food Chain Provides Few Soundbites—But Much to Chew On*, U.C. BERKELEY NEWS, Apr. 11, 2006, *available at* http://www.berkeley.edu/news/media/releases/2006/04/11_pollan.shtml.

94. Purdy & Salzman, *supra* note 76, at 10,851.

95. *See* Bruce A. McCarl & Fred O. Boadu, *Bioenergy and U.S. Renewable Fuels Standards: Law, Economic, Policy/Climate Change and Implementation Concerns*, 14 DRAKE J. AGRIC. L. 43, 44–48 (2009) (describing various legislative acts designed to promote bioenergy, including ethanol use in the United States).

96. U.S. Energy Info. Admin., *Energy Timelines: Ethanol*, http://www.eia.doe.gov/kids/history/timelines/ethanol.html (last visited Feb. 28, 2010).

97. *Cf. infra* notes 106–08 and accompanying text; *see* McCarl & Boadu, *supra* note 95.

up the industry.[98] Until passage of the Renewable Fuel Standard in 2005, energy and clean air policy provided the foundation for expanding the ethanol industry.

Congress initially began promoting corn ethanol as a means to achieve energy independence in the 1970s when it passed the Energy Tax Act of 1978, which gave a $0.40 per gallon subsidy for ethanol use in gasoline.[99] Congress followed this initial step by passing several other laws, including the Energy Security Act of 1980,[100] the Surface Transportation Assistance Act of 1982,[101] and the Tax Reform Act of 1984,[102] all of which increased the tax incentives and subsidies for ethanol, resulting in a subsidy of $0.60 per gallon by 1984.[103] Even this substantial subsidy, however, could not make ethanol competitive with gasoline when oil prices plummeted to $10 per barrel in 1985.[104] Several ethanol producers went under as a result,[105] and the industry appeared doomed.

However, concerns about air quality revived the ethanol industry beginning in the late 1980s, when states and then Congress mandated the use of oxygenated fuels.[106] Oxygenated fuels, including fuels mixed with additives like ethanol and methyl tertiary butyl ether (MTBE), allowed gasoline to burn more completely and thus release fewer pollutants.[107] However, MTBE turned out to be a toxic, carcinogenic chemical that readily leached into and contaminated groundwater supplies, which enabled ethanol to dominate the oxygenated fuel market.[108] The ethanol industry thus regained its footing as a result of the oxygenated fuels requirement.

Congress, meanwhile, continued to award ethanol more subsidies and to pass additional laws requiring its use.[109] In 2005, Congress restructured these tax incentives to create the alcohols fuels credit, which amounted to a $0.51 per gallon credit in 2008, and a separate excise tax credit, which

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98. *See infra* notes 109–16 and accompanying text.

99. *Energy Timelines*, *supra* note 96; *see* McCarl & Boadu, *supra* note 95, at 45 & n.6 (explaining how the legislation promoted gasohol, which effectively meant ethanol).

100. Pub. L. No. 96-294, 94 Stat. 611 (codified as amended at 42 U.S.C. §§ 8802–03, 8813–16, 8820 (2006)).

101. Pub. L. No. 97-424, 96 Stat. 2097 (codified as amended at 16 U.S.C. § 40 (2006)).

102. Pub. L. No. 98-369, 98 Stat. 494 (codified as amended at 26 U.S.C. § 40 (2006)).

103. McCarl & Boadu, *supra* note 95, at 45.

104. *Id.*

105. *Energy Timelines*, *supra* note 96; McCarl & Boadu, *supra* note 95, at 45 n.11.

106. *See* McCarl & Boadu, *supra* note 95, at 45–46 (describing state and federal mandates to control pollution by requiring oxygenated fuels); 42 U.S.C. § 7545(m) (2006) (requiring oxygenated gasoline in areas not meeting ambient air quality standards).

107. *See id.* at 45–46 & n.12 (citing Thomas J. Knudson, *Antipollution Plan Stirs Ire of Colorado Motorists*, N.Y. TIMES, July 27, 1987, at A8).

108. McCarl & Boadu, *supra* note 95, at 46.

109. *Id*.

allowed ethanol users to take a $0.51 per gallon credit.[110] Congress also imposed a $0.54 per gallon tariff on imported ethanol.[111] Although the interactions between the tax credits and subsidies are quite complicated,[112] the combined amount of subsidies for corn and subsidies for corn ethanol runs into the billions of dollars per year. Total U.S. corn subsidies from 1995 to 2005 exceeded $56 billion, and ethanol subsidies cost $5.1 to $7 billion in 2006.[113] On a per gallon basis, subsidies amounted to $1.05 to $1.38 per gallon.[114] When combined with the import tariff, corn ethanol costs $120 more than every barrel of oil saved.[115] Experts expect the total subsidies to increase as a result of RFS requirements, which require an increase in biofuels production through the year 2022.[116]

C. Renewable Fuel Standards

Congress passed the first RFS (RFS1) as part of the comprehensive energy legislation embodied in the 2005 EPAct. RFS1 required gasoline producers, importers, and refiners to blend up to four billion gallons of biofuels into gasoline in 2005 and to increase the amount to 7.5 billion gallons by 2012.[117] RFS1 established a guaranteed market for various biofuels, including corn ethanol, and quickly worked with other forces, including existing tax subsidies and credits and soaring oil prices, to lead to a boom in ethanol production.[118]

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110. *See* Mann & Hymel, *supra* note 28, at 47–49 (explaining the differences between the different types of tax credits and how they interact with each other). Those details are beyond the scope of this article.

111. Omnibus Reconciliation Act of 1980, Pub. L. No. 96-499, 94 Stat. 2599 (1980); *see* David Adams, *Sugar in the Tank*, FORBES, Nov. 16, 2005, *available at* http://www.forbes.com/2005/11/15/energy-ethanol-brazil_cx_1116energy_adams.html. This tariff has achieved its intended effect of reducing imports of Brazilian sugarcane ethanol. Sautter et al., *supra* note 2, at 26. In so doing, the tariff, along with U.S. corn and corn-ethanol subsidies, may violate free trade rules enforced by the World Trade Organization (WTO). Phoenix X.F. Cai, *Think Big and Ignore the Law: U.S. Corn and Ethanol Subsidies and WTO Law*, 40 GEO. J. INT'L L. 865, 905 (2009).

112. *See* Mann & Hymel, *supra* note 28, at 47–51 (describing the complexities of ethanol-based tax incentives).

113. Cai, *supra* note 111, at 899. These figures reveal the difficulty in calculating actual subsidies for corn and corn ethanol. Subsidies come from so many different laws and appear in so many different forms that it is difficult for even experts to track them.

114. Sautter et al., *supra* note 2.

115. Purdy & Salzman, *supra* note 76, at 10,853 (citing Michael Pollan, *The Great Yellow Hope*, N.Y. TIMES, May 24, 2006, http://pollan.blogs.nytimes.com/2006/05/24/the-great-yellow-hope).

116. Cai, *supra* note 111, at 905–06.

117. Energy Policy Act of 2005 § 1501, 42 U.S.C. § 7545(o)(2)(B)(i) (2006) (amending the Clean Air Act).

118. EPA RFS2 Proposal, *supra* note 13, at 24,908.

Two years after creating RFS1, Congress passed EISA and substantially increased the renewable fuel production and use requirements in what EPA calls RFS2.[119] As discussed below, EISA has significantly modified the RFS by creating clearer mandates for the production of advanced biofuels and by establishing greenhouse gas emission thresholds that renewable fuels must achieve. However, EISA includes a significant loophole that allows existing corn ethanol facilities to be grandfathered from the new greenhouse gas emission requirements.[120] As a result, corn ethanol appears likely to retain its status as the primary biofuel in the United States for several more years.

D. Putting It Together: Corn Is King

Overall, the various farm and energy laws, tax subsidies and credits, and other policies enabled corn ethanol to dominate the U.S. biofuels sector for more than thirty years. Renewable fuel standards have propelled corn ethanol into gaining an even larger market share over other biofuels.[121] By the end of 2007, corn ethanol comprised 95% of the biofuels used in the United States.[122] As discussed in greater detail below, EISA will continue to allow corn ethanol production to grow, despite the increasing evidence showing that corn ethanol likely creates more harm than previously thought.

III. THE UNINTENDED CONSEQUENCES OF BIOFUELS DEVELOPMENT

Increased production of biofuels, and particularly corn ethanol, has led to several unintended consequences. Some of these, such as the direct environmental and economic damage exacted by increased corn production, were readily foreseeable even in the 1970s. However, the passage of the RFS in 2005 gave corn a new image as a "green fuel" that would release fewer greenhouse gases than fossil fuel. As ethanol production increased to serve this new purpose, several new studies revealed that first-generation biofuels, and corn ethanol in particular, may actually cause significant increases in greenhouse gas emissions.[123] Other studies linked a boom in

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119. *Id.*

120. *Id.*

121. Cai, *supra* note 111, at 905–06.

122. Frances Cerra Whittelsey, *Bio-Hope, Bio-Hype*, SIERRA MAG., Sept. – Oct. 2007, at 50–51, *available at* http://www.sierraclub.org/sierra/200709/bio.asp.

123. UNEP, *supra* note 15, at 67–69; *see* Searchinger et al., *supra* note 21, at 1238–39 tbl.1; Fargione et al., *supra* note 22.

ethanol production in the United States, increased biodiesel production in Europe, and spiking oil prices around the world to a food crisis.[124] These studies suggested that the benefits of corn ethanol may be outweighed by its detrimental effects and have led to calls to suspend all biofuels produced from food crops.[125]

A. Foreseeable Impacts: Environmental and Economic

Corn growing exacts a heavy toll on water quality, air quality, and wildlife habitat, as several studies have documented for many years.[126] Corn subsidies have also generally favored large agribusiness companies rather than small farmers, and have contributed to the concentration of agriculture business in the hands of relatively few players.[127] Subsidies for corn ethanol only enhance these harmful environmental and economic effects by adding even greater incentives for corn production and by continuing to allow large corporations to benefit from the subsidies.[128]

1. Localized Environmental Impacts

Other articles have extensively documented the environmental consequences of expansive corn production.[129] This article will not repeat their findings, except to highlight some of the major impacts to the environment from intensive corn production. Corn production has a particularly profound impact on water quality and supply.[130] Corn is an

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124. *See infra* notes 156–58 and accompanying text.

125. *See* Purdy & Salzman, *supra* note 76, at 10,853 n.34 (quoting a United Nations official who argued that diverting arable land from food production to fuel production is "a crime against humanity").

126. *See* William S. Eubanks II, *A Rotten System: Subsidizing Environmental Degradation and Poor Public Health with Our Nation's Tax Dollars*, 28 STAN. ENVTL. L.J. 213, 251–73 (2009) (summarizing the studies discussing the environmental impacts of intensive agricultural production with a focus on the effects of growing corn crops).

127. *Id.* at 221–34.

128. *See* Cai, *supra* note 111, at 904 (noting that the Volumetric Ethanol Excise Tax Credit, which provides a $0.51 per gallon tax credit, will continue to apply as renewable fuels mandates increase); Mann & Hymel, *supra* note 28, at 72 ("[I]ndependent farmers will not benefit nearly as much from ethanol subsidies as large agribusiness concerns."). According to EPA, company-owned facilities produce about 80% of all U.S. corn ethanol, compared to 20% produced by farmer cooperatives. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,745. Just three companies own facilities that produce 30% of all domestic ethanol. *Id.*

129. Eubanks, *supra* note 126, at 251–73.

130. *Id.* at 252–61.

extremely input-intensive crop, which requires massive amounts of water[131] and typically large amounts of fertilizers, herbicides, and pesticides to grow.[132] Chemicals added to the crops frequently run off into surface waters or leach into groundwater and contaminate water supplies.[133] One particular herbicide used on corn, called atrazine, pollutes many water bodies in the Midwest and has been linked to hermaphrodism in frogs and other amphibians.[134] Nitrogen fertilizers, which farmers apply heavily to corn crops, have also created particular problems in many aquatic areas by causing "dead zones" that can kill all immobile organisms within low oxygen areas.[135] EPA anticipates that water quality will continue to suffer as corn ethanol production increases.[136]

Corn production and corn ethanol production also contribute to loss of soil, air quality deterioration, and loss of habitat.[137] Intensive agriculture typically involves the tilling of soil, which increases the likelihood of erosion and airborne transport of soils.[138] Chemicals applied to crops can become airborne, along with the soil, and create a risk of exposure to humans and other animals.[139] Ethanol production and combustion also release chemicals that can contribute to air pollution and public health risks.[140] Although adding ethanol to gasoline may reduce emissions of some pollutants from motor vehicles,[141] ethanol can also increase emissions of other pollutants.[142] Whether ethanol yields net benefits in air quality remains difficult to determine.[143]

It is clearer, however, that increased corn production has reduced, and will likely continue to reduce, wildlife habitat, as it has done for decades.[144] As discussed in greater detail below, Congress amended the RFS to allow biofuels to qualify as renewable fuels when they are grown on certain types of land. EPA has decided to include lands that would otherwise be set aside

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131. *Id.* at 253–54. Ethanol production plants also consume significant quantities of water; a typical plant will use three to six gallons of water for each gallon of corn ethanol produced. *See* EPA RFS2 Proposal, *supra* note 13, at 25,104.

132. EPA RFS2 Proposal, *supra* note 13, at 25,101 ("Corn has the highest fertilizer and pesticide use per acre and accounts for the largest share of nitrogen fertilizer use among all crops.").

133. *Id.*

134. *Id.* at 25,105 (discussing presence of atrazine in drinking water).

135. Eubanks, *supra* note 126, at 255–56.

136. EPA RFS2 Proposal, *supra* note 13, at 25,101.

137. Eubanks, *supra* note 126, at 261–68; EPA RFS2 Proposal, *supra* note 13, at 25,097–100.

138. Eubanks, *supra* note 126, at 257–58.

139. EPA RFS2 Proposal, *supra* note 13, at 25,097.

140. *Id*.

141. *See supra* notes 106–07 and accompanying text.

142. EPA RFS2 Proposal, *supra* note 13, at 25,097.

143. *Id.*

144. Eubanks, *supra* note 126, at 263–66.

for conservation as qualifying lands for corn ethanol production under EISA.[145] Since these lands would otherwise provide habitat for animals displaced by agricultural practices, it is likely that wildlife habitat will continue to decline due to corn ethanol production.[146] None of these outcomes, however, are particularly surprising. Agriculture has always exacted a heavy toll on the natural environment, and increased agricultural production will predictably do the same.

2. Domestic Economic Impacts of Increased Corn Ethanol

The economic consequences of increased corn ethanol production—at least to the extent that they affect ongoing subsidies—also present few surprises. Despite the image of U.S. agricultural policy as promoting small family farms, farm bills have instead propped up large agribusiness enterprises for almost as long as farm subsidies have existed.[147] Most observers expect increased renewable fuel mandates, and the accompanying per gallon tax credits, to further aid these large corporations.[148] Indeed, Congress changed the eligibility requirements under the Small Ethanol Producer Credit so that "small producers" can receive a $0.10 per gallon tax credit so long as they produce no more than sixty million gallons of ethanol.[149] Before the change, the maximum production level topped out at thirty million gallons.[150] These increased subsidies to larger corporations will likely result in a further decrease in smaller farms and an increase in the political power of the corporations.[151]

Increased corn ethanol production will also likely affect the prices of corn, other crops, and agricultural commodities worldwide. Ethanol already competes with other consumptive uses of corn, and increased ethanol mandates will likely contribute to increased costs for cattle feed and

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145. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,692–93.

146. Purdy & Salzman, *supra* note 76, at 10,853.

147. Eubanks, *supra* note 126, at 221–34; Mann & Hymel, *supra* note 28, at 72–73.

148. *See* Mann & Hymel, *supra* note 28, at 72–73 (showing the biggest beneficiaries of ethanol tax-credits are large corporations); Sanjay Gupta & Charles W. Swenson, *Rent Seeking by Agents of the Firm*, 46 J.L. & ECON. 253, 265 (2003) (describing how firms with strong managerial ownership engage in more rent seeking behavior than firms with smaller levels of managerial ownership); *see generally* DOUG KOPLOW, BIOFUELS—AT WHAT COST? GOVERNMENT SUPPORT FOR ETHANOL AND BIODIESEL IN THE UNITED STATES (2006), *available at* http://earthtrack.net/files/biofuels_subsidies_us.pdf (detailing government policies and subsidies concerning ethanol and biodiesel).

149. Energy Policy Act of 2005, Pub. L. No. 109-58, sec. 1347(a), § 40(a), 119 Stat. 594, 1056; *see* Cai, *supra* note 111, at 904–05.

150. Cai, *supra* note 111, at 905.

151. Eubanks, *supra* note 126, at 227–33; *see* Gupta & Swenson, *supra* note 148.

other food products.[152] If farmers dedicate more land to corn production, as the existing subsidies and mandates should incentivize, available land for soy and wheat will decline, leading to a reduction in soy and wheat supplies.[153] Reduced supplies of these products will increase their prices, leading to increased production on whatever land is available.[154] Globally, this could spur increased food prices in the near term, and increased food production in the longer term.[155] As discussed in the next sections, these developments could ultimately undermine one of the driving purposes of the RFS—reducing global greenhouse gas emissions.

B. Global Food Shortages

In the first half of 2008, increased food prices around the globe triggered concern that the world economy had entered a food crisis. Food prices during that time had reached their highest levels in fifty years and were placing great stress on people in the poorest countries.[156] In response, the United Nations Food and Agriculture Organization (FAO) convened a high-level meeting to discuss the causes of the increased prices.[157] Although the organization found that many factors contributed to the food crisis, experts linked first-generation biofuels to the rising prices and, thus, to global food shortages.[158]

The link between biofuels production and global food prices results from the fact that first-generation biofuels use the very same crops—namely corn in the United States and soy and oil crops in the European Union—that would otherwise go toward global food production.[159] In essence, biofuels demand "forge[s] closer linkages between the energy and agricultural markets," exposing agricultural prices to global energy demand.[160] Although energy prices have long influenced global agricultural prices, due to the use of machinery and fossil-fuel derived fertilizers and pesticides, biofuels policy integrates energy and agriculture in unprecedented ways.[161] This integration indicates that so long as biofuels

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152. Purdy & Salzman, *supra* note 76, at 10,853.
153. *Id.*
154. *Id.*
155. *Id.*
156. FAO *Soaring Food Prices*, *supra* note 16, ¶ 1.
157. *Id.* ¶ 5.
158. *Id.* ¶¶ 7, 18 n.11 (explaining the linkages between agriculture and fuel prices), ¶ 22 (discussing how corn ethanol production in the United States will draw down U.S. corn supply), ¶¶ 33–63 (discussing impacts of high food prices on developing countries).
159. FAO BIOFUELS REPORT, *supra* note 17, at 41–43.
160. *Id.* at 43.
161. *Id.*

policy relies on food crops to produce energy it will likely continue to drive up food prices.[162]

C. Increased Greenhouse Gas Emissions

First-generation biofuels may also, ironically, result in increased greenhouse gas emissions.[163] Corn ethanol produced in the United States may have the worst impact on greenhouse gas emissions.[164] EPA initially estimated that direct emissions from corn ethanol production, including emissions from growing the corn and processing corn starch into ethanol, likely exceeded fossil fuel emissions from gasoline by more than 10%.[165] These increases result from emissions of greenhouse gases from the soil[166] and the fossil fuels consumed at ethanol production facilities, most of which use natural gas or coal power.[167]

When researchers add the consequences of indirect land use changes into their estimates, most studies show significant increases in overall greenhouse gas emissions.[168] Economists predict that increased commodity prices associated with biofuels production will increase pressure for developing countries to convert non-agricultural land into cropland so that they can either produce their own food crops (to reduce local food prices) or their own biofuels (to increase exports and take advantage of the higher global fuel prices).[169] Many developing countries will likely convert rainforests and peatlands, which currently sequester significant amounts of greenhouse gases, into agriculture lands.[170] This, in turn, could release massive amounts of greenhouse gases into the atmosphere and thus offset

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162. *Id.* at 41–43; *see* Joachim von Braun, Dir. Gen., Int'l Food Pol'y Research Inst., Keynote Address at the Crawford Fund Annual Conf., When Food Makes Fuel: The Promises and Challenges of Biofuels 6–7 (Aug. 15, 2007), http://www.ifpri.org/sites/default/files/publications/2007jvbcrawfordkeynote.pdf.

163. FAO BIOFUELS REPORT, *supra* note 17, at 55–59.

164. *Id.* at 57 fig.23. The type of corn ethanol production employed—whether it involves wet mill or dry mill processing—would change the greenhouse gas emissions, as would the energy source for the production. *See* EPA RFS2 Proposal, *supra* note 13, at 25,043 tbl.VI.C.1-2, tbl.VI.C.1-3; EPA RFS2 Final Rule Preamble, *supra* note 35, at 251–256.

165. FAO BIOFUELS REPORT, *supra* note 17, at 57 fig. 23.

166. *See* Crutzen et al., *supra* note 11, at 11,197.

167. EPA RFS2 Proposal, *supra* note 13, at 25,043 tbl.VI.C.1-2 (showing that coal-fired corn-ethanol production could increase greenhouse gases by 41% during the first 30 years and by 20% when these emissions are spread out over a 100-year timeframe); EPA RFS2 Final Rule Preamble, *supra* note 35, at 165 (relating that of the 180 existing ethanol production facilities, 151 burn natural gas and 17 plants burn coal).

168. Searchinger et al., *supra* note 21, at 1238–39 tbl.1; Fargione et al., *supra* note 22; UNEP, *supra* note 15, at 67.

169. UNEP, *supra* note 15, at 67–68.

170. *Id.*

the direct reductions that biofuels may otherwise achieve.[171] EPA's initial assessment of lifecycle greenhouse gas emissions from U.S. corn ethanol, when considering indirect land use changes, concluded that it would take between twenty-two and seventy-five years (depending on whether coal or biomass powers the ethanol production facility) for corn ethanol production to achieve a 0% increase in emissions, and more than 100 years for a coal-fired ethanol plant to achieve a 20% greenhouse gas emissions reductions.[172] Although EPA revised these estimates based on different assumptions about crop yields and the types of land conversions that would result from increased ethanol use,[173] the weight of the evidence shows that first-generation biofuels will spur increased land use changes in other countries, and these land-use changes may increase global greenhouse gas emissions for a period of time.[174] Thus, ironically, many biofuels policies designed to mitigate climate change may ultimately have the opposite effect.

IV. WEAK INITIAL EFFORTS TO ADDRESS THE UNINTENDED CONSEQUENCES

While Congress knew in 2005 when it passed the first RFS that first-generation biofuels could have some detrimental effects, this knowledge did not provide adequate justification for the majority of Congress to stand up to the corn lobby and vote against the RFS. However, Congress did at least attempt to limit the unintended consequences by including some safeguards in the laws. The 2005 EPAct gave EPA the authority to establish different values for various biofuels in an effort to create market incentives for companies to produce and use more advanced and environmentally sound biofuels.[175] Congress also included a waiver provision in the RFS to allow any state to petition EPA to waive the RFS where its implementation caused injury to the economy or environment of a state.[176] These safeguards did nothing to limit corn ethanol production, however, because they served as weak, if not impotent, mitigation measures when compared to the subsidies, tax credits, and other economic drivers of corn ethanol. Despite the food

171. *Id.*
172. EPA RFS2 Proposal, *supra* note 13, at 25,048 tbl.VI.C.2–1.
173. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,769–72.
174. Searchinger et al., *supra* note 21, at 1238–39 tbl.1.
175. EPA RFS1 Final Rule, *supra* note 23, at 23,918–19.
176. 42 U.S.C. § 7545(o)(7)(A)(i) (2006).

crisis and emerging studies demonstrating the harmful nature of first-generation biofuels, corn has remained king.

A. 2005 EPAct and Equivalence Values

Congress passed the first national renewable fuel standard in 2005 as part of its expansive energy bill.[177] The heart of RFS1 consisted of mandatory volume requirements, establishing the amount of renewable fuels that importers, refiners, and blenders (collectively, "obligated parties") must add to motor vehicle fuels between 2006 and 2012.[178] Beginning in 2006, obligated parties collectively were required to add four billion gallons of renewable fuels, and by 2012, that amount increased to 7.5 billion gallons.[179] After 2012, RFS1 gave EPA discretion to establish new volume requirements so long as the volumes did not fall below the 2012 standards.[180] To figure out each party's annual obligations under RFS1, EPA employed a formula reflecting anticipated fuel production, each party's share of production, and the proportion of renewable fuel each party would need to use to meet the national goal.[181]

Congress directed EPA to establish a credit trading system to provide flexibility for obligated parties to meet the volume mandates established under the law.[182] To implement this trading scheme, EPA assigned each gallon of produced or imported renewable fuel a Renewable Identification Number (RIN).[183] Whenever a party produced or imported renewable fuel, it received a unique RIN assigned to the batch of fuel produced.[184] An ethanol producer, for example, would receive a RIN for each batch of ethanol produced, and whenever the producer sold the ethanol to an obligated party, it would also sell or transfer the RIN.[185] At the end of each year, obligated parties needed to demonstrate that they had obtained enough credits, as reflected by the number of RINs they had obtained, to meet their volume requirements.[186] If an obligated party had purchased and used more renewable fuel than necessary, it could sell its excess RINs to another

177. Energy Policy Act of 2005 § 1501, 42 U.S.C. § 7545(o) (2006) (amending the Clean Air Act.).

178. EPA RFS1 Final Rule, *supra* note 23, at 23,903 tbl.I.B.-1.

179. *Id*.

180. *Id.* at 23,912.

181. *Id.*

182. *Id.* at 23,909.

183. *Id.* at 23,908, 23,929–36.

184. *Id.*

185. *Id.*

186. *Id.*

obligated party.[187] If another obligated party had not purchased enough fuel, it could nonetheless meet its obligations by purchasing enough RINs to meet its obligations; even though a different party actually used the renewable fuel, each party's ultimate compliance was measured according to the number of RINs it collected, and not according to the actual amount of fuel used.[188]

RINs, however, did not carry equal value under RFS1. In an attempt to incentivize development of cellulosic and waste-derived biofuels, Congress assigned these fuels equivalence values 2.5 times the value of corn ethanol.[189] Under this system, each gallon of ethanol would receive a RIN worth one, but each gallon of waste-derived biofuel would have a RIN worth 2.5.[190] Presumably, Congress expected these differential values to create adequate incentives for obligated parties to purchase more cellulosic and waste-derived biofuels. EPA, in turn, followed Congress's lead by assigning other biofuels different equivalence values, all of which were higher than the baseline value assigned to corn ethanol.[191] In theory, these higher equivalence values should have increased investment in and production of biofuels other than corn ethanol.[192] In reality, the equivalence values had no effect on corn ethanol production. Indeed, corn ethanol accounted for approximately 95% of all biofuel production in the United States in 2007.[193] Thus, the equivalence values seem to have had no effect on reversing corn ethanol's dominance in the biofuels industry.

B. The Waiver Policy

Congress included another mitigating measure in its first RFS by giving EPA the authority to waive the national renewable fuel requirements if "implementation of the requirement would severely harm the economy or environment of a State, region, or the United States."[194] For the first three years of the RFS, the waiver went essentially unnoticed. However, in April 2008, when soaring gas, ethanol, and food prices sent commodity values sky-high, Texas's governor petitioned EPA to waive the RFS requirements

187. *Id.*
188. *Id.* at 23,908.
189. *Id.* at 23,920–21 tbl.III.B.-1.
190. *Id.* Crude-based renewable fuels, which are not biofuels, received the same value as corn ethanol. *Id.* at 23,921 tbl.III.B.-1.
191. *Id.* at 23,918–21 tbl.III.B.-1.
192. *Id.* at 23,919.
193. Whittelsey, *supra* note 122.
194. 42 U.S.C. § 7545(o)(7)(A)(i) (2006).

for the 2008–2009 corn marketing year.[195] Texas sought the waiver to protect its cattle industry, which had become heavily dependent on corn feed, and which faced escalating prices due, in part, to the corn ethanol boom.[196] Texas argued that the sheer size of its cattle industry, which was the largest in the United States and amounted to about one-quarter of the entire U.S. herd, justified the waiver request.[197] Despite EPA's calculations that waiving the RFS mandates could potentially decrease feed costs in Texas by anywhere from $53 million to $207 million—and even perhaps as much as $919 million[198]—EPA denied Texas's request for a waiver.[199]

Texas was the first state to seek waiver of the RFS, and prior to Texas's request, EPA had not explained how it would apply the waiver or interpret its requirements. In acting on Texas's petition, EPA used its response to explain how it would interpret the statutory requirements for the waiver and to notify future petitioners about the evidence they would need to produce to obtain a waiver. EPA's denial of Texas's petition helps explain why the waiver provision will not limit production of corn ethanol.

As noted, the statute gives EPA discretion to waive a RFS mandate if the Administrator determines that implementation of the requirement would severely harm the economy or environment of a state, region, or the United States.[200] EPA determined that this statutory authorization requires the agency to make two findings before it exercises its discretion to grant or deny the waiver.[201] First, because the statute requires a finding that implementation of the RFS "would" harm the economy or environment,[202] EPA stated that evidence must demonstrate, to a high degree of confidence, that the RFS is itself the cause of the harm.[203] Second, EPA concluded that evidence must also show, to a high degree of confidence, that the resulting harm would be severe.[204] This latter condition also requires petitioners to show that granting the waiver would provide effective relief from that harm.[205] Once EPA established the framework by which it would analyze

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195. Texas Waiver Denial, *supra* note 31, at 47,170 & n.3.

196. *Id.* at 47,170.

197. *Id.* at 47,177.

198. *Id.* EPA considered the $919 million estimate to be a highly unlikely worst-case scenario. *Id.* at 47,177 & n.36.

199. *Id.* at 47,168.

200. 42 U.S.C. § 7545(o)(7)(A)(i) (2006).

201. Texas Waiver Denial, *supra* note 31, at 47,182.

202. § 7545(o)(7)(A)(i).

203. Texas Waiver Denial, *supra* note 31, at 47,182.

204. *Id.*

205. *Id.* at 47,172.

Texas's waiver request, it became nearly a foregone conclusion that EPA would deny it.

First, EPA concluded that Texas could not demonstrate that the RFS itself had caused Texas's economic woes. The agency rejected Texas's argument that Congress intended the waiver to apply whenever the RFS contributed significantly to severe economic or environmental harm; instead, it concluded that the RFS alone must act as the cause of the asserted harm.[206] Texas argued that the EPA's interpretation would render the waiver provision a nullity, since the RFS will never be the sole and direct cause of injury.[207] Although EPA appeared to agree that the RFS will always work in conjunction with other factors, such as gasoline and food prices, to affect the economy and environment, EPA nonetheless held that the waiver requires a demonstration that the RFS, acting alone, is the cause of the alleged harm.[208] The agency pointed to many other places in the Clean Air Act where Congress used the term "causes or contributes" to allow the agency to consider direct and indirect contributions of various acts on a single outcome.[209] However, since Congress did not use the "cause or contribute" language in describing the RFS waiver, EPA concluded that Congress intended to allow a waiver only where the RFS itself "would" harm the economy or environment.[210] While implicitly acknowledging Texas's point that EPA's interpretation could render the waiver option a nullity, EPA concluded that its interpretation more fully adhered to Congress's intent to promote the use of renewable fuels.[211]

Second, EPA determined that whatever economic impacts Texas could show did not amount to the "severe" impacts required for a waiver.[212] EPA concluded that the threshold level of harm required for a waiver fell somewhat below "extreme" harm, but required Texas to demonstrate more than a "significant adverse impact[]" on its economy.[213] Moreover, Texas needed to show that the RFS would severely harm the entire economy of a state, region, or the United States, not only one sector.[214] Based on the high threshold of harm EPA required, it is not surprising that EPA denied Texas's waiver request. Ultimately, EPA concluded that waiving the RFS for the 2008–2009 marketing period (the year for which Texas sought the waiver)

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206. *Id.* at 47,171.
207. *Id.* at 47,170–71.
208. *Id.* at 47,171.
209. *Id.*
210. *Id.*
211. *Id.*
212. *Id.* at 47,168.
213. *Id.* at 47,171, 47,182.
214. *Id.* at 47,183.

would likely alter cattle feed prices by between 1.2% and 4.7%, or, at the very most, 20%.[215] While this would decrease annual feed costs by $53 million, $207 million, or even $919 million, depending upon the factors considered, EPA found these economic effects small compared to Texas's $1 trillion economy.[216]

C. Corn Is Still King

The 2005 EPAct achieved its overarching goal of increasing domestic biofuels production. When combined with tax credits, subsidies, and the skyrocketing oil prices of 2007 and early 2008, RFS1 surpassed expectations. However, to the limited extent that Congress and EPA sought to diversify the sources of biofuels and to limit the growth of corn ethanol, RFS1 failed. Corn remains, by far, the dominant biofuel.

This failure to diversify is not simply an issue of historical importance, however, because EPA has chosen to retain the RIN system and the equivalence values from RFS1, although it will modify them to a limited degree.[217] The waiver provision also still exists, although Congress amended it to allow more parties to petition for waivers.[218] Despite these changes, the weak mitigating measures will do little to offset the financial superiority of corn ethanol.

1. Equivalence Values Do Not Offset Other Incentives for Corn Ethanol

The equivalence values established in RFS1 have not, and likely cannot, offset the substantial subsidies and tax credits that corn ethanol producers and corn growers already receive. As a result, equivalence values seem unlikely to spur a transition away from corn ethanol and toward other, less damaging biofuels. When one considers the existing technology to produce corn ethanol compared to other biofuels, existing facility capacity and infrastructure, and other factors, the equivalence values seem especially weak.

As noted above, corn growers themselves benefit enormously from subsidies: corn receives more subsidies than any other commercial crop. Many biofuels crops, such as switchgrass and algae, have historically

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215. *Id.* at 47,177. The different values derive from three different scenarios considered in the economic model EPA employed to assess whether the RFS would severely harm the Texan economy. *Id.*

216. *Id.*

217. EPA RFS2 Proposal, *supra* note 13, at 24,943; EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,675. The RIN modifications are beyond the scope of this article.

218. Texas Waiver Denial, *supra* note 31, at 47,183.

received almost no subsidies at all.[219] But even when compared to soy, which is the other major domestic crop currently used to produce first-generation biofuels and which benefits greatly from subsidies and tax credits, corn still receives far more in subsidies annually.[220] EPA assigned soy-based biodiesel an equivalence value of 1.5, meaning that each gallon of biodiesel could earn 1.5 credits towards compliance with the mandate.[221] Simply comparing the growers' subsidies to the equivalence value suggests that the equivalence value would not offset corn's dominance. Of course, this simple comparison ignores other factors, such as the demand for the commodity and the capacity to convert the crop into a biofuel, which could make other biofuels more competitive with corn than direct growers' subsidies might suggest. However, when these additional factors come into play, the equivalence values seem even weaker.

Corn ethanol has benefitted from having a significant head start over other biofuels due to clean air requirements that mandate blending ethanol into gasoline. These mandates spurred the initial construction of corn ethanol production capacity, such that EPA estimates that facilities in existence as of December 2007 could produce more than fifteen billion gallons of corn ethanol per year.[222] First-generation biodiesel production capacity, in comparison, comes in at less than a billion gallons per year.[223] From there, production capacity for other biofuels drops precipitously. For example, only one plant in the United States currently operates to produce cellulosic biofuels, and algae biofuel production is in its infancy. Clearly, absent the capacity to produce the fuels, the equivalence values themselves will not promote development of advanced biofuels.[224]

It may be, however, that the new mandates under EISA will spur greater investment in advanced biofuels production and make the equivalence

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219. The 2008 Farm Bill established a $1.01 per gallon tax credit for cellulosic biofuel produced between December 31, 2008 and January 1, 2013. *See IRS Issues Guidance on Cellulosic Biofuels Tax Credit*, ETHANOL PRODUCER MAG., Mar. 2009, *available at* http://www.ethanolproducer.com/article.jsp?article_id=5327.

EPA anticipated this tax credit would increase cellulosic biofuel production in the future, although it is unclear if the tax credit will enable cellulosic biofuels to compete with corn ethanol, which remains cheaper and easier to produce. *See* EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,688.

220. *See* Mann & Hymel, *supra* note 28, at 46–47 ("[C]orn constitutes about 90% of the feedstock for U.S. ethanol production. . . . Changing the source and methods of agriculture can limit adverse environmental and economic effects of ethanol production.").

221. EPA RFS1 Final Rule, *supra* note 23, at 23,918.

222. EPA RFS2 Proposal, *supra* note 13, at 24,925.

223. *Id.* at 24,999.

224. *But see id.* at 24,945 (explaining that equivalence values are meant to provide a level playing field, particularly for technologies that are in the early stages of development).

values more relevant in the future.[225] But for this to happen, the trading program itself would require much more activity than it has experienced to date. In 2008, EPA reported that RINs under RFS1 traded at less than 5 cents per gallon on average and never exceeded 6.5 cents per gallon,[226] an almost negligible value. Even using the highest multipliers in the equivalence values—2.5—would result in credits worth only 12.5 cents to 16.25 cents per gallon of fuel, which is well below the 51 cent excise credit ethanol receives under existing subsidies.[227] For the equivalence values to work to make cellulosic fuels competitive with corn ethanol, RINs for corn ethanol would need to cost more than corn ethanol receives in subsidies. It seems unlikely that they will reach this value any time soon, since the market supply currently exceeds RFS mandates. Indeed, EPA estimates that existing corn ethanol facilities could produce fifteen billion gallons per year, but the new RFS volume mandates will not reach that level until 2016.[228] The current abundance of corn ethanol will keep credit prices low for the foreseeable future and, consequently, make the equivalence values generally irrelevant. In other words, the longstanding market flaws of the corn and corn ethanol industries render impotent EPA's efforts to employ market tools to incentivize other types of biofuels.

2. The RFS Waiver Will Not Suspend Corn Production

EPA's rejection of Texas's waiver request suggests that future waiver requests aimed at curbing corn ethanol production, whether based on injury to the economy or the environment, would suffer the same fate as the Texas petition. By requiring a petitioner to demonstrate that the RFS alone has caused the alleged harm, EPA has effectively insulated corn ethanol from waivers. EPA's test requires a petitioner to show that granting the waiver would effectively suspend all production of corn ethanol and thus mitigate the alleged harm. However, as EPA acknowledged in its waiver denial, other factors, such as mandatory ethanol blending requirements,[229]

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225. *Id.* at 24,944–45.

226. Texas Waiver Denial, *supra* note 31, at 47,175.

227. Mann & Hymel, *supra* note 28, at 49 (noting the excise tax awards ethanol producers $0.51 per gallon).

228. EPA RFS2 Proposal, *supra* note 13, at 24,910 tbl.II.A.1-1. In 2012, the total renewable fuel requirement will exceed 15.2 billion gallons, but 2 billion gallons must come from advanced biofuels. By 2015, the total requirement will reach 20.5 billion gallons, 5.5 of which must come from advanced biofuels. The remaining 15 billion gallons will come from either first-generation biofuels or other advanced renewable fuels. *Id.* Due to corn ethanol's abundance and low costs, EPA expects corn ethanol to account for the entire 15 billion gallons of first-generation biofuels. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,746.

229. *See supra* notes 106–10 and accompanying text.

subsidies, and tax credits will continue to spur corn ethanol production even without the RFS mandates.[230] While increased RFS mandates may play a larger role in encouraging future corn ethanol development, EPA predicted that the RFS mandate would not become the cause of any alleged economic harm until the RFS requires approximately fifteen billion gallons of corn ethanol production.[231] The RFS will not require this volume of ethanol use until 2015.[232] Even then, a petitioner would need to demonstrate that other forces, such as crude oil prices and corn production levels, do not contribute to corn ethanol production.[233] So long as Congress continues to subsidize corn and corn ethanol production—and it has shown no sign of ending these subsidies—the waiver provision in the RFS could play no role in abating corn ethanol use.

In addition, the demonstration of harm required by EPA places a nearly impossible burden on petitioners and makes a successful waiver petition extremely unlikely. Petitioners must not only show severe harm—defined by EPA as something more than significant adverse effects but somewhat less than "extreme" harm[234]—to the economy or the environment; they must also apparently demonstrate that the detrimental impacts seriously outweigh the beneficial ones.[235] In the case of a waiver request based on economic concerns, it may be hard for a state to make such a showing, since some sectors of the economy will undoubtedly benefit from the RFS mandate.[236]

In theory, it might become easier for a petitioner to demonstrate severe harm to the environment from corn ethanol production as the science progresses and more studies reveal the localized and global harms that result directly and indirectly from increased corn ethanol production. However, the waiver applies only where a petitioner can show direct harm to the environment of a state, region, or the United States.[237] This appears to preclude petitioners from relying on global increases in greenhouse gas emissions to prove their harm, due to the indirect nature of the linkages between localized ethanol production, global land use changes, global climate change, and resulting localized environmental degradation. While petitioners could arguably rely on local harm to water quality, air quality, and wildlife habitat, these injuries may be offset, at least to some degree, by the air quality benefits that ethanol blending provides. Even assuming

230. Texas Waiver Denial, *supra* note 31, at 47,173.
231. *Id.* at 47,173 n.21.
232. *See supra* note 228 and accompanying text.
233. Texas Waiver Denial, *supra* note 31, at 47,176.
234. *Id.* at 47,182, 47,184.
235. *Id.* at 47,183.
236. *Id.* at 47,172.
237. 42 U.S.C. § 7545(o)(7)(A)(i) (2006).

petitioners could meet their burden of showing severe environmental harm, they still bear a heavy burden to show that the RFS mandate is itself the cause of the environmental harm.[238] It appears highly unlikely that petitioners could make such a showing, when so many other factors incentivize corn ethanol production and thus contribute to localized and global harms. In sum, the mitigating measures provided under the 2005 EPAct have very little chance of reducing corn ethanol production and avoiding the unintended consequences of using this biofuel.

V. A STRONGER RESPONSE: EPA'S REGULATION IMPLEMENTING EISA

By the end of 2008, it had become clear to most scientists and policymakers that first-generation biofuels, and corn ethanol in particular, had several negative impacts that required regulatory attention. At the same time, outside of a few state efforts to address these negative effects,[239] EPA appeared unwilling to take meaningful steps to limit production of these first-generation biofuels. However, the passage of EISA in December 2007 created several new mandates for advanced biofuels production and specifically required new corn ethanol production to achieve a 20% reduction in greenhouse gas emissions as compared to emissions from fossil fuels. Most significantly, EISA directed EPA to conduct life-cycle analyses of greenhouse gas emissions from various biofuels. EPA interpreted this requirement to allow it to consider both direct and indirect emissions resulting from domestic and international land use changes.[240] If nothing else, EISA appeared likely to radically alter biofuels production and corn ethanol's dominance.

EPA's life-cycle analyses initially revealed that many advanced biofuels would satisfy the emissions reductions requirements but that corn ethanol generally would not.[241] EPA's final rule, however, yielded different results, based on different assumptions regarding the types of land use changes that would occur internationally and the types of corn ethanol production

238. Texas Waiver Denial, *supra* note 31, at 47,184.

239. For example, California embarked on a difficult effort to ensure that any renewable fuels used in its state qualified as "low carbon" fuels based on all direct and indirect emissions associated with producing the fuels. Payne, *supra* note 45, at 891. Several states in the Northeast announced their intention to create a regional Low Carbon Fuel Standard modeled after California's. *Id.* at 897–98.

240. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,765–66.

241. EPA RFS2 Proposal, *supra* note 13, at 25,042 (concluding that corn ethanol produced in a basic dry mill ethanol production facility would reduce emissions by 16% compared to fossil fuels over a 100-year period, but result in a 5% increase in emissions over a 30-year period); *see id.* at 25,042 tbl.VI.C.1-2 (showing that all types of corn ethanol production would fail to achieve the 20% reduction requirement over a 30-year timeframe).

facilities likely to come online in the future.[242] Applying these new assumptions, EPA concluded that corn ethanol produced at new facilities using "advanced efficient technologies" and natural gas, biomass, or biogas for energy would meet the 20% emissions reduction requirements.[243] In effect, EPA's new rule establishes a road map for companies to follow to keep corn ethanol in production in the future.

It is unclear, however, whether EPA's final rule will actually trigger new investment in corn ethanol facilities in the foreseeable future. EISA exempted all existing biofuel production facilities from the greenhouse gas reduction requirements.[244] EPA, moreover, interpreted EISA's exemption to extend to all corn ethanol production facilities that burn natural gas or biomass for energy that had commenced construction before the end of 2009.[245] By grandfathering in all existing facilities—and the fifteen billion gallons per year of corn ethanol they produce—EISA and EPA's final rule will ensure corn ethanol's dominance over other first-generation biofuels for the foreseeable future. This may restrict investment in new corn ethanol, thereby giving EPA time to more completely assess the life-cycle emissions from new corn ethanol facilities. On the other hand, the existing grandfathering provisions may spur even more investment in new corn ethanol production facilities, since both Congress and EPA have shown a willingness to protect existing investments that do not meet the greenhouse gas reduction requirements.

Overall, EISA represents a significant step forward in its use of life-cycle analyses and promotion of advanced biofuels. However, its generous grandfathering terms all but guarantee that corn ethanol will dominate the U.S. biofuels industry for years to come. Moreover, absent new scientific assessments of the life-cycle emissions from biofuels or a new renewable fuels mandate that phases out corn ethanol entirely, it seems that corn ethanol will maintain its status well into the future.

A. Life-cycle Analyses and Advanced Biofuels

One of the most promising aspects of EISA, in addition to its direct mandates for advanced biofuels, is Congress's recognition that biofuels may cause an overall increase in emissions of greenhouse gases when direct and

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242. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,768–72.
243. *Id.* at 14,677.
244. EPA RFS2 Proposal, *supra* note 13, at 24,924.
245. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,688–89.

indirect emissions are considered.[246] EISA, therefore, includes three important changes from RFS1 that have the potential to revolutionize the renewable fuels industry and ensure that biofuels are climate friendly.

First, EISA establishes new and aggressive production mandates for various advanced biofuels. EISA phases the requirements in slowly by requiring, for example, that 0.6 billion gallons of biofuels come from advanced fuels in 2009.[247] By 2016, advanced biofuels must supply 7.25 billion gallons of the mandate, and cellulosic biofuels must account for at least 4.25 billion.[248] By 2022, advanced biofuels must supply 21.0 billion gallons of all renewable fuels and will account for almost 60% of all renewable fuels required under the RFS.[249] When compared to RFS1 under the 2005 EPAct, the mandates under EISA represent a significant improvement in biofuels policy. While RFS1 had nominal production requirements for cellulosic and advanced biofuels,[250] RFS2 signals a new, and generally positive, direction for U.S. biofuels policy towards advanced and likely more sustainable[251] renewable fuels.

Second, and perhaps more importantly, EISA defines various biofuels according to their life-cycle greenhouse gas emissions and only allows those biofuels that achieve net reductions in these emissions to qualify for the RFS mandates.[252] With an important exception for existing corn ethanol production,[253] renewable fuels[254] must reduce life-cycle greenhouse gas emissions by 20% compared to the baseline emissions of the fossil fuels they replace.[255] EISA creates three new categories of renewable fuels—advanced biofuels, cellulosic biofuels, and biomass-based diesel—all of which must achieve even greater life-cycle greenhouse gas reductions compared to baseline emissions from fossil fuels.[256] "Advanced biofuels" are any renewable fuels other than corn ethanol that achieve a life-cycle greenhouse gas emission displacement of 50% compared to the fossil fuel it

246. Ted Gayer, *Lose-Lose on Biofuels?,* THE AMERICAN, May 28, 2009, http://www.american.com/archive/2009/may-2009-lose-lose-on-biofuels.

247. EPA RFS2 Proposal, *supra* note 13, at 24,910 tbl.II.A.1-1.

248. *Id.*

249. *Id.* By 2022, the total RFS volume mandate will reach 36 billion gallons, and advanced biofuels must supply 21 billion gallons, or 58.3% of the total. *Id.*

250. EPA RFS1 Final Rule, *supra* note 23, at 23,905 (noting that the 2005 Act required 250 million gallons of renewable fuels to come from cellulosic ethanol, starting in 2013).

251. *See infra* Part VI.

252. EPA RFS2 Proposal, *supra* note 13, at 24,911.

253. *See infra* notes 272–93 and accompanying text.

254. A renewable fuel is fuel produced from renewable biomass that is used to replace or reduce the quantity of fossil fuel present in transportation fuels. EPA RFS2 Proposal, *supra* note 13, at 24,921.

255. *Id.* at 24,924.

256. *Id.* at 24,911.

displaces.[257] Cellulosic biofuels are any renewable fuels derived from any cellulose, hemicelluloses, or lignin, and achieve a 60% reduction in life-cycle greenhouse gas emissions compared to fossil fuels.[258] Finally, biomass-based diesel must achieve at least a 50% reduction in greenhouse gas emissions.[259] In sum, EISA requires a minimum reduction of 20% and up to a 60% reduction[260] in greenhouse gas emissions compared to fossil fuels. This change undoubtedly represents a significant step forward for U.S. biofuels policy.

Third, the definition of renewable fuels requires that the fuels come from renewable biomass, which Congress further defined as coming from seven distinct types of biological materials.[261] These include "planted crops and crop residue," "planted trees and tree residues," and slash from non-federal forestlands.[262] Moreover, EISA restricts the definitions such that planted crops and crop residue and planted trees and tree residue must come from agricultural lands and plantations that existed before December 19, 2007.[263] These definitions attempt to ensure that biofuels will not come directly from existing forests or other wildlands, and instead require biofuels production to occur on already cultivated lands. Presumably, these definitions will preclude U.S. fuel refiners, importers, and blenders from purchasing palm oil and sugarcane ethanol grown on recently converted forests or peatlands. As such, these definitions should address, at least in part, some of the concerns raised regarding the direct emissions of greenhouse gases associated with biofuel production.[264]

However, the renewable biomass definition, and EPA's final regulation, will not address all of the concerns related to biofuels development. For example, renewable biomass is defined as planted crops and crop residue from agricultural land cleared or cultivated at any time before December 19, 2007 that is non-forested and either actively managed or fallow.[265]

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257. *Id.* at 24,923.

258. *Id.*

259. *Id.*

260. EISA allows EPA to reduce these requirements by up to 10% per category of biofuel, if EPA determines the existing reductions are not commercially attainable. *Id.* at 24,924. EPA has proposed adjusting the emissions reductions downward to 44% or even 40% for advanced biofuels, based on its assessment of emissions reductions achievable through sugarcane ethanol production. *Id.*

261. *Id.* at 24,922.

262. *Id.* Other types of acceptable biomass are "animal waste material and byproducts," biomass cleared from close proximity to buildings to reduce wildfire risk, algae, and separated yard or food waste. *Id.*

263. *Id.* at 24,931, 24,933.

264. *See, e.g.*, Payne, *supra* note 45, at 908–15 (discussing how these restrictions could implicate World Trade Organization rules).

265. EPA RFS2 Proposal, *supra* note 13, at 24,931.

Applying this definition, EPA has decided to allow all existing cropland, pastureland, and, most significantly, Conservation Reserve Program (CRP) land to qualify for biofuels production.[266] Using existing cropland will likely raise the same environmental concerns generally expressed regarding U.S. farm policy and have the same implications of expanding corn production.[267] Including pastureland in the definition may raise different concerns. On the one hand, as EPA notes, pastureland provides a good location for growing switchgrass and other fibrous plants used for cellulosic biofuels production.[268] On the other hand, some conservationists fear that pasturelands could become new locations for genetically modified crops and create greater risks to plant biodiversity.[269] Including CRP land in the allowable category of lands for biofuels production, however, seems especially likely to stir controversy. Historically, the U.S. Department of Agriculture has paid farmers to set aside and restore or protect environmentally sensitive lands through the CRP program.[270] Corn ethanol production has already resulted in many farmers leaving the CRP program and putting these sensitive lands into cultivation.[271] EPA's decision to allow further cultivation of CRP lands will likely receive strong criticism from some conservationists.

B. New Versus Old Corn Ethanol Production

Although EISA defines renewable fuels to mean fuels that achieve a 20% reduction in life-cycle greenhouse gas emissions compared to fossil fuels,[272] this definition applies only to fuel produced from new facilities that commenced construction after December 19, 2007.[273] Fuel produced from facilities that commenced construction before then is exempt from the 20% reduction requirement.[274] In addition, EISA declares that facilities that commenced construction after the December 2007 cutoff date but that used natural gas or biomass to power the facility in 2008 or 2009 are "deemed

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266. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,692.

267. *See supra* notes 126–46 and accompanying text (discussing the environmental consequences of expansive corn production).

268. EPA RFS2 Proposal, *supra* note 13, at 24,931.

269. *See* Elizabeth Rosenthal, *New Trend in Biofuels Has New Risks*, N.Y. TIMES, May 21, 2008, *available at* http://www.nytimes.com/2008/05/21/science/earth/21biofuels.html (describing conservationists' and botanists' concerns over the invasive potential of second-generation biofuels crops).

270. Eubanks, *supra* note 126, at 242–43; Purdy & Salzman, *supra* note 76, at 10,583.

271. Purdy & Salzman, *supra* note 76, at 10,853.

272. EPA RFS2 Proposal, *supra* note 13, at 24,924.

273. *Id.*

274. *Id.*

compliant" with the 20% reduction requirement.[275] These two exceptions, and particularly the grandfathering provision for "old" ethanol facilities, have the potential to allow continued production of significant quantities of corn ethanol—perhaps up to fifteen billion gallons per year[276]—despite EPA's conclusions that existing corn ethanol production emits more greenhouse gases than it prevents. The "old" versus "new" distinction therefore represents a significant flaw in RFS2 that could undermine the otherwise laudable goals of EISA.

EPA's proposed regulation included a preferred alternative and five alternative options to limit the harmful impacts of the grandfathering and "deemed compliant" exceptions. EPA's preferred alternative would limit the exceptions to the baseline volumes of ethanol the facilities stated they were able to produce whenever they sought their initial air quality permits.[277] If a facility exceeded its baseline production levels, then any increased production would face the 20% greenhouse gas reductions requirement, but baseline production would remain exempt.[278] Baseline production volumes would also remain exempt even if facilities replaced production equipment, although EPA also suggested that it would consider an option under which replacing certain equipment would render the facility a "new facility" and thus subject all production to the greenhouse gas reduction requirements.[279] Even with this potential change, EPA's preferred alternative would still exempt approximately fifteen billion gallons of corn ethanol production annually from the requirement that renewable fuels reduce greenhouse gas emissions by 20% compared to fossil fuel emissions levels.

EPA also proposed five alternative options to its preferred approach. First, EPA proposed that significant facility changes that would qualify under other Clean Air Act programs as "reconstruction" would convert an existing facility into a "new" facility and remove the exemptions for all

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275. *Id.* at 24,924–25.

276. *Id.* at 24,925.

277. *Id*. at 24,926. Under the Clean Air Act, facilities must obtain permits before constructing any facility with the potential to emit more than 100 tons per year, or in some cases 250 tons per year, of regulated air pollutants. Facilities must record their potential emissions in their permit applications and typically calculate these emissions based on their predicted production capacity. EPA's proposed regulation would use these figures to establish baseline production limits for ethanol. *Id*. If, for some reason, the permit application did not state the plant's maximum capacity, the facility's actual peak production amount would establish its baseline amount. *Id.*

278. *Id.* EPA acknowledged that some production increases could occur within the plant's "inherent capacity" and suggested that some increases—perhaps a 10% increase above the established baseline capacity—would also remain exempt from the greenhouse gas reduction requirement. *Id.*

279. *Id.* at 24,927–28.

ethanol produced at the facility.[280] Unlike EPA's preferred alternative, this option would not retain any exemptions for baseline production levels.[281] Next, EPA proposed two alternative options that would establish a fifteen-year expiration date for the exceptions.[282] One of these would allow unrestricted production of corn ethanol at these exempt facilities, and the other would also subject existing facilities to the baseline production levels articulated in EPA's preferred alternative.[283] EPA based the fifteen-year expiration date on studies showing that components on many ethanol facilities would require complete replacement within ten to fifteen years of their construction.[284] Under these two options, starting in 2023, all biofuels produced from existing facilities would need to meet the 20% greenhouse gas reduction requirement.[285] Another related option would separate out "significant production units" so that whenever a company added new production units, biofuels produced from those units would be subject to the 20% reduction requirement.[286] In essence, this proposal would prevent facilities from adding new equipment and increasing production capacity without complying with the 20% requirement. EPA's last option would head in the other direction, establishing indefinite grandfathering and no limitations on the volume of biofuels existing facilities could produce.[287] Ultimately, EPA selected its preferred alternative, which will indefinitely allow existing facilities and facilities under construction to continue to produce ethanol at baseline production levels.[288]

Although some of the alternative options could have lessened the significance of the grandfathering and "deemed compliant" exceptions, they would not have done much to lessen the immediate impacts of continued corn ethanol production. The most stringent alternative option would have established a fifteen-year expiration date for the grandfathering option and limited production levels to baseline capacity.[289] While the fifteen-year expiration date would have established certainty in the biofuels industry by creating a date-certain by which existing facilities would need to meet the

280. *Id.* at 24,928–29.

281. *Id.* at 24,928.

282. *Id.* at 24,929–30.

283. *Id.*

284. *Id.* at 24,929.

285. *Id.*

286. *Id.* at 24,930.

287. *Id.*

288. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,690–91. EPA will set the baseline production rates either by looking at the amount of ethanol a facility is allowed to produce under state or federal air pollution permits or, where the permits do not set limits, by calculating the annual peak production volume of a given plant over a three- or five-year period. *Id.* at 14,690.

289. EPA RFS2 Proposal, *supra* note 13, at 24,929.

20% greenhouse gas reduction obligation,[290] it would have done nothing to reduce existing corn ethanol production in the near term. Indeed, the only real difference between the most stringent alternative and EPA's preferred alternative was the deadline for future compliance. Otherwise, EPA's proposals would have allowed production of up to fifteen billion gallons of corn ethanol annually, despite its likely harmful effects, which may extend well into the future.

Unfortunately, EPA's discretion to phase out ethanol within a quicker timeframe is likely limited by EISA itself and Congress's unfortunate choice to establish the grandfathering and "deemed compliant" exceptions. In passing EISA, Congress set no limit on production volumes and no deadline for phasing out the exceptions. EPA could have argued, however, that it had discretion to include its proposed restrictions. For example, EPA could readily have made the case that its proposed limitations on ethanol production levels were consistent with Congress's intent to exempt only existing facilities, and, presumably, existing production from those facilities. Similarly, EPA could have argued that Congress's grandfathering of existing facilities, much like its grandfathering of other facilities under other parts of the Clean Air Act,[291] was meant to protect existing investments only.[292] A time limit on these exemptions would have been consistent with other parts of the Clean Air Act that require modified facilities to meet the same requirements as new facilities must meet.[293]

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290. *Id.*

291. *See, e.g.*, 42 U.S.C. § 7411 (2006) (establishing New Source Performance Standards for new and modified facilities); *see id.* §§ 7475–7479 (requiring facilities that undergo major modifications to comply with the Prevention of Significant Determination permitting requirements otherwise applicable to new facilities); *id.* § 7503 (requiring facilities that undergo major modifications to comply with the New Source Review requirements applicable to new facilities).

292. *See* EPA RFS2 Proposal, *supra* note 13, at 24,929–30 (arguing that Congress likely created the exemptions to protect existing investments).

293. *Id*. at 24,929. Under other parts of the Clean Air Act, EPA uses case-by-case tests to determine whether or not a facility has performed a major modification and thus triggered requirements that would otherwise apply to new facilities. Envtl. Defense v. Duke Energy Corp., 549 U.S. 561, 568–69 (2007) (discussing the various regulations defining the term modification). EPA's case-by-case approach has resulted in substantial litigation over the years regarding whether particular facilities in fact made modifications triggering enhanced permitting and pollution control requirements. *See id.* at 579 n.7 (discussing three other cases). Nonetheless, EPA will need to continue to use a case-by-case approach for those parts of the Clean Air Act because the statutory definition of "modification," which requires a physical change resulting in an increase in emissions, requires EPA to determine in each case whether a facility made a change that increased emissions. *Id.* at 568–69. Under EISA, in contrast, Congress did not use the term modification or establish a case-by-case process for EPA to determine whether a facility could remain grandfathered. While ethanol producers could argue that this indicates congressional intent to permanently grandfather facilities, EPA has a colorable argument that Congress intended only to grandfather facilities in existence in 2007 and to subject any facility modifications to the 20% greenhouse gas reductions requirement.

Beyond that, however, Congress's decision to carve out exemptions for existing facilities likely constrains EPA from taking additional steps beyond those in the proposed regulations to limit ongoing corn ethanol production. If Congress wants to move toward developing a sustainable biofuels policy that actually reduces greenhouse gas emissions, Congress itself will need to remove the unfortunate exemptions it established under EISA.

C. Will New Ethanol Become Old Ethanol?

A more troubling issue arises with new corn ethanol facilities and their compliance with the 20% emissions reduction requirement. In its proposed rule, EPA calculated that new corn ethanol production would, over a thirty-year timeframe, likely result in more greenhouse gas emissions than it would prevent, based on predicted production methods and indirect land use changes.[294] EPA's proposed rule would therefore have prohibited new corn ethanol production from qualifying as a renewable fuel under RFS2. In its final rule, EPA reversed course and determined that corn ethanol produced at new or expanded facilities using natural gas, biogas, or biomass would meet the 20% greenhouse gas emissions reduction requirement.[295] EPA based its conclusion on new data and scientific methods for calculating indirect emissions associated with land use changes and on assumptions about the types of technologies that EPA would expect new facilities to employ.[296] As a matter of administrative law, EPA's changes represent a perfectly justifiable reversal based on updated science and economic data.[297] However, as a matter of good biofuels policy, EPA's determination appears premature and may enable corn ethanol producers to evade the greenhouse gas reductions requirements, even if scientific advancements reveal that indirect land use emissions are far greater than EPA predicted.

In developing both its proposed and final rules, EPA conducted an extensive survey of existing data to assess whether new corn ethanol and other biofuels would meet the greenhouse gas reduction requirements set by Congress. In both rulemaking proceedings, EPA identified areas of uncertainty and suggested that EPA would seek additional data and

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294. EPA RFS2 Proposal, *supra* note 13, at 25,042 (concluding that corn ethanol produced in a basic dry mill ethanol production facility would reduce emissions by 16% compared to fossil fuels over a 100-year period, but result in a 5% increase in emissions over a 30-year period); *see id.* at 25,042 tbl.VI.C.1-2 (showing that all types of corn ethanol production would fail to achieve the 20% reduction requirement over a 30-year timeframe).

295. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,677.

296. *Id.* at 14,677–79.

297. *See* Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 42 (1983) (noting that an agency may reverse itself where data support the agency's changed position).

information to verify the accuracy of its assumptions.[298] As an agency charged with making certain decisions in an area abounding with scientific uncertainty, EPA's approach appears appropriate and cautious.

However, EPA's determination that new corn ethanol production, which likely will not begin for years, will meet the 20% reduction requirement appears premature and subject to change. Looking, for example, at the indirect land use emissions that will result from corn ethanol, EPA explained that it used improved satellite data to assess whether assumed cropland expansion would result in increased deforestation—and thus more greenhouse gas emissions—or other types of land conversion that would result in fewer emissions.[299] Once EPA decided that less deforestation would result, it lowered its overall greenhouse gas emissions estimates.[300] Similarly, EPA revised its assumptions about the types of facilities corn ethanol producers would build based on predictions about the economics of the industry in the future.[301] These assumptions predicted that future ethanol plants would need to operate more efficiently and produce valuable byproducts for them to compete in the future.[302] Collectively, these revised assumptions resulted in a conclusion, about which the agency was "over 50% confident," that new corn ethanol plans would meet the 20% greenhouse gas reduction requirement.[303] In contrast, the agency was 95% confident that new corn ethanol would reduce emissions somewhere between 7% and 32% compared to the baseline.[304]

This begs the question of why the agency released its conclusions at all and effectively blessed new corn ethanol production plants. The answer, according to EPA, is that EISA mandates EPA to make the threshold determinations now, despite the uncertain science.[305] In addition, the agency has promised to consult with the National Academy of Sciences regarding its estimates and to update its conclusions based on any relevant new information.[306] With these caveats, the Agency decided to authorize new ethanol facilities that use efficient technologies.[307] Although the Agency likely had no other choice than to issue the rule, it does not appear that EPA had to approve new corn ethanol production as part of that rule.

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298. EPA RFS2 Final Rule Preamble, *supra* note 35, at 14,678–79.
299. *Id.* at 14,678.
300. *Id.*
301. *Id.* at 14,785–86.
302. *Id.*
303. *Id.* at 14,786.
304. *Id.*
305. *Id.* at 14,785.
306. *Id.*
307. *Id.* at 14,688.

EPA felt 95% confident that emissions would be between 7% and 32% lower when compared to gasoline, but that range suggests that many of the emissions may fall on the low end and not meet the 20% reduction requirement. If that proves to be the case, many facilities built in reliance on the rule may not ultimately comply with EISA. Those facilities will have three options: quit production; continue producing ethanol, but no longer receive production credits under EISA; or seek an exemption from Congress. Based on the history of the biofuels industry, the third approach seems the most likely one for corn ethanol producers to pursue. If that happens, corn ethanol will continue its reign for far longer than even EPA's new rule may suggest.

VI. A Sustainable Biofuels Policy or More of the Same?

As the science has developed to link corn ethanol and other first-generation biofuels to increased emissions of greenhouse gases, increased conversion of rainforests and peatlands into agricultural lands, and increased localized pollution, U.S. biofuels policy has also begun to change. However, while various advocates have called for the United States to develop a sustainable biofuels policy, neither Congress nor EPA has heeded the call. U.S. biofuels policy, even after the passage of EISA in 2007, will continue to allow production of corn ethanol, and, by definition, will therefore continue to allow biofuels policy to result in various unintended consequences.

Yet, U.S. biofuels policy has moved significantly away from its original foundation and, if it continues to progress, could actually serve as a model for biofuels laws in other countries. Congress's decision to define renewable fuels and various categories of advanced and cellulosic fuels according to their greenhouse gas reductions represents a huge step forward in biofuels policy. Most other countries are only now beginning to pass biofuels laws, and none of these establish clear greenhouse gas reduction goals like U.S. biofuels law does. The new definitions in EISA, moreover, have the potential to mitigate the other unintended consequences of biofuels development. For example, EISA defines "advanced biofuels" as a fuel not derived from corn starch. As the volume requirements for advanced biofuels increase in the future, these mandates will be less likely to affect food supplies. The movement away from food crops as a source of fuel could prove to be an especially important development as global populations increase and global food supplies shrink due to climate change and other pressures. Similarly, a future move away from corn ethanol could address concerns about localized degradation of water quality, air quality, and habitat, as corn production exacts a particularly harsh toll on the environment.

Finally, and perhaps most importantly, the changes in EISA could signal, perhaps ever so slightly, a willingness on behalf of Congress to resist at least some of the demands of the corn lobby. Admittedly, the corn industry will continue to profit immensely from the fifteen billion gallons of corn ethanol that it can continue to produce as a result of the exemptions in EISA. Yet, any limit on the corn industry must be seen, at least on some levels, as a success. For years, critics have argued against corn subsidies and called on politicians to suspend them, to no avail.[308] Some scholars have concluded that the fight against subsidies is doomed to failure and have instead suggested ways for consumers to directly affect the corn industry.[309] Even then, these scholars recognize the near futility in their proposals.[310] Biofuels policy, however, could signal a way to mitigate the power of the corn industry. As science shows the harm that corn ethanol is exacting, and as Congress responds to the science, the corn industry itself may face greater restrictions. For now, EISA's small steps suggest a movement, however slight, towards sustainability.

To be sure, U.S. biofuels policy remains flawed, and if Congress does not amend EISA to remove the grandfathering exceptions, corn ethanol will continue to exact an enormous toll on the environment and the economy. Yet, Congress's progress regarding biofuels policy has been quite extraordinary. In 2005, Congress's first RFS placed no limits on corn ethanol production and established pitifully weak standards for advanced biofuels. Only two years later, Congress set aggressive goals for advanced biofuels and required corn ethanol to meet a 20% greenhouse gas emissions reduction requirement. If Congress continues to proceed along this trajectory, U.S. biofuels policy may become truly sustainable. For now, there is at least reason to hope for its future.

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308. *See* Eubanks, *supra* note 126 (critiquing subsidies for commercial agriculture).
309. Purdy & Salzman, *supra* note 76, at 10,853–56.
310. *Id.* at 10,856.