Energy[1]

INTRODUCTION

The purpose of this memo is to outline the history, context, and content of the farm bill's Energy Title. First, this memo will discuss the history of government support for biofuels in the U.S. Second, it will outline the Title's programs under the 2014 Farm Bill. Finally, it will conclude with an overview of the questions and controversies surrounding biofuels, namely their environmental impact, the inclusion of forest biomass as feedstocks, and their consequences for food security.

I. HISTORY

Federal interest in biofuels began with the oil crises of 1973 and 1979, which drew attention to the U.S.' dependence on energy from OPEC and other foreign powers.[2] When reliance on gasoline became a threat to U.S. economic sovereignty, finding alternative fuels became a priority. In 1978, the first federal tax credit for ethanol was passed.[3] Further, in 1980, the government placed tariffs on ethanol imports as a way to incentivize domestic production.[4]

In order to further incentivize the production of ethanol, adjustments were made to the Corporate Average Fuel Efficiency standards (CAFE). CAFE standards were first introduced in 1988 with the Alternative Motor Fuels Act (AMFA), which required car manufacturers to meet average fleet level efficiency goals.[5] The Act also allowed Flexible-Fueled Vehicles (FFVs) to count toward meeting CAFE standards.[6] FFVs are cars with engines designed to run on any mix of gasoline and ethanol, with up to 85 percent ethanol.[7] The combination of these policies caused ethanol production to grow steadily.[8]

Beginning in 1990, the pace of growth in the ethanol market accelerated, driven by a series of favorable policy changes for producers and processors. These included the Clean Air Act Amendments (CAAA) which, in conjunction with favorable tax credits for ethanol, encouraged the production of ethanol blends as an environmentally friendly alternative to traditional fuel.[9] The Act also mandated that federal agencies purchase a certain proportion of FFVs for their fleets.[10] Additionally, the 1996 Farm Bill ended payments for leaving land idle in years predicted to have commodity surplus (known as set-asides).[11] The absence of both payments for idle land combined with rising corn prices from ethanol expansion led to an increase in land used for corn.[12]

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[1] The following people contributed to this report: Alexandra Smith (Summer Intern, Harvard Law School Food Law and Policy Clinic) and Julia Nitsche (Harvard Law School).
[2] U.S. DEP'T OF AGRIC., U.S. ETHANOL: AN EXAMINATION OF POLICY, PRODUCTION, USE, DISTRIBUTION, AND MARKET INTERACTIONS 1 (Sept. 2015), https://www.usda.gov/oce/reports/energy/EthanolExamination102015.pdf.
[3] *Id*.
[4] *Id*. at 2.
[5] *Id*. at 2.
[6] *Id*. at 2.
[7] The convention for abbreviating these percentages is the letter "E" followed by the percentage of ethanol an engine can handle. For instance, a car running on 85 percent ethanol would be said to use E85.
[8] U.S. DEP'T OF AGRIC., *supra* note 2, at 2.
[9] *Id*. at 2.
[10] *Id*. at 2.
[11] *Id*. at 10.
[12] *Id*. at 10.

Shortly thereafter, the USDA became involved in the promotion of biofuels. The FY2000 Appropriations Bill included provisions for harvesting biomass from lands in the Conservation Reserve Program (CRP), established a bioenergy program through the Commodity Credit Corporation (CCC) (again intended in part to address low prices from crop surpluses), and subsidized ethanol and biodiesel manufacturers.[13] The 2002 Farm Bill was the first to include an Energy Title, which promoted biofuels in several different ways, most notably by expanding and formalizing the CCC Bioenergy Program.[14]

Post-2002, a variety of legislative developments outside of the agriculture sector continued to further increase the growth of corn ethanol. The 2004 American Jobs Creation Act extended ethanol tax credits, lifted the specific percentages of ethanol blending set by CAAA in favor of allowing the private sector to blend any amount of ethanol up to E10 into gasoline, and created the Volumetric Ethanol Excise Tax Credit (VEETC), which increased subsidies to ethanol production.[15] Further, the 2005 EPA Act enacted a number of policies that not only favored ethanol as a renewable source, but also effectively ended ethanol's primary competitor as a component of environmentally preferable fuel blends.[16] Finally, the 2005 EPA Act set up a tax credit system for putting alternative fueling stations in place, making FFVs more appealing.[17]

In 2007, a shift in policy occurred. While the government still supported biofuels overall, the reputation of corn ethanol was waning for a variety of reasons (see Key Issues, below). For instance, the Energy Independence and Security Act (EISA) of 2007 enacted RFS2 (Renewable Fuel Standards 2) a more aggressive set of mandates for biofuel usage in response to volatile energy prices.[18] Whereas the EPA had originally required 7.5 billion gallons of renewable fuel by 2012 (RFS), EISA mandated 36 billion gallons by 2022.[19] Unfortunately for corn ethanol producers, it also established a four-tiered system of renewable fuel classification: renewable fuel, advanced biofuel, biomass-based diesel, and cellulosic biofuel.[20] While corn ethanol was in the "renewable fuel" category (the lowest category of the four in terms of greenhouse gas reduction), [21] the Act exempted existing ethanol plants and instead required that the vast majority of the 36 billion gallon goal come from advanced biofuels.[22] These goals proved to be overly ambitious from a research and development perspective.

The 2008 Farm Bill largely reflects this shift away from corn ethanol support,[23] as does the subsequent 2014 Farm Bill. Indeed, the 2008 and 2014 Farm Bills are remarkably similar in terms of substance. The

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[13] *Id*. at 3.
[14] *Id*. at 3.
[15] *Id*. at 4.
[16] The 2005 EPA Act lifted the mandate for gasoline oxygenation using MTBE or ethanol under RGP (meaning producers could use other agents to meet EPA standards), but simultaneously created the Renewable Fuel Standard (RFS) system, which made biofuel usage mandatory. This was accomplished by setting annual volumetric minimums for total renewable fuel production in the U.S. and then created a trading system of biofuel credits known as Renewable Identification Numbers (RINs). Thus, ethanol became very attractive to gasoline producers because it fulfilled RGP and RFS at the same time. The Act also ended the use of MTBE in the U.S. for all practical purposes; the combination of ethanol made more attractive by the legislation with MTBE made less attractive by lawsuits and state bans ended the substance's use. Mounting evidence showed that the substance polluted groundwater and caused a variety of environmental and health problems, so ethanol's primary competitor for fuel oxygenation had been eliminated.
[17] CAFE standards are currently in the process of phasing out credit for FFVs. The change began in 2016 and will end in 2019 with no credit for FFVs.
[18] U.S. DEP'T OF AGRIC., *supra* note 2, at 4.
[19] *Id*. at 5.
[20] *Id*. at 5.
[21] *Id*. at 5.
[22] *Id*. at 6.
[23] *Id*. at 3.

only addition in 2014 is the Energy Efficiency Report for USDA Facilities.[24] However, it is notable that funding levels are significantly lower for programs under the 2014 Farm Bill across the board.[25]

In spite of significant government support for advanced biofuels starting in 2007, corn ethanol still dominates the market.[26] Ethanol has little competition, due in part to the slow pace of scientific progress in the field of renewable energy. Cellulosic biofuels in particular, which accounted for 16 billion gallons of the 36 billion gallon 2022 goal under RFS2,[27] have not become commercially viable. Despite numerous efforts, alternative biofuels have consistently fallen short of the RFS2 targets. [28]

Interestingly, there are challenges to meeting the RFS2 requirement for corn ethanol as well, in spite of an abundant supply. The E10 blending limit, though technically raised to E15 in 2010 for newer car models[29], is practically still in place given infrastructural challenges to making E15 more widely available. As cars become more fuel efficient, it has actually become impossible for renewable fuels (the category dominated by corn ethanol) to meet its assigned volume requirements under RFS2 as well.[30] Thus, the issue is not so much one of availability as it is one of demand, given that the de facto blending limit puts a cap on the portion of the fuel market that can be captured by corn ethanol.

At present, corn ethanol utilizes over 40% of total U.S. corn production,[31] and the most recent data shows that the amount of corn used for ethanol has consistently risen in spite of U.S. policy shifts toward advanced biofuels.[32] The only setback corn has had in recent years was the 2012 drought, from which it recovered quickly.[33] In fact, 2016 had a record high of 14.54 billion bushels used for ethanol.[34]

II. THE 2014 FARM BILL

Title IX of the 2014 Farm Bill covers different aspects of energy, including renewable energy and energy efficiency, but its main focus is biofuels. In FY2011, at the height of federal biofuel subsidies, the government gave $7.7 billion to research efforts and firms participating in the biofuel supply chain; a significant portion of this funding came from the farm bill.[35] Among biofuels, corn-based ethanol is dominant. As of 2012, 94% of U.S. biofuel production was corn ethanol and the rest was largely biodiesel from lard, soy oil, and waste oil and grease.[36] Biofuels in the U.S. are intimately tied to agriculture, since their feedstocks are some of the nation's most important commodity crops.[37]

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[24] MARK A. MCMINIMY, CONG. RESEARCH SERV., R43416, ENERGY PROVISIONS IN THE 2014 FARM BILL (P.L. 113-79): STATUS AND FUNDING 4 (2016).
[25] *Id*. at 5-6.
[26] *U.S. Bioenergy Statistics*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV. (Sept. 6, 2017), https://www.ers.usda.gov/data-products/us-bioenergy-statistics/.
[27] U.S. DEP'T OF AGRIC., *supra* note 2, at 6.
[28] *Id*. at 3.
[29] Though originally limited to vehicles made after model year (MY) 2007, a 2011 rulemaking allowed the use of E15 in any light duty vehicle made during or after MY2001. Cars made after MY2001 account for the majority of gasoline usage in the US. *See id*. at 59.
[30] *Id*. at 66.
[31] Jonathan Foley, *It's Time to Rethink America's Corn System*, SCIENTIFIC AMERICAN (Mar. 5, 2013), https://www.scientificamerican.com/article/time-to-rethink-corn/
[32] *Maps and Data – U.S. Total Corn Production and Corn Used for Ethanol Production*, ALT. FUELS DATA CTR., https://www.afdc.energy.gov/data/10339
[33] *Id*.
[34] *Id*.
[35] MCMINIMY, *supra* note 24, at 1.
[36] U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., *supra* note 26.
[37] *Crops*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV. (Aug. 22, 2016), https://www.ers.usda.gov/topics/crops/.

The major programs under Title IX of the 2014 Farm Bill are summarized below.

A. The Biobased Markets Program (BMP)

This program requires that federal agencies purchase biobased products when available for any order of internal supplies over $10,000.[38] The purchase must use the highest level of biobased content, when available at a reasonable price as determined by the USDA.[39] The program also creates a voluntary labeling program through which products can display a "USDA Certified Biobased Product" label after approval.[40] Finally, BMP creates an expedited approval process for biobased products made from forest biomass.[41] The program is administered by the USDA's Office of the Chief Economist and its Office of Energy Policy and New Uses.[42] BMP is funded annually by $3 million in mandatory funds from the Commodity Credit Corporation (CCC) as well as $2 million in discretionary funds.[43]

B. The Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program

This program offers competitive loans for building or retrofitting refineries that aim to prove the commercial viability of advanced biofuels.[44] Loans can cover up to 80% of costs (capped at $250 million per project).[45] The loans can also be used for making biobased products, but funding for that purpose is capped at 15 % of total spending on the program.[46] The project is administered by the Rural Business and Cooperative Service and Rural Development Agency at the USDA in conjunction with the Department of Energy.[47] The project received $100 million in FY2014 and $50 million annually in FY2015 and FY2016, all in mandatory CCC funds.[48] There is no baseline funding for the project after FY2016, although the Farm Bill allocates $75 million annually in discretionary funding annually for FY2014 to FY2018.[49]

C. Repowering Assistance Program

This program gives funding to biorefineries to use biofuels to run their buildings rather than fossil fuels.[50] Only biorefineries built before 2008 are eligible and only 5% of total funds can go to large biorefineries (those with the capacity to process 150 million gallons or more of advanced biofuels annually).[51] The program is administered by the Rural Business and Cooperative Service at the USDA.[52] It is funded with $12 million in mandatory CCC funding for FY2014 that can be used in subsequent years.[53] The Farm Bill also recommends $10 million annually in discretionary funding for the program for FY2014 to FY2018.[54]

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[38] 7 U.S.C. § 8102 (2002).
[39] MCMINIMY, *supra* note 24, at 7.
[40] *Id*.
[41] *Id*. at 8.
[42] *Id*. at 7.
[43] *Id*. at 8.
[44] *Id*. at 8.
[45] 7 U.S.C. §8103 (2002).
[46] *Id*.
[47] MCMINIMY, *supra* note 24, at 9.
[48] *Id*.
[49] *Id*.
[50] 7 U.S.C. §8104 (2002).
[51] MCMINIMY, *supra* note 24, at 10.
[52] *Id*.
[53] *Id*.
[54] *Id*.

D. Biorefinery Program for Advanced Biofuels

This program offers government contracts to advanced biofuel producers to pay them for producing and expanding their production capacity.[55] The payments available for production alone fall over time as the incentives to expand rise.[56] The program has been in an existence since President Clinton created it by executive order in 1999, and as of 2013 the program has granted $211 million to 290 producers in 47 states.[57] It is currently administered by the Rural Business and Cooperative Service of the USDA and is funded by $15 million in annual mandatory CCC funds for FY2014 to FY2018.[58] The 2014 Farm Bill also recommends $20 million annually in discretionary funding during those same years.[59]

E. Biodiesel Fuel Education Program

This program offers competitive grants to nonprofits to educate government agencies, private organizations, and the public about the benefits of biodiesel.[60] The program is administered by the National Institute of Food and Agriculture and Office of Energy Policy and New Uses at the USDA.[61] It is funded by $1 million in annual CCC mandatory funding and $1 million in annual recommended discretionary funds.[62]

F. Rural Energy for America Program (REAP)

This program offers grants and loans for renewable energy system (RES) construction and energy efficiency initiatives, grants for auditing and making recommendations about energy use and RES development at certain institutions,[63] and grants for assessing RES viability for farms and small rural businesses.[64] According to the Congressional Research Service, "REAP funds have helped more than 13,000 rural small businesses and agricultural producers and funded more than 1,000 solar projects and more than 560 wind projects" between FY2003 and FY2011.[65] The program is administered by the Rural Business and Cooperative Service at the USDA[66] and funded with $50 million annually in mandatory CCC funds.[67] Those annual payments do not expire with the 2014 Farm Bill, but instead will only stop if Congress acts to change them.[68] The Bill also recommends $20 million in annual discretionary funding for FY2014 through FY2018.[69]

G. Biomass Research and Development Initiative (BRDI)

This program offers competitive funding for "institutions of higher learning, national laboratories, federal or state research agencies, private-sector entities, and nonprofit organizations" engaged in research on

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[55] 7 U.S.C. §8105 (2002).
[56] McMinimy, *supra* note 24, at 11.
[57] *Id*.
[58] *Id*.
[59] *Id*.
[60] 7 U.S.C. §8106 (2002)
[61] McMinimy, *supra* note 24, at 12.
[62] 7 U.S.C. §8106 (2002)
[63] These institutions include "state, tribe, or local governments; land-grant colleges and universities; rural electric cooperatives; and public power entities." 7 U.S.C. §8107 (2002).
[64] McMinimy, *supra* note 24, at 12.
[65] *Id*. at 13-14.
[66] *Id*. at 13.
[67] *Id*. at 14.
[68] *Id*. at 14.
[69] *Id*. at 14.

biofuel production, products, feedstocks, and innovation.[70] The funding can be offered through contracts or grants.[71] The Initiative also established the Biomass Research and Development Board to coordinate research efforts and the Biomass Research and Development Technical Advisory Committee to evaluate applications.[72] The program was initially established through the Biomass Research and Development Act of 2000, but it now falls under the Farm Bill and is administered by the National Institute of Food and Agriculture at the USDA, in conjunction with the Department of Energy.[73] It is funded with mandatory annual levels of $3 million for FY2014 through FY2017 and discretionary appropriations of $20 million annually for FY2014 through FY2018.[74]

H. Feedstock Flexibility Program for Bioenergy Producers

This program mandates that the USDA purchase sugar intended for food when there is a surplus, and then sell that sugar for ethanol production.[75] Thus, the program operates at zero cost.[76] It was created to counteract a CCC problem with sugar farmers forfeiting their collateral (sugar) when surplus led to low prices and they could not pay back their loans.[77] The program is administered by the USDA Farm Service Agency, and has mandatory funding for as much money as is necessary to carry out the program through FY2018, since the federal government will get back whatever it spends.[78]

I. Biomass Crop Assistance Program (BCAP)

This program offers payments for farmers growing feedstock for biofuels through two plans: (a) funding to plant perennial or annual crops with single payments for the former and annual payments for the latter, and (b) matching payments (at a 1:1 ratio for the value of the biomass provided) to help pay for "collection, harvest, storage, and transportation" (CHST).[79] This funding is available for farmers in a contract with the USDA to grow feedstock crops, with limitations on public land, land in conservation programs, invasive species, and commodity crops.[80] The program is overseen by the Farm Service Agency of the USDA[81] and receives $25 million in annual mandatory funding and no discretionary funding for FY2014 through FY2018.[82]

J. Community Wood Energy Program

This program offers grants to match state and local government investment in "community wood energy systems" for state and municipal buildings.[83] The money is conditional upon a plan to reduce greenhouse gas emissions, lower costs, educate constituents about energy use, and use only "low-value wood

[70] 7 U.S.C. §8108 (2002).
[71] McMinimy, *supra* note 24, at 14.
[72] 7 U.S.C. §8108 (2002).
[73] McMinimy, *supra* note 24, at 15.
[74] 7 U.S.C. §8108 (2002).
[75] 7 U.S.C. §8110 (2002).
[76] McMinimy, *supra* note 24, at 16.
[77] *Id*.
[78] *Id*.
[79] 7 U.S.C. §8111 (2002).
[80] McMinimy, *supra* note 24, at 17.
[81] *Id*.
[82] *Id*. at 18.
[83] 7 U.S.C. §8113 (2002).

sources."[84] The program is administered by the Forest Service of the USDA[85] and is funded by $5 million in annual discretionary funding for FY2014 through FY2018.[86]

K. Energy Efficiency Report for USDA Facilities

This program, the only new addition in 2014, requires the USDA to conduct an evaluation of energy usage and efficiency on the agency's properties.[87] The study was not assigned to a specific branch of the USDA and was not given funding.[88]

III. KEY ISSUES

A. Are biofuels better for the environment than fossil fuels?

Some biofuels' environmental benefits are relatively undisputed. For instance, the cellulosic biofuels mentioned earlier are widely recognized as a less greenhouse gas (GHG)-intensive fuel than gasoline.[89] However, as mentioned above, these advanced biofuels are still not commercially viable.[90] Thus, the more relevant question is whether corn-based ethanol is less carbon intensive than gasoline. This question is quite complex. The basic concept behind renewable fuels is that they are carbon neutral because the carbon released by burning them is reabsorbed by the photosynthetic regrowth of the feedstock used to make them.[91] While this is correct in theory, a wide variety of other factors complicate the analysis.

The results of studies on corn ethanol's environmental impacts depend largely on which aspects of the production of ethanol are being taken into consideration. The carbon contained in the corn and the ethanol it produces is not the primary concern. Rather, the carbon intensity of the production *process* is difficult to account for. This variable depends on everything from the fossil fuels used to transport the corn, to the tilling practices of individual corn farmers, to the effects of deforestation in the Amazon. Different models utilize different assumptions, and which ones to take into account is a topic of great debate. It has therefore been difficult to reach an agreement about whether or not ethanol is in fact better for the environment.

Beyond greenhouse gases, there are concrete harms that come from increased ethanol production. Increased fertilizer runoff into waterways increases eutrophication in the Gulf of Mexico.[92] Higher pesticide usage contributes to the decline of bees, a key pollinator population.[93] Higher corn prices from ethanol production incentivize farmers to take their land out of conservation programs, and instead put it

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[84] MCMINIMY, *supra* note 24, at 19.
[85] *Id*.
[86] *Id*. at 20.
[87] *Id*. at 21.
[88] *Id*. at 21.
[89] David C. Holzman, *The Carbon Footprint of Biofuels: Can We Shrink It Down to Size in Time?* (June 2008), NAT'L CTR. FOR BIOTECH. INFO., https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2430251/.
[90] *Id*.
[91] *Hydrocarbons as Fuels*, BBC, http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/crudeoil/hydrocarbonsrev3.shtml (last visited Oct. 3, 2017).
[92] David Biello, *Streams and Rivers – Creating Vast "Dead Zones,"* SCI. AM. (Mar. 14, 2008), https://www.scientificamerican.com/article/fertilizer-runoff-overwhelms-streams/.
[93] Clint R.V. Otto et al., *Land Use Change Reduces Habitat Suitability for Managed Honey Bee Colonies in the Northern Great Plains*, PROCEEDINGS OF THE NAT'L ACAD. OF SCI. OF THE U.S. (Aug. 29, 2016), http://www.pnas.org/content/113/37/10430.abstract.

into input-intensive production.[94] Ethanol burning also causes local air pollution.[95] Once again, however, the comparative harm from ethanol versus gasoline is contentious and scientifically complex. While we know that there are harms associated with the high-input farming that produces ethanol, it is difficult to define exactly how those problems compare to the harms associated with oil extraction.

The difficulty of determining ethanol's impact leads us to ask: is there a better alternative? For many, sugar-based ethanol is an option. As a result of the different photosynthetic efficiency and energy content between sugar and corn, the former represents a much clearer improvement on gasoline from a GHG standpoint.[96] Brazil utilizes sugar-based ethanol on a large scale.[97] The question then becomes whether Brazil's successes are replicable in the United States. While some say that Brazil's success is dependent on its climatic advantage in sugar production, as well as heavy government support for sugar-based ethanol,[98] others argue that it offers a model for what the U.S. should be doing.[99] The USDA published a report in 2006 that examined the feasibility of domestic sugar-based ethanol production, which concluded that molasses would be the only cost-competitive feedstock, and that production would need to scale up dramatically to make it a feasible source.[100]

B. Should forests be used as biomass feedstocks?

One particularly controversial issue in biofuel policy in recent years has been the use of forest biomass as fuel. Several programs in the 2014 Farm Bill included special provisions for forest-based products, including an expedited approval process within the Biobased Markets Program,[101] and more direct promotion in the Community Wood Energy Program.[102] In response to President Obama's Clean Power Plan, Maine's senators proposed an amendment to the Energy Policy Modernization Act to count forest biomass-based energy as carbon neutral.[103] The amendment passed,[104] but sparked significant controversy. Environmentalists spoke out against the policy, arguing that the timescale of that neutrality rendered it meaningless.[105] While forest-based bioenergy is carbon neutral in the long run, given that the carbon released by burning old trees can be reabsorbed and stored through the photosynthetic growth process of new trees, the reabsorption process could take decades given the slow growth rate of forest and the long hang-time of carbon dioxide in the atmosphere.[106] During the decades that the carbon is in the

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[94] *The Impacts of Large-Scale Biofuel Use on Land Use and Conservation*, WOODS INST. FOR THE ENV. AT STANFORD UNIV., https://woods.stanford.edu/sites/default/files/files/Biofules-Policy-Brief-5-20061205.pdf (last visited Sept. 17, 2017).
[95] Biello, *supra* note 92.
[96] José Goldemberg, *The Brazilian Biofuels Industry*, NAT'L CTR. FOR BIOTECH. INFO. (May 2008), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2405774/
[97] *Id*.
[98] Anselm Eisentraut, Michael Waldron, *Brazil's Biofuel Sector: What Future*, OECD OBSERVER, http://oecdobserver.org/news/fullstory.php/aid/3748/Brazil_92s_biofuel_sector:_What_future_.html (last visited Sept. 17, 2017).
[99] *Greenhouse Gas Reductions*, SUGARCANE, http://sugarcane.org/sugarcane-benefits/greenhouse-gas-reductions (last visited Sept. 17, 2017).
[100] *The Economic Feasibility of Ethanol Production from Sugar in the United States*, U.S. DEP'T OF AGRIC. (July 2006), https://www.usda.gov/oce/reports/energy/EthanolSugarFeasibilityReport3.pdf.
[101] MCMINIMY, *supra* note 24, at 18.
[102] *Id*. at 19.
[103] Eduardo Porter, *Next 'Renewable Energy': Burning Forests, if Senators Get Their Way*, N.Y. TIMES (Oct. 4, 2016).
[104] Press release, Office of Susan Collins, Senators Collins-Klobuchar-King Biomass Amendment Passes Senate (Feb. 2016), https://www.collins.senate.gov/newsroom/senators-collins-klobuchar-king-biomass-amendment-passes-senate
[105] *Letter to the Senate on Carbon Neutrality of Forest Biomass*, WOODS HOLE RES. CTR. (Feb. 24, 2016), http://whrc.org/letter-to-the-senate-on-carbon-neutrality/.
[106] While 65 to 80 percent of atmospheric carbon dioxide dissolves into the ocean over a period of 20 to 200 years, the remainder can take hundreds of thousands of years to be stored through weathering and rock synthesis. *See* Duncan Clark, *How Long Do Greenhouse Gases Stay in the Air?* THE GUARDIAN (Jan. 16, 2012).

air, the greenhouse effect will be the same as if the gases were from any other source. Thus, some argue that the designation of forest biomass as carbon-neutral is misleading.

C. Are biofuels a threat to food security?

The vast majority of corn grown in the United States is not used for human consumption. Instead, roughly 40% is used for animal feed and another 40% goes towards ethanol production.[107] Ethanol advocates argue that corn used for fuel does not affect food markets because a byproduct of the refining process, dried distiller grains, can be used as animal feed.[108] Although grains cannot fully replace corn as feed - they can only make up about 50% of a cow's diet before meat and dairy production is adversely affected[109] – decreased availability of corn is a concern for some worried about ethanol and food security.

More pressing for those concerned about food security is ethanol's effect on corn prices. The rise in corn prices, concurrent with the rise in ethanol, is undeniable. Commodity prices began increasing in the early 2000s, precisely when biofuels took off, following decades of steady commodity prices.[110] Rising food prices affect the global poor, as became evident when commodity prices spiked in 2008.[111] Though the sudden increase has been attributed to a variety of different factors, from speculative investment in food markets to unfavorable weather patterns, experts from Environmental Protection Agency (EPA)[112] to International Monetary Fund (IMF) analysts[113] believe that biofuel policy shares the blame for a crisis that caused unrest and food riots in 33 nations. The IMF in particular explained that U.S. ethanol policy was partially responsible for the crisis, with high prices from new demand causing farms to switch over to corn production and thus raise prices for other key commodities.[114] Wheat, rice, and corn--three of the commodities affected--account for about two-thirds of global calorie consumption.[115] Thus, biofuel production has consequences for the hungry even when the crop in question does not feed humans.

It is worth noting that advanced biofuels would not pose the same problems. They use the inedible parts of agricultural plants, meaning they pose no threat to food production, but instead make its waste products into something useful.

CONCLUSION

The shifts away from corn ethanol in the 2008 and 2014 Farm Bill were crucial steps to making the Energy Title more environmentally conscious. The new priorities outlined above, namely support for

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[107] Jonathan Foley, *Only a Tiny Fraction of Corn Grown in the U.S. Directly Feeds the Nation's People, and Much of That is from High-Fructose Corn Syrup,* SCI. AM. (March 5, 2013), https://www.scientificamerican.com/article/time-to-rethink-corn/.
[108] *Opportunities and Challenges of Feeding Distillers Grains,* PENN STATE EXTENSION (Aug. 14, 2017), http://extension.psu.edu/animals/dairy/nutrition/nutrition-and-feeding/ration-ingredients/opportunities-and-challenges-of-feeding-distillers-grains-to-dairy-cows.
[109] *Id.*
[110] *Iowa Cash Corn and Soybean Prices,* IA STATE EXTENSION FILE A2-11, 3 (2017), https://www.extension.iastate.edu/agdm/crops/pdf/a2-11.pdf.
[111] Nicole Condon, Heather Klemick, Ann Wolverton, *Impacts of Ethanol Policy on Corn Prices: A Review and Meta-Analysis of Recent Evidence,* NATIONAL CTR. FOR ENVTL. ECON., WORKING PAPER #13-05 (revised Oct. 2013), https://www.epa.gov/sites/production/files/2014-12/documents/impacts_of_ethanol_policy_on_corn_prices.pdf; *see also Biofuels and Food Security,* HIGH LEVEL PANEL OF EXPERTS (June 2013), *http*://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf.
[112] Condon, *et al.*, *supra* note 111.
[113] HIGH LEVEL PANEL OF EXPERTS, supra note 111.
[114] *Id.*
[115] Brian Wright, *Gobal Biofuels: Key to the Puzzle of Grain Market Behavior,* 28 AM. ECON. ASS'N 1, 73 (2014), https://www.aeaweb.org/articles?id=10.1257/jep.28.1.73.

advanced biofuels, are somewhat more contentious. It will be interesting to see whether the scientific community, as well as policy-makers, can come to an accord on the role that biofuels should play in American agriculture. Funding for advanced biofuel research may help unlock a powerful environmental technology with minimal food security drawbacks, but this will likely take some time to develop. Investing money into advanced biofuels rather than renewable energy that is already viable, such as the projects in REAP, is a plan with potentially short term rewards and a long term risks. Furthermore, certain provisions of the Farm Bill, such as the promotion of forest-based biomass, have potential environmental drawbacks that call into question the premise that they are in fact more environmentally friendly. Thus, there are meaningful opportunities for reform in the Energy Title of the next Farm Bill. However, the most important change may come from outside the Energy Title, for instance through decreasing commodity support and crop insurance payments for corn, or outside the Farm Bill altogether, such as reforming the RFS2.