



Energy¹

INTRODUCTION

The purpose of this backgrounder 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 Agriculture Improvement Act of 2018 ("2018 Farm Bill"). Finally, it will conclude with an overview of the questions and controversies surrounding biofuels, including their environmental impact, the addition of algae to the program, and the usage of ethanol as transportation fuel.

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 In 1980, the government placed tariffs on ethanol imports as a way to incentivize domestic production.⁴

To further incentivize the production of ethanol, adjustments were made to the Corporate Average Fuel Economy standards (CAFE). In 1975, the Energy Policy and Conservation Act established CAFE standards for model year 1978⁵ vehicles and required fuel economy information be distributed to consumers. To incentivize alternative fuel vehicle development, the Alternative Motor Fuels Act of 1988 (AMFA) established vehicle manufacturer incentives, in the form of CAFE credits, for Flexible-Fueled Vehicles (FFVs),⁶ which are cars with engines designed to run on any mix of gasoline and ethanol, with up to 85% 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

¹ The following people contributed to this report: Ludovica M. Brown (Public Policy Fellow, Vermont Law School), Genevieve Byrne (Staff Attorney, Vermont Law School), Julia Nitsche (Harvard Law School), Emma Scott (Clinical Instructor, Harvard Law School Food Law & Policy Clinic), and Alexandra Smith (Summer Intern, Harvard Law School Food Law & Policy Clinic).

² JAMES A. DUFFIELD & ROBERT JOHANSSON, U.S. DEP'T OF AGRIC., U.S. ETHANOL: AN EXAMINATION OF POLICY, PRODUCTION, USE, DISTRIBUTION, AND MARKET INTERACTIONS 1 (2015).

³ M. FLUGGE ET AL., U.S. DEP'T OF AGRIC. A LIFE-CYCLE ANALYSIS OF THE GREENHOUSE GAS EMISSIONS FROM CORN-BASED ETHANOL (2018), https://www.usda.gov/oce/climate_change/mitigation_technologies/LCA_of_Corn_Ethanol_2018_Report.pdf.

⁴ DUFFIELD & JOHANSSON, *supra* note 2, at 3.

⁵ Previous background reports inadvertently listed CAFE standards as introduced in 1988. The standards were passed in 1975 and first established for model year 1978 vehicles. UNION OF CONCERNED SCIENTISTS, BRIEF HISTORY OF U.S. FUEL EFFICIENCY STANDARDS (2017), <https://www.ucsusa.org/resources/brief-history-us-fuel-efficiency>.

⁶ DUFFIELD & JOHANSSON, *supra* note 2, 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 DUFFIELD & JOHANSSON, *supra* note 2, at 2.

⁹ *Id.*

¹⁰ *Id.*



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

Shortly thereafter, 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

¹¹ *Id.* at 10.

¹² *Id.*

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 started phasing out credit for FFVs in 2016 and FFVs stopped receiving credit in 2019.

¹⁸ DUFFIELD & JOHANSSON, *supra* note 2, at 4.

¹⁹ *Id.* at 5.

²⁰ *Id.* at 5.



greenhouse gas reduction), the Act exempted existing ethanol plants from EISA mandates, and instead required that the vast majority of the 36 billion gallon goal come from advanced biofuels.²¹

The 2008 Farm Bill largely reflected this shift away from corn ethanol support,²² as did the subsequent 2014 and 2018 Farm Bills. Indeed, the 2008, 2014, and 2018 Farm Bills are remarkably similar in terms of substance. The only addition in 2014 was the Energy Efficiency Report for USDA Facilities.²³ The 2018 farm bill focuses less on efficiency and establishes a new program for carbon utilization and biogas education.²⁴

In spite of significant government support for advanced biofuels starting in 2007, corn ethanol still dominates the market.²⁵ Ethanol has little competition, due in part to the slow pace of scientific progress in the field of renewable energy. However, cellulosic biofuels, which accounted for 16 billion gallons of the 36 billion-gallon 2022 goal under RFS2,²⁶ may be becoming more commercially viable. The cost to produce cellulosic ethanol dropped from approximately \$10 per gallon to approximately \$2 per gallon between 2005 and 2015.²⁷

Interestingly, there are challenges to meeting the RFS2 requirement for corn ethanol as well, despite an abundant supply. The E10 blending limit, though technically raised to E15²⁸ in 2010 for newer car models,²⁹ is practically still in place given challenges to making E15 more widely available, such as a lack of both well-distributed dispensing stations and consumer awareness.³⁰ The ethanol content of most of the motor gasoline sold in the United States does not exceed 10% by volume, and all gas vehicles can accept this fuel.³¹ Only FFVs and light-duty vehicles with a model year of 2001 or later can accept E15 or

²¹ *Id.* at 5–6; The Renewable Fuel Standard sets out four categories of fuel based on the feedstocks and production methods used and the total GHG reductions achieved when compared to fossil fuel. *Renewable fuel* typically refers to ethanol derived from corn starch and must achieve 20% lifecycle GHG emissions reductions. *Advanced biofuels* are derived from **non-corn** biomass feedstocks including other high-yield crops, agricultural or forestry waste, or algae, and must achieve 50% lifecycle GHG emissions reductions. *Biomass-based diesel* must achieve 50% lifecycle GHG emissions reductions. *Cellulosic biofuel* must be produced from cellulose, hemicellulose, or lignin and must achieve 60% lifecycle GHG reductions. These are nesting categories, so that cellulosic biofuel and biomass-based diesel qualify as advanced biofuels, and all categories qualify as renewable fuel. *Overview of Renewable Fuel Standards*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/renewable-fuel-standard-program/overview-renewable-fuel-standard> (last visited Aug. 13, 2020).

²² DUFFIELD & JOHANSSON, *supra* note 2, at 4.

²³ KELSIE BRACMORT, CONG. RSCH. SERV., R43416, ENERGY PROVISIONS IN THE 2014 FARM BILL (P.L. 113-79): STATUS AND FUNDING 4 (2018), <https://fas.org/sgp/crs/misc/R43416.pdf>.

²⁴ CONG. RSCH. SERV., OVERVIEW OF BIOENERGY PROGRAMS IN THE 2018 FARM BILL (2019), <https://fas.org/sgp/crs/misc/IF10288.pdf>

²⁵ *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/>

²⁶ DUFFIELD & JOHANSSON, *supra* note 2, at 6.

²⁷ Sena Christian, *Is Cellulosic Ethanol the Next Big Thing in Renewable Fuels?*, EARTH ISLAND JOURNAL (Jan. 5, 2015), http://www.earthisland.org/journal/index.php/articles/entry/is_cellulosic_ethanol_the_next_big_thing_in_renewable_fuels/

²⁸ Generally, there are three categories of ethanol-gasoline blends: E10, E15, and E85. E10 is gasoline with 10% ethanol content. E15 is gasoline with 15% ethanol content, and E85 may contain up to 85% fuel ethanol. The ethanol content of most of the motor gasoline sold in the United States does not exceed 10% by volume.

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 DUFFIELD & JOHANSSON, *supra* note 2, at 59.

³⁰ *Id.* at 66.

³¹ *How much Ethanol is in Gasoline?*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/tools/faqs/faq.php?id=27&t=10> (last visited Jul. 20, 2020).



higher.³² Thus, the issue is not so much one of availability as it is one of demand, given that the de facto blending limit of 10% puts a cap on the portion of the fuel market that can be captured by corn ethanol.

In 2014, corn ethanol used over 40% of total U.S. corn production,³³ and the amount of corn used for ethanol has consistently risen in spite of U.S. policy shifts toward advanced biofuels.³⁴ In 2018, the amount of corn used for ethanol is remained at around 40%.³⁵

The U.S. does not have a comprehensive plan for reducing emissions from transportation, and the biofuels and corn ethanol markets suffer from a lack of policy clarity. For example, CAFE standards have recently been subject of unresolved and ongoing litigation between states and the federal government after the Trump administration acted to roll back standards that would require an additional 23% reduction in vehicle emissions from 2020-2025.³⁶ Current CAFE standards apply to vehicle model years 2017-2025 and require achievement of approximately 54 miles per gallon (mpg) on average by model year 2025.³⁷ There is also some competition in the clean transportation sector beyond the issues of fuel economy and biofuels, as beneficial electrification can achieve emissions reductions by powering electric vehicles from renewable sources of distributed energy.³⁸ Ultimately, among biofuels, corn-based ethanol is still 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.³⁹ Biofuels in the U.S. remain intimately tied to agriculture, since their feedstocks are some of the nation's most important commodity crops.⁴⁰ The Energy Title of the Farm Bill is thus uniquely affected by U.S. transportation emissions and renewable fuel policies, as evidenced by its support of research and development of biofuels.⁴¹

II. THE 2018 FARM BILL

Title IX of the 2018 Farm Bill covers different aspects of energy, including renewable energy and energy efficiency, but its main focus, like the 2014 Farm Bill, is biofuels. It encourages investments in alternative energy technology and production of renewable biomass for biofuels through education, research, and financial assistance programs. It also encourages the manufacture and production of other renewable

³² *Id.*

³³ 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/>.

³⁴ *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>.

³⁵ *Freedgrains Sector at a Glance*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., <https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/feedgrains-sector-at-a-glance/> (last visited Aug. 13, 2020).

³⁶ John Decicco, *Despite Industry Pleas, White House halts Progress on Fuel Economy*, YALE ENV'T 360 (June 13 2019), <https://e360.yale.edu/features/despite-industry-pleas-the-epa-halts-progress-on-fuel-economy>.

³⁷ OFFICE OF TRANS. & AIR QUALITY, U.S. ENVTL. PROT. AGENCY, EPA AND NHTSA SET STANDARDS TO REDUCE GREENHOUSE GASES AND IMPROVE FUEL ECONOMY FOR MODEL YEARS 2017-2025 CARS AND LIGHT TRUCKS (2012), <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockkey=P100EZ7C.PDF>; see Jessica Zielinski, et al., *Prospects for Meeting the Corporate Average Fuel Economy Standards in the U.S.*, 136 RES., CONSERV. & RECYCLING 466 (2018), <https://www.sciencedirect.com/science/article/pii/S0921344918301277>.

³⁸ DAVID FARNSWORTH, ET AL., REG. ASSISTANCE PROJECT, BENEFICIAL ELECTRIFICATION OF TRANSPORTATION (2019), <https://www.raponline.org/knowledge-center/beneficial-electrification-of-transportation/>.

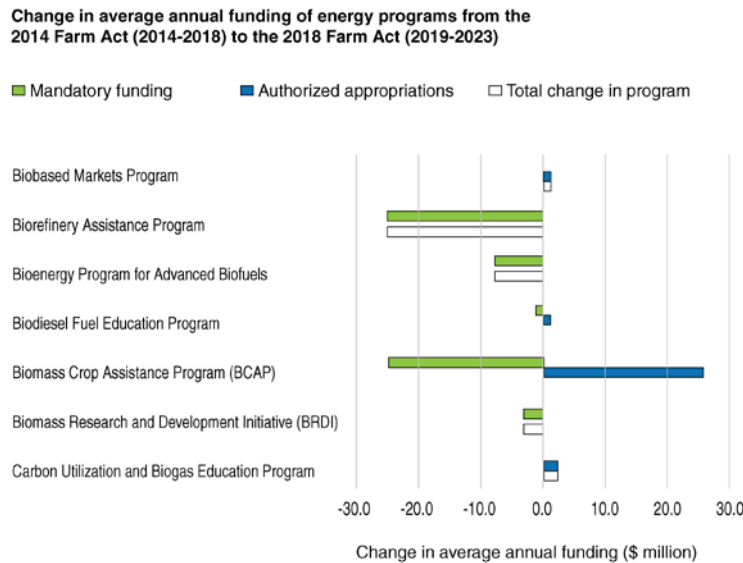
³⁹ *U.S. Bioenergy Statistics*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., <https://www.ers.usda.gov/data-products/us-bioenergy-statistics/> (last visited Aug. 13, 2020).

⁴⁰ *Crops*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., <https://www.ers.usda.gov/topics/crops/> (last visited Aug. 13, 2020).

⁴¹ For more background on U.S. ethanol policy, see FARM BILL LAW ENTERPRISE, U.S. ETHANOL POLICY (2020), *forthcoming* at farmbilllaw.org/background-library.



biochemical and biobased products through Federal procurement and financial assistance programs.⁴² While the 2018 Farm Bill increases the amount of overall authorized funding (\$1.7 billion in discretionary funding over 5 years), mandatory funding decreased to \$375 million from \$694 million in the 2014 Farm Bill.⁴³ The chart below, provided by the USDA Economic Research Service, shows graphically the difference in funding between the 2014 and 2018 Farm Bills.⁴⁴



Sources: Agricultural Act of 2014 and the Agriculture Improvement Act of 2018.
 Note: This is a comparison of funding levels for different time periods (fiscal years 2014-18 compared to fiscal years 2019-23). The difference should not be interpreted as a score provided by the Congressional Budget Office.

The major programs and relevant changes under Title IX of the 2018 Farm Bill are summarized below. While most existing programs will continue, the Title repealed the Repowering Assistance Program and the Rural Energy Self-Sufficiency Initiative⁴⁵ and added a new Carbon Utilization and Biogas Education Program.⁴⁶ Additionally, the Biomass Research and Development Initiative (BRDI) and Community Wood Energy and Wood Innovation Program moved to different Titles of the Farm Bill, Title VII

⁴² CONG. RSCH. SERV., IF10639, 2018 FARM BILL PRIMER: ENERGY TITLE (2019), <https://crsreports.congress.gov/product/pdf/IF/IF10639>.

⁴³ CONG. RSCH. SERV., R45943, THE FARM BILL ENERGY TITLE: AN OVERVIEW AND FUNDING HISTORY (2019), <https://fas.org/sgp/crs/misc/R45943.pdf> [Hereinafter “CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE”] While there are some discrepancies between the discretionary funding estimates between Congressional Research Service analyses, this overview contains the most in depth analysis of the Title in the 2018 Farm Bill and we thus opted to report the \$1.7 billion figure.

⁴⁴ Energy, U.S. DEP’T OF AGRIC., ECON. RESEARCH SERV. (Aug. 20, 2019) <https://www.ers.usda.gov/agriculture-improvement-act-of-2018-highlights-and-implications/energy/>.

⁴⁵ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, §§ 9004, 9008, 132 Stat. 4885, 4887.

⁴⁶ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9011, 132 Stat. 4887.



(Research, Extension, & Related Matters) and Title VIII (Forestry), respectively.⁴⁷ The Title also updated several general definitions, the most significant being the addition of “renewable chemicals” to the definition of “biobased product.”⁴⁸

A. *Biobased Markets Program (BMP)*

This program requires that federal agencies purchase products with maximum biobased content (explicitly including forest products) when available for an order of internal supplies over \$10,000.⁴⁹ Known as the “BioPreferred Program,” USDA also uses the program to promote renewable products through its “USDA Certified Biobased Product” label and certifies eligibility for the federal procurement preference.⁵⁰ The 2018 Farm Bill directs USDA to expand qualifying product definitions to include renewable chemicals.⁵¹ It further requires USDA to establish expedited approval processes and streamlined procedures for product eligibility and labeling determinations.⁵² Notably, agencies are newly prohibited from establishing procurement guidelines for biobased products that are more restrictive than those established by the USDA.⁵³ Finally, the program is realigned into the Rural Development mission area. The Farm Bill provided \$3 million, annually, in mandatory funding and another \$3 million, annually, in discretionary funding, through 2023.⁵⁴

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

This program provides loan guarantees (not to exceed 80% of project costs) for the development, construction, or retrofitting biorefineries in order to prove the commercial viability of advanced biofuels.⁵⁵ The 2018 Farm Bills expands the definition of “eligible technologies” to include technologies that produce one or more or a combination of advanced biofuels, renewable chemicals, or biobased products.⁵⁶ The Farm Bill included \$50 million and \$25 million in mandatory funding for fiscal years 2019 and 2020, respectively, with an additional \$75 million in annual discretionary funding through 2023.⁵⁷

C. *Bioenergy Program for Advanced Biofuels*

This program offers government contracts to advanced biofuel producers to pay them for producing and expanding their production capacity.⁵⁸ The payments available for production alone fall over time as the incentives to expand rise.⁵⁹ The program has been in an existence since President Clinton created it by

⁴⁷ BRDI is discussed below. The Community Wood Energy and Wood Innovation Program is discussed in the FBLE Forestry Title Backgrounder.

⁴⁸ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9001, 132 Stat. 4883.

⁴⁹ 7 U.S.C. § 8102.

⁵⁰ BRACMORT, *supra* note 23, at 7.

⁵¹ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9002, 132 Stat. 4883.

⁵² Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9002, 132 Stat. 4883.

⁵³ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9002, 132 Stat. 4883.

⁵⁴ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9002, 132 Stat. 4883.

⁵⁵ 7 U.S.C. § 8103.

⁵⁶ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9003, 132 Stat. 4884.

⁵⁷ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9003, 132 Stat. 4884.

⁵⁸ 7 U.S.C. § 8105.

⁵⁹ CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 10.



executive order in 1999.⁶⁰ It is currently administered by the Rural Business and Cooperative Service of the USDA.⁶¹ The 2018 Farm Bill continues to authorize appropriations of \$20 million per fiscal year for 2019 through 2023, and sets mandatory funding at \$7 million per fiscal year, down from the \$15 million for 2014 to 2018.⁶² The only substantive change to the program is a limitation requiring that payments made for production of advanced biofuels derived from a single eligible commodity shall not exceed one third of the total available funds, in an effort to promote “equitable distribution.”⁶³

D. 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.⁶⁴ The program is administered by the National Institute of Food and Agriculture and Office of Energy Policy and New Uses at the USDA.⁶⁵ The program may receive appropriations of \$2 million per fiscal year 2019 through 2023.⁶⁶ The increase in discretionary funding—up from \$1 million annually fiscal year in 2014 Farm Bill—reflects the elimination of \$1 million in annual mandatory funding that had been authorized in prior years.

E. The Rural Energy for America Program (REAP)

Administered by the Rural Business and Cooperative Service of USDA, this program assists agricultural producers and small businesses in rural America in adopting renewable energy and improving energy efficiency.⁶⁷ It offers grants and loans for renewable energy system (RES) construction and energy efficiency initiatives, grants for energy auditing and renewable energy development assistance at certain institutions,⁶⁸ and grants for assessing RES viability for farms and small rural businesses.⁶⁹ The 2018 Farm Bill amends available financial assistance to include limits on loan guarantees for energy efficient equipment for agricultural production or processing systems, and limits funds for those guarantees to 15% of the annual program funding.⁷⁰ It also authorizes the provision of loan guarantees to agricultural producers to install energy efficient equipment or systems for agricultural production or processing that exceed relevant efficiency standards.⁷¹ Mandatory funding remains at \$50 million per fiscal year, with authorized appropriations continue at \$20 million per fiscal year through FY2023.⁷²

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9005, 132 Stat. 4884.

⁶³ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9005, 132 Stat. 4884; CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 10–11.

⁶⁴ 7 U.S.C. § 8106.

⁶⁵ CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 10.

⁶⁶ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9006, 132 Stat. 4885.

⁶⁷ 7 U.S.C. § 8107.

⁶⁸ 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).

⁶⁹ 7 U.S.C. § 8107; CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 11.

⁷⁰ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9007, 132 Stat. 4886; CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 11–12.

⁷¹ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9007, 132 Stat. 4886.

⁷² 7 U.S.C. § 8107.



F. The Feedstock Flexibility Program

This program authorizes the Commodity Credit Corporation to purchase surplus sugar from processors to resell to ethanol producers for fuel, with the aim of avoiding sugar forfeitures on CCC loans.⁷³ The 2018 Farm Bill extends this program through FY2023 with such funds as necessary, through the CCC, to carry out the program.⁷⁴

G. The 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).⁷⁵ 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.⁷⁶ The program is overseen by the Farm Service Agency of the USDA.⁷⁷ The program continues financial assistance to owners and operators of agricultural and non-industrial private forestland who establish, produce, and deliver biomass feedstock. The 2018 Farm Bill adds **algae** as an eligible feedstock under the program.⁷⁸ Mandatory funding (\$25 million annually under the 2014 Farm Act) is not continued. Annual appropriations of up to \$25 million are authorized for fiscal years 2019-2023.⁷⁹

H. NEW: The Carbon Utilization and Biogas Education Program

This new program authorizes annual appropriations of \$2 million to support grant projects that (1) provide education to the public about the benefits of permanent sequestration or utilization of carbon dioxide (from the production of a biobased product), or (2) provide education to agricultural producers about opportunities for aggregation of organic waste from multiple sources into a single biogas system, with \$1 million allocated for each of the two objectives.⁸⁰

I. RELOCATED: The Biomass Research and Development Initiative (BRDI)

Relocated from the Energy Title to the Research Title. 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 biofuel production, products, feedstocks, and innovation.⁸¹ The funding can be offered through contracts, grants, or other assistance.⁸² 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.⁸³

⁷³ 7 U.S.C. § 8110.

⁷⁴ 7 U.S.C. § 8110(b)(6).

⁷⁵ 7 U.S.C. § 8111.

⁷⁶ BRACMORT, *supra* note 23, at 17.

⁷⁷ *Id.*

⁷⁸ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9010, 132 Stat. 4887.

⁷⁹ *Id.*

⁸⁰ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 9011, 132 Stat. 4887.

⁸¹ 7 U.S.C. § 8108.

⁸² *Id.*

⁸³ 7 U.S.C. § 8108(c).



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.⁸⁴ The 2018 Farm Bill expands the definition of “biobased product” to include carbon dioxide that “is intended for permanent sequestration or utilization” and is a byproduct of certain commercial and industrial products, and adds “an individual with expertise in carbon dioxide capture, utilization, and sequestration” to the Biomass Research and Development Technical Advisory Committee.⁸⁵ The section authorizes annual appropriations of \$30 million but did not extend the mandatory funding of \$3 million included in the prior 2014 Farm Bill.

III. KEY ISSUES

A. *Ethanol’s Status as Environmentally Sustainable*

Evidence is growing that the environmental benefits of corn-ethanol subsidies are likely much smaller than originally thought.⁸⁶ The touted environmental benefit of combining ethanol into gasoline is a reduction in net carbon-dioxide emissions. However, the corn-ethanol production process itself emits carbon dioxide, from the growing process through transportation, conversion, and distribution, not to mention the intensive inputs required including water, chemicals, and fossil fuels (e.g., fertilizer), which must also be transported to the growing region.⁸⁷ Independent ethanol studies have indicated that the production process “requires twenty-nine percent more fossil fuel energy than corn-based ethanol creates.”⁸⁸ Furthermore, ethanol policies have contributed to the conversion of uncultivated lands, including grassland and wetland, to cropland for growing corn.⁸⁹ Such conversions run counter to the farm bill’s land conservation objectives and release carbon into the atmosphere.⁹⁰

Despite these drawbacks, the farm bill and related federal policies continue to promote the industry for the additional benefits of supporting the domestic agricultural economy and economic vitality of rural communities.⁹¹ Ethanol policy remains an important issue for “farm-states” and is thus a critical talking point in national elections.⁹²

B. *Forests as Fuel*

One particularly controversial issue in biofuel policy is the use of forest biomass as fuel. Several programs in the 2018 Farm Bill include special provisions for forest-based products, including an expedited approval process within the Biobased Markets Program,⁹³ and more direct promotion in the

⁸⁴ CONG. RSCH. SERV., THE FARM BILL ENERGY TITLE, *supra* note 43, at 12.

⁸⁵ Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 7507, 132 Stat. 4823.

⁸⁶ Jason S. Johnston, *Regulatory Carrots and Sticks in Climate Policy: Some Political Economic Observations*, 6 TEX. L. REV. 107, 108 (2018).

⁸⁷ Allison Payton Nicklin, *Too Much of a Yellow Things? How Growing Golden Kernels Grew Into America’s Corn Crises*, 25 VILL. ENVTL. L.J. 235, 250–51 (2014); Johnston, *supra* note 78, at 124.

⁸⁸ Nicklin, *supra* note 87, at 258–59.

⁸⁹ Johnston, *supra* note 86, at 125; Scott Faber, *Corn Ethanol: Bad for Farmers, Consumers, and the Environment*, ENVTL. WORKING GRP. (Feb. 4, 2013), <https://www.ewg.org/agmag/2013/02/corn-ethanol-bad-farmers-consumers-and-environment>.

⁹⁰ See Faber, *supra* note 89.

⁹¹ Nicklin, *supra* note 87, at 239.

⁹² See, e.g., Michael Grunwald, *How the 2020 Democrats Learned to Love Ethanol*, POLITICO (Mar. 5, 2019), <https://www.politico.com/magazine/story/2019/03/05/2020-democrats-ethanol-225517>.

⁹³ BRACMORT, *supra* note 23, at 18.



Community Wood Energy Program.⁹⁴ Supporters argue that generating energy from forest-based biomass can be carbon neutral in the long run.⁹⁵ However, forest-based bioenergy also has environmental drawbacks. Biomass releases carbon dioxide upon combustion and the absorption process could take decades and depends on forest management practices.⁹⁶ During the decades that the carbon is in the air, the greenhouse effect will be the same as if the gases were from any other source. Additionally, forests are a carbon sink and forest-based bioenergy could decrease their contribution to climate change mitigation.⁹⁷ Thus, some argue that the designation of forest biomass as carbon-neutral is misleading.

C. Impact on 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.⁹⁸ 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.⁹⁹ 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 affected¹⁰⁰ – 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.¹⁰¹ Rising food prices affect the global poor, as became evident when commodity prices spiked in 2008.¹⁰² 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)¹⁰³ to International Monetary Fund (IMF) analysts¹⁰⁴ 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.¹⁰⁵ Wheat, rice, and corn--three of the

⁹⁴ *Id.* at 19

⁹⁵ See, e.g., *Senators Collins-Klobuchar-King Biomass Amendment Passes Senate*, OFFICE OF SUSAN COLLINS (Feb. 3, 2016), <https://www.collins.senate.gov/newsroom/senators-collins-klobuchar-king-biomass-amendment-passes-senate/>.

⁹⁶ See Alice Favero et al., *Forests: Carbon Sequestration, Biomass Energy, or Both?*, 6 *SCI. ADVANCES* 6792 (2020).

⁹⁷ *Id.*

⁹⁸ 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/>.

⁹⁹ *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>.

¹⁰⁰ *Id.*

¹⁰¹ *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>.

¹⁰² NICOLE CONDON ET AL., NAT'L CTR. FOR ENVTL. ECON., *IMPACTS OF ETHANOL POLICY ON CORN PRICES: A REVIEW AND META-ANALYSIS OF RECENT EVIDENCE* (revised Oct. 2013), https://www.epa.gov/sites/production/files/2014-12/documents/impacts_of_ethanol_policy_on_corn_prices.pdf; see also HIGH LEVEL PANEL OF EXPERTS, *BIOFUELS AND FOOD SECURITY* (June 2013), http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf.

¹⁰³ CONDON ET AL., *supra* note 102.

¹⁰⁴ HIGH LEVEL PANEL OF EXPERTS, *supra* note 102.

¹⁰⁵ *Id.*



commodities affected--account for about two-thirds of global calorie consumption.¹⁰⁶ 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 2014 and 2018 Farm Bills retain essentially the same energy policy, which continues to focus on corn ethanol and advanced biofuels. 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. 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 Renewable Fuel Standard.

¹⁰⁶ Brian Wright, *Global 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>.