Biofuel Tax Credits

Tax Credit Program Evaluation Study

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Preface

Iowa Code section 2.48 directs the Department of Revenue to review certain tax expenditures it administers. The schedule provided in this section requires a review in 2024 of the Biofuel Tax Credits available under sections 422.11O, 422.11P and 422.11Y. "The review shall consist of evaluating [the tax credit] and assess its equity, simplicity, competitiveness, public purpose, adequacy, and extent of conformance with the original purpose of the legislation that enacted the tax expenditure, as those issues pertain to taxation in Iowa." The report may include recommendations for better aligning tax expenditures with the original intent of the legislation that enacted the tax expenditure. This is the Department of Revenue's fourth evaluation study completed for these expenditures. Prior studies of the Biofuel Tax Credits were completed in 2009, 2014 and 2019.

As part of the evaluation, an advisory panel was convened to provide input and advice on the study's scope and analysis. We wish to thank the members of the panel:

John Maynes	FUELIowa
Doug Struyk	Iowa Biodiesel Board
Paul Ovrom	Iowa Dept. of Agriculture and Land Stewardship
Abbie Christophersen	Iowa Economic Development Authority
Tim Johnson	Iowa Farm Bureau Federation
Nathan Hohnstein	Iowa Renewable Fuels Association

The assistance of an advisory panel implies no responsibility for the content and conclusions of the evaluation study. This report was also reviewed by Robin Anderson, Ph.D., State Chief Economist and Division Administrator of the Research and Policy Division. This study and other evaluations of Iowa tax credits can be found on the Tax Credits Tracking and Analysis Program web page on the Iowa Department of Revenue website.

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Executive Summary

Currently, there are three active biofuel tax credits in Iowa. They are the E15 Plus Gasoline Promotion Tax Credit, E85 Gasoline Promotion Tax Credit and Biodiesel Blended Fuel Tax Credit. A fourth tax credit, the Ethanol Promotion Tax Credit, was allowed to expire on January 1, 2021. Further information on the credits, claims data and sales amounts will be summarized below. Additionally, information regarding programs across the United States will be provided. The final section of this executive summary will be a brief discussion on related economic considerations.

E15 Plus Gasoline Promotion Tax Credit

- E15 Plus is a blend of gasoline that contains between 15 percent and 69 percent ethanol. E15 has been approved by the United States Environmental Protection Agency (EPA) for use in all 2001 and newer cars, trucks and SUVs.
- Beginning July 1, 2011, the E15 Plus Gasoline Promotion Tax Credit was available to retail dealers of gasoline who sell blended gasoline that is classified as E15 Plus gasoline. The current tax credit rate is $0.09 per eligible gallon.
- If not extended by the legislature, this tax credit is set to expire on January 1, 2026.

E85 Gasoline Promotion Tax Credit

- E85 (or Flex Fuel) is a blend of gasoline that contains between 70 percent and 85 percent ethanol. E85 requires dedicated pumps and can only be used in flexible fuel vehicles (FFVs).
- Starting on January 1, 2006, retail dealers of motor fuel that sell E85 gasoline were able to claim the E85 Gasoline Promotion Tax Credit. Currently the tax credit amount is set at $0.16 per gallon.
- The current expiration date for this credit is January 1, 2028.

Biodiesel Blended Fuel Tax Credit

- Biodiesel is defined as a renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in diesel vehicles or any equipment that operates on diesel fuel.
- Retail dealers that sell biodiesel have been able to claim the tax credit since January 1, 2006. The present tax credit rate varies between $0.05 and $0.10, depending on the blend being sold.
- The tax credit will sunset on January 1, 2028.

Ethanol Promotion Tax Credit

- The Ethanol Promotion Tax Credit was created to replace the Ethanol Blend Gasoline Tax Credit, which expired December 31, 2008. The credit became effective on January 1, 2009 and sunset on January 1, 2021.
- Retailers selling ethanol blended gasoline, including E10, E15 and E85, were eligible to claim the credit.

Biofuel Tax Credits, Mandates and Incentives Across the United States

- Seven states, including Iowa, offer tax credits for retailers based on the number of gallons of biofuel sold.
- Seventeen states offer a tax deduction or excise tax exemption on the sale of biofuel.
- Kansas, North Dakota and South Carolina currently offer tax credits for retailers to invest in the necessary infrastructure to sell biofuel.
- The federal government and five states provide other types of incentives for investment in biofuel retail infrastructure.

Biofuel Retail Sales in Iowa

- E15 sales were first reported in calendar year 2011, and in that year 0.1 million gallons were sold. E15 sales have risen every year since, with 179.5 million gallons sold being reported in 2023.
- E85 sales were 4.2 million gallons in calendar year 2007 and crested in 2017 at 20.6 million gallons. For calendar year 2023, sales were reported at 19.0 million gallons.
- Biodiesel sales were 160.8 million gallons in calendar year 2007. Overall biodiesel sales have tripled since then, with 486.5 million gallons being sold in 2023.

Tax Credit Claims

- The number of claims for the E15 Plus Gasoline Promotion Tax Credit in tax year 2022 was 212. This is the highest number of tax claims for any tax year reported, and the total dollar amount was $3.87 million. This dollar amount is significantly lower than the prior year.
- In tax year 2006, the number of E85 Gasoline Promotion Tax Credit claimants was 107. The number of claimants peaked at 315 in tax year 2017 and has steadily decreased since. In tax year 2022, there were only 185 claimants. However, the average claim amount has on the whole increased every year. In tax year 2022 the average claim amount was just over $17,000.
- For the Biodiesel Blended Fuel Tax Credit, the total number claims increased from the 76 reported in the initial year, to a high of 451 claims in 2017. Since then the number has slowly retreated to 325 in 2022. In 2022, the total claim amount for this credit was nearly $17.0 million, with results in an average claim of just over $52,000.

Impact of Electric Vehicles on Biofuel Sales

- The number of electric vehicles (EVs) registered in Iowa and the United States continues to rise. However, it still only represents a small percentage of total vehicles. Just 0.3 percent of vehicles in Iowa and 1.2 percent of vehicles nationwide were EVs in 2022.
- A number of models and forecasts have been generated to predict EV market share in the future. However, the forecasts vary widely, mainly due to the wide range of assumptions that can be applied.

Effect of Biofuels on the Agriculture Industry

- It appears that there is a connection between biofuel prices and commodity prices. More specifically, it appears that as biofuel prices rise, commodity prices also rise.
- Some studies suggest that food prices are impacted by biofuels. Some studies suggest that as production of biofuels increase, that increase puts upward pressure on the cost of food. However, this belief is not universal as some studies suggest that there is no evidence of higher food prices since the onset of significant biofuel production.
- There is research that proposes that as demand for biofuel feedstock increases, land values also increase.

I. Introduction

Iowa currently has three tax credits in place to encourage ethanol and biodiesel consumption in the state. These credits are the E15 Plus Gasoline Promotion Tax Credit (E15GC), E85 Gasoline Promotion Tax Credit (E85GC) and Biodiesel Blended Fuel Tax Credit (BBFC). These credits became effective in 2006, as a result of the Iowa General Assembly enacting HF 2754. This act provided incentives for the installation of biofuels infrastructure and the promotion of biofuel sales. The incentives were incorporated to support the legislation's goal that 25 percent of all petroleum used in the formulation of gasoline consumed in the state be replaced by biofuels by the year 2020. This goal was not achieved by the target date.

Since the passage of HF 2754, the Iowa Department of Revenue (IDR) has completed three evaluation studies on the related tax credits, with the current study being the fourth. The primary goal of this study is to examine the claims data of these three tax credits in an attempt to evaluate the effectiveness of the credits. Additionally, the potential impact of electric vehicles on biofuel demand will be explored. Finally, the study will investigate if the tax credits have an effect on Iowa's agricultural industry. Specifically, the relationship between ethanol and corn prices, as well as biodiesel and soybean prices.

Section II of this report provides a detailed description of each active tax credit, along with briefly commenting on the recently sunset Ethanol Promotion Tax Credit (EPTC). Section III provides information about tax credits and incentives in

other states and at the federal level. Section IV presents a review of relevant research regarding the topic of biofuel. Section V provides descriptive statistics related to biofuel sales, tax credit claims and other industry statistics. In Section VI an economic analysis will be offered of the tax credits. The final section of this report provides a brief conclusion.

II. Description of Iowa Biofuel Tax Credits

A. E15 Plus Gasoline Promotion Tax Credit

E15 Plus is a blend of gasoline that contains between 15 percent and 69 percent ethanol. E15 has been approved by the United States Environmental Protection Agency (EPA) for use in all 2001 and newer cars, trucks and SUVs. Based on data provided by the Iowa Renewable Fuels Association, more than 96 percent of vehicles operating today would be able to utilize E15.

Starting July 1, 2011, the E15 Plus Gasoline Promotion Tax Credit was available to retail dealers of gasoline who sell blended gasoline that is classified as E15 Plus gasoline. This tax credit applies to qualifying gallons sold on a companywide basis. Beginning on July 1, 2011 and running through December 31, 2013, the tax credit rate per eligible gallon sold was $0.03 (see Table 1). The credit was set to expire January 1, 2018.

During the 2014 legislative session, the E15GC was made seasonal. Beginning January 1, 2014, gallons sold from June 1 through September 15 earned a tax credit of $0.10 per blended gallon. For dates outside of that window, the tax credit remained $0.03 per gallon. The higher tax credit rate allowed during the summer reflected EPA regulations that disallowed the sale of E15 during the summer months as a regular fuel, unless the ethanol was blended with low volatile gasoline to meet air quality regulations.

In 2016, the Legislature extended the sunset date for this tax credit to January 1, 2025. On May 31, 2019, the EPA approved E15 to be sold year-round by extending the waiver from air quality regulations. During the 2022 legislative session, the expiration date of the credit was changed from January 1, 2025 to January 1, 2026. Also, during the 2022 legislative session the tax credit rates were modified to $0.09 without regard to the month the gallon of fuel was sold, effective January 1, 2023. Taxpayers making E15GC claims must file Form IA 138 and the IA 148.

B. E85 Gasoline Promotion Tax Credit

E85 (or Flex Fuel) in Iowa is a blend of gasoline that contains between 70 percent and 85 percent ethanol. E85 requires dedicated pumps and can only be used in flexible fuel vehicles (FFVs). FFVs are similar to conventional gasoline

only vehicles, other than fuel economy is generally lower in FFVs. Per data from the U.S. Department of Energy – Alternative Fuel Data Center, there were approximately 20.9 million FFVs in the United States in 2022.

Beginning January 1, 2006, retail dealers of motor fuel that sell E85 gasoline were able to claim the E85 Gasoline Promotion Tax Credit. The tax credit applies to E85 gallons sold on a company-wide basis. The tax credit rate started at $0.25 per gallon sold for calendar years 2006 through 2008, fell to $0.20 for calendar years 2009 and 2010 and then dropped to $0.10 in calendar year 2011 (see Table 2). The tax credit rate was scheduled to decrease one cent per year down to a final rate of one cent per gallon sold in 2020, with expiration set for January 1, 2021. However, legislation in 2011 raised the credit to $0.16 per gallon starting in calendar year 2012 through 2017 and moved the expiration date to January 1, 2018. A law change passed in 2016 extended the sunset date for this tax credit to January 1, 2025. During the 2022 legislative session, the expiration of the credit was changed to January 1, 2028. In order to claim the E85GC, taxpayers are required to file Form IA 135 and IA 148 with the tax return on which the credit is claimed.

C. Biodiesel Blended Fuel Tax Credit

Biodiesel is defined by the U.S. Department of Energy – Alternative Fuels Data Center as a renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in diesel vehicles or any equipment that operates on diesel fuel. Compared to petroleum diesel fuel, which is refined from crude oil, biodiesel combustion produces fewer air pollutants.

Starting January 1, 2006, retail dealers that sell biodiesel blended fuel can claim the Biodiesel Blended Fuel Tax Credit (BBFC). For 2006 through 2008, to qualify for the tax credit, on a company-wide basis, 50 percent or more of the total gallons of diesel fuel sold by the retailer in Iowa must have been biodiesel fuel containing a minimum percentage of two percent biodiesel by volume (B2). Effective in 2009 through 2011, eligibility for the tax credit was determined separately at each retail location, where at least 50 percent of diesel sales must have been B2 or higher blend biodiesel sales. Through calendar year 2011, the tax credit equaled $0.03 multiplied by the total number of gallons of biodiesel blended fuel gallons of B2 or higher sold at each qualifying retail location (see Table 3).

In 2011, the Legislature made changes on eligibility and tax credit rates to the BBFC:

- Effective for tax years beginning on or after January 1, 2012, the 50 percent biodiesel sales requirement was eliminated so that the BBFC now applies to all biodiesel sold on a company-wide basis regardless of its share of sales at each retail location.

- The tax credit rate was lowered to $0.02 per gallon for blends between B2 and B4 and raised to $0.045 per gallon for blends classified as B5 or higher. In calendar years 2013 through 2017, the tax credit equals $0.045 per gallon for blends classified as B5 or higher; lower blends are no longer eligible. For sales in calendar year 2018 through 2022, the tax credit equals $0.035 per gallon for blends classified as B5-B10 and $0.055 per gallon for blends classified as B11 or higher.

In 2016, the Legislature extended the sunset date for the tax credit to January 1, 2025. In 2016, legislation was enacted that lowered the tax credit for blends B5-B10 to $0.035 per blended gallon (from $0.045) and provided a tax credit of $0.055 per blended gallon for blends of B11 or above.

During the 2022 legislative session, the sunset date was extended to January 1, 2028. Additionally, the tax credits were changed effective January 1, 2023. The changes eliminated the credit for the 5 to 10 percent biodiesel blends, and established three blend categories. Those categories are B11 to B19, B20 to B29 and B30 or higher. Taxpayers making BBFC claims must file Form IA 8864 and the IA 148.

D. Ethanol Promotion Tax Credit

Ethanol is a renewable, domestically produced alcohol fuel made from plant material, such as corn, sugar cane, or grasses. The Ethanol Promotion Tax Credit was created to replace the Ethanol Blend Gasoline Tax Credit, which expired December 31, 2008. Beginning January 1, 2009, motor fuel retailers selling ethanol blended gasoline, including E10, E15 and E85, were eligible to claim the EPTC (see Table 4). The tax credit was sunset on January 1, 2021.

III. Biofuel Tax Credit Programs Across the United States

In addition to Iowa, six other states currently offer tax credits for retailers based on the amount of biofuel sold at retail stations. Seventeen states offer a tax deduction or excise tax exemption on the sale of biofuel. Three states currently offer tax credits for retailers to encourage investment in the necessary infrastructure to sell biofuel. Additionally, five states, along with the federal government, offer other types of incentives for investment in biofuel retail infrastructure. Finally, the federal government and a number of other states have declared a mandate or explicit goal for biofuel usage. All of these items will be discussed in greater detail below.

A. Retailer Tax Credits

Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, Oklahoma and South Dakota have established tax credit programs for biofuel sales (see Table 5). Iowa, Missouri, Nebraska and North Dakota offer tax credits for biofuel sales

against income taxes. Kansas offers a sales tax credit, while Montana, Oklahoma and South Dakota offer credits against their fuel taxes.

Iowa's tax credit applies to E15, E85 and B11 biodiesel or higher. The tax credit for E15 expires at the end of 2025, while the credits for E85 and biodiesel are set to sunset at the end of 2027. The rate for the E15 credit is $0.09 per gallon, the credit for E85 is $0.16 per gallon and the rate for the biodiesel credit ranges from $0.05 to $0.10, depending on the blend. Missouri's credit was implemented in 2023, has an annual cap and applies to both biodiesel and ethanol. Nebraska's retailer tax credit applies solely to 100% biodiesel and allows for a $0.14 per gallon credit. The credit in Nebraska was put in place at the beginning of 2024 and is currently set to terminate on December 31, 2029. North Dakota's credit is targeted towards biodiesel and renewable diesel. The credit pertains to B5 or higher blends and calls for a $0.05 per gallon credit. North Dakota's credit is the only income tax credit that has a carry forward feature, as it can be carried forward up to five years.

Kansas has a retailer tax incentive program for renewable fuels, including biodiesel blends. In Kansas's program a qualified fuel retailer would be eligible for up to $0.065 for every gallon of renewable fuel sold and up to $0.03 for every gallon of biodiesel sold, if a required threshold percentage is met. The threshold is determined by calculating the percent of total gasoline sales that is renewable fuel or biodiesel. Kansas's tax credit can be claimed quarterly, however this tax credit program is currently not receiving funding.

Montana offers a $0.01 per gallon refund of fuel taxes paid by retailers on biodiesel produced entirely from Montana components. Blend requirements or limits are not outlined in the code that governs this credit. Oklahoma's Ethanol Fuel Retailer Tax Credit has been in place since January 1, 2006. The credit furnishes $0.016 for each gallon on ethanol blend of gasoline containing up to 15 percent ethanol by volume sold if the retailer provides a price reduction of equal amount. South Dakota has a credit set to go into effect on January 1, 2025. The credit is $0.05 for each gallon of E15 and does have a program cap. The credit will be paid from money deposited into South Dakota's ethanol infrastructure incentive fund. If the amount of money in that fund is not sufficient to pay all allowable amounts for the calendar year, the payments will be prorated among the applicants.

B. Other Incentive Programs for Biofuel Sales

Seventeen states, including Iowa, offer incentives for sales of biofuel, typically through reduced fuel tax rates or exemption from sales tax (see Table 6).

In Iowa, the tax rate reduction between ethanol and gasoline started at $0.01 in FY 1989. From FY 2002 through FY 2024, the gap has been as high as $0.06 and as low as $0.011 (see Table 7). The tax rate gap for biodiesel has remained relatively unchanged at either $0.02 or $0.03 per gallon from July 1, 2015 to July

1, 2024. The Iowa fuel excise tax rate is currently $0.30 per gallon on gasoline and E10 to E14 ethanol, while the fuel tax on ethanol blended E15 or higher is $0.255 per gallon. It is important to note that the fuel tax is levied at the terminal; however, a significant number of gallons of ethanol-blended fuel are blended downstream, that is between the terminal and the retailer. Blenders are thus eligible to receive a refund from the Department of Revenue when gasoline is blended into an E15 or higher ethanol blend or diesel is blended into a B20 or higher blend.

The incentives offered by other states are a combination of programs for biodiesel only, ethanol only, biodiesel and ethanol, alternative fuels in general, or in the case of Tennessee specifically targeted at methanol.

C. Retailer Investment Tax Credits

Kansas, North Dakota and South Carolina currently offer some level of tax credit for investment in biofuel infrastructure by retailers (see Table 8). State tax credits for biofuel infrastructure investment range from 10 percent of direct costs in North Dakota to 40 percent of total costs in Kansas. All of the income tax credits are nonrefundable with carry forward periods ranging from four to ten years.

Kansas offers the Alternative Fueling Infrastructure Tax Credit for the installation of alternative fueling infrastructure after January 1, 2009. The credit is only available to entities with corporate income tax liability. The tax credit states that qualified property must be directly related to the delivery of alternative fuel into the fuel tank of a motor vehicle propelled by such fuel.

North Dakota offers a 10 percent income tax credit for the direct costs to adapt or add equipment that enables a facility to sell at least 2 percent biodiesel blends. In addition, a retailer may only claim the credit for up to five years and is limited to $50,000 cumulative credits for all taxable years.

South Carolina allows an income tax credit for up to 25 percent of the purchase, construction, property and installation costs for the fueling facility. Eligible infrastructure includes pumps, storage tanks and related equipment. The credit must be taken in three equal annual installments. Qualifying fuels include blends containing at least 70 percent ethanol dispensed at the retail level for use in motor vehicles, along with pure ethanol or biodiesel fuel.

Since the prior evaluation study in 2019, two states have allowed their investment tax credits expire. Those states are Louisiana and Montana, both of with had their credits expire on January 1, 2022. The tax credit in Louisiana was allowed up to 30 percent of eligible costs, while Montana offered a credit up to 15 percent of eligible costs.

D. Other Incentive Programs for Biofuel Retail Investment

Five states, along with the federal government provide incentives other than tax credits to encourage investment in alternative fuel filling stations (see Table 9). The incentives are mainly in the form of loans and grants. These incentives are discussed in more detail below.

The federal government offers the Rural Energy for America Program (REAP) which provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. Funds may be used for the purchase and installation of a number of renewable energy systems, including biodiesel and ethanol. The maximum loan guarantee is up to 75 percent of total eligible project costs. Grants are available for up to 50 percent of total eligible project costs.

Additionally, the U.S. Department of Agriculture Rural Development offers the Higher Blend Infrastructure Investment Program (HBIIP). Based on information provided on the program's website, the purpose of HBIIP is to increase significantly the sales and use of higher blends of ethanol and biodiesel. This is achieved by offering funding for the installation, retrofitting and upgrading of dispensers or pumps, infrastructure and related equipment at qualified facilities. The program's goal is to increase biofuel sales by 1.2 billion gallons annually.

Iowa offers the Renewable Fuel Infrastructure Grant Program through the Iowa Department of Agriculture and Land Stewardship. The program provides financial assistance to qualified ethanol and biodiesel retailers to install, replace or convert eligible infrastructure to expand the use of renewable fuels in Iowa. Approved ethanol cost-share applications can result in awards up to $75,000 per project, while approved biodiesel cost-share applications can result in awards up to $50,000 per project. Biodiesel terminal projects can receive up to $100,000 per project depending upon the percentage of biodiesel in dispensed blended diesel products. Based on information provided by the Department of Agriculture and Land Stewardship, to date the program has distributed or obligated more than $53.5 million to 1,314 projects around the state (see Table 10).

The programs offered in Nebraska and Oregon are similar to each other in that they provide low-cost, low-interest loans for qualified projects. Likewise, the programs in Texas and Washington are comparable due to the fact they are grant based. Moreover, the focus of the Texas and Washington programs is fairly wide, as they provide funding for alternative fuel projects, hydrogen fueling infrastructure and electric vehicle charging stations.

Two states have allowed their grant programs to expire since the 2019 evaluation study. Maryland offered a grant program to cover the costs associated with planning, installing or operating public access fueling and charging infrastructure. The program required the applicant to cover at least 50 percent of the costs and the maximum grant amount was $35,000. In South Dakota, their grant program looked to offset the costs of installing blender pumps and underground storage

tanks for ethanol at retail fueling stations. The program grants had maximum amounts of $25,000 for the first blender pump, $10,000 for additional pumps and $40,000 for the related underground storage tanks.

E. Mandates or Explicit Goals

The United States Environmental Protection Agency announced in June 2023 a final rule to establish biofuel volume requirements and associated percentage standards for cellulosic biofuel, biomass-based diesel, advanced biodiesel and total renewable fuel for 2023 through 2025 as a part of the Renewable Fuel Standard. The renewable fuel volume target for 2024 is 21.54 billion gallons and the 2025 target is 22.33 billion gallons.

Eight states, Hawaii, Louisiana, Minnesota, Missouri, New Mexico, Oregon, Pennsylvania and Washington, have mandates for biofuel sales independent of the federal requirements (see Table 11). Of the eight states, only the mandates in New Mexico and Washington are limited to biodiesel. Missouri's mandate is for ethanol only, while the remaining states' mandates cover both ethanol and biodiesel.

Two states, Rhode Island and Wisconsin, currently have set explicit goals (see Table 11). In Rhode Island, the Petroleum Savings and Independence Advisory Commission was established to provide recommendations and monitor programs designed to reduce the state's dependence on petroleum-based fuels in the transportation and heating sectors. Established targets may not provide less than a 30% overall reduction in petroleum consumption from 2007 levels by 2030 and a 50% overall reduction from 2007 levels by 2050. In Wisconsin, the legislature sets goals for minimum annual renewable fuel sales volumes based on annual renewable fuel volumes required under the federal Renewable Fuel Standard. In addition, fifteen states passed the "25 x 25" vision, in which renewable energy will provide 25 percent of the total energy consumed in the United States by the year 2025, while still producing safe, abundant, and affordable food, feed, and fiber.

In addition to the goals and mandates listed above, Iowa will be implementing a mandate for E15 beginning on January 1, 2026. On that date retail fueling stations in Iowa must advertise and sell E15 from at least one gasoline dispenser. Failure to comply with this mandate may result in the Iowa Department of Agriculture and Land Stewardship refusing to renew, suspending or revoking the retailer's fuel license.

Finally, there are states that have adopted or are exploring low carbon fuel standards. The U.S. Department of Energy, Alternative Fuels Data Center states that California first implemented a Low-Carbon Fuel Standard (LCFS) in 2011. The California LCFS requires a reduction in the carbon intensity of transportation fuels that are sold, supplied or offered for sale in the state through 2030. LCFS regulated fuels include natural gas, electricity, hydrogen, gasoline mixed with at

least 10 percent corn-derived ethanol, biomass-based diesel and propane. The LCFS allows producers and importers to generate, acquire, transfer, bank, borrow and trade program credits. Oregon implemented a similar program in 2016 and Washington followed in 2024. New Mexico passed legislation in March 2024 on clean fuel standards that will go into effect no later than July 1, 2026. As mentioned previously there are a number of additional states introducing or considering similar legislation.

IV. Literature Review

While literature specific to the state of Iowa is limited, there is research at the regional and national level that addresses biofuel policies, along with the benefits and costs of using alternative fuels. This research will be discussed below.

Since the 1970s, there have been policies in place to support biofuels (Stokes & Breetz, 2018). In the United States, this initial movement was linked to the farm crisis of the mid-1970s, when farmers suffered from crop surpluses, depressed grain prices and record debt (Bernton, Kovarik, Sklar, Griffin, & Woolsey, 2010). In the late 1970s and early 1980s, two new crises provided legislative opportunities: an oil shock following the Iranian revolution and a U.S. grain surplus caused by an embargo on grain sales to the Soviet Union (Stokes & Breetz, 2018). These events impacted legislation through the mid-1990s. More recently, the United States Environmental Protection Agency sets policy regarding biofuel volume requirements through the Renewable Fuel Standard. This significant policy was developed in two phases: a modest RFS (RFS1) in the Energy Policy Act of 2005 and a massively expanded RFS (RFS2) in the Energy Independence and Security Act of 2007. In both cases, advocates for rural jobs, national security, and environmental protection supported biofuels (Stokes & Breetz, 2018).

Tax credits also play an important role in the strategy concerning biofuels. These tax credits are offered at the federal level and by some states. The credits can be offered to the producers, blenders, retailers or consumers. The specifics of incentives in Iowa, along with the federal government and other states, is discussed in detail in other sections of this study. Although quite limited, there is literature available that addresses the subject of public opinion on biofuel tax credits. In a study from 2021, it was suggested that public support for government investment in biofuels is not as polarized along partisan lines as other aspects or public opinion on energy and environmental policy, such as fracking or climate change (Goldfarb & Kriner, 2021). Interestingly, one study suggested that public opinion on biofuels can vary simply from the terms being used. The study claims that the public reacted more positively to the term “biofuels” than to “ethanol” (Fung, Choi, Scheufele, & Shaw, 2014). In the same study, the authors suggest that understanding how the interplay between partisanship and risk/benefit perception of biofuels can provide critical insights into potential sources of influence on public opinion and the process of

democratic decision making about public policies related to science and technology.

Due to support from the United States, along with related backing in other countries, biofuel production has increased globally. World bioethanol production has increased by 67 percent, from 67 to 110.4 billion liters, over the decade from 2008-2018. During the same period, biodiesel production increased more than threefold, from 12 to 41 billion liters. Currently, biofuels account for about 3.4percent of total transportation fuels worldwide (Jeswani, Chilvers, & Azapagic, 2020).

Globally, there seems to be a consensus that biofuel has advantages such as renewability, cleanliness, or economic efficiency, which not only can resolve fossil energy supply problems, optimize energy structure and ensure national energy security but also can lower greenhouse gas emissions, reduce ecological degradations, promote economic growth, and increase farmers' income (Ji & Long, 2016). In the United States, the guiding principle of biofuel policies has been a reduction in the country's dependency on oil (Sorda, Banse, & Kemfert, 2010). However, there are other benefits of biofuels that must be considered. The environmental benefits include lower greenhouse gas emissions and other air quality benefits (Hahn & Cecot, 2009). Additionally, many studies emphasize the benefits of reduced tax costs for farm subsidy programs, reduced fuel prices and improved international terms of trade (de Gorter & Just, 2010). Some of the benefits of biofuel, along with the associated costs and concerns, will be discussed below.

As mentioned above, there are many environmental benefits that are believed to result from the increased usage of biofuels. Perhaps the most obvious is that fossil fuels are a finite resource, while biofuels are made from renewable feedstocks. Based on information provided on the United States Environmental Protection Agency website, first generation biofuels are fuels made from sugar crops (sugarcane, sugarbeet), starch crops (corn, sorghum), oilseed crops (soybean, canola) and animal fats. Second generation biofuels are made from cellulose, which is available from non-food crops and waste biomass. Some examples of this are corncobs, straw, wood and wood byproducts. Unfortunately, it is much more difficult to break down cellulose into the simple sugars necessary to make ethanol than it is to break down corn, with the result that it is not currently cost-effective (Hahn & Cecot, 2009). Third generation biofuels use algae as a feedstock and are not yet commercially produced. The renewability of energy should be dependent on the level of fossil energy (nonrenewable energy) used in the energy life cycle, including exploration, production, transportation, use, pollution treatment and other processes. Accordingly, energy renewability can be categorized into absolute renewability (no consumption of fossil fuels in any life cycle process), partial renewability (consumption of fossil-fuel energy during the entire life cycle is lower than the energy it contains) and non-

renewability (consumption of fossil-fuel energy during the entire life cycle is higher than the energy it contains) (Ji & Long, 2016).

The EPA cautions that there are some potentially negative environmental impacts associated with the renewable feedstocks mentioned above. One potential impact is that although the feedstock is renewable, diverting land to grow the crops needed for biofuel may lead to the increased use of polluting inputs. Additionally, increases in irrigation and ethanol refining could deplete aquifers. A final concern to be considered, is devoting more land to crop production could lead to biodiversity losses (Economics of Biofuels, 2024).

Decreased greenhouse gas (GHG) emissions and improved air quality is another identified benefit of biofuel usage. Existing evidence suggests that if no land-use change is involved, first generation biofuels can, on average, have lower GHG emissions than fossil fuels. Second generation biofuels have, in general, a greater potential to reduce the emissions, provided there is no land-use change. Third generation biofuels do not represent a feasible option at present state of development as the GHG emissions are higher than those from fossil fuels (Jeswani, Chilvers, & Azapagic, 2020). Souza, Ballester & de Brito Cruz (2017) echo this sentiment in their study by stating that in relation to fossil fuels, biofuels can have lower human health toxicity and reduce GHG emissions.

However, the EPA points out that biofuel production and processing practices can release GHGs, as many biorefineries operate using fossil fuels (Economics of Biofuels, 2024). In regards to ethanol use, Hahn & Cecot (2009) state that the evidence is mixed on the subject of GHGs, as ethanol is likely to reduce carbon dioxide emissions, but may not decrease overall greenhouse gas emissions. Ji & Long (2016) have a similar take on biodiesel usage, explaining that most studies suggest that compared with conventional diesel fuel, biodiesel can significantly reduce emissions of particulate matter. For nitrogen oxides, however, the situation is the opposite. A study from 2021 argued that an increase in demand for biofuel feedstock production displaces land away from feed and food production because crops are competing for a relatively fixed amount of land. Thus, the increase in corn demand not only increases the price of corn, but also the price of other commodities competing for land. These higher commodity prices encourage farms to increase production through either extensification (i.e., bringing more land into production) or intensification (e.g., increasing fertilizer application and/or using better quality seeds). Extensification leads to the expansion of agricultural land into native grassland and forests, which in turn releases soil and biomass carbon. The carbon emissions from expansion of cropland into native vegetation can potentially increase greenhouse gas emissions associated with ethanol significantly (Dumortier, Carriquiry, & Elobeid, 2021). Nevertheless, it is important to note that various data from the U.S. Department of Agriculture shows that the number of acres being farmed in the United States has slowly declined since the 1950s.

Increased farm income and rural economic growth is believed to be an additional advantage of biofuel use. Most biofuel models predict a positive effect on farm income, a decrease in demand for farm support programs, an ambiguous effect on the livestock sector and an increase in rural jobs (Rajagopal & Zilberman, 2008). Studies also suggest that the impact on rural economic growth can be far reaching. Employment and other income generation during construction, operation and regular maintenance of the biofuel plant are of great importance as an output of a biofuel project in the local community. Direct employment includes the creation of job opportunities from increased biofuel feedstocks production, transportation and construction and operation, and maintenance of conversion processing plants. In addition, indirect employment is also created through the supporting industries, such as those in marketing and distribution of end products generated by biofuel industry (Sheelanere & Kulshreshtha, 2013). Furthermore, there may be unforeseen benefits that come to those that are involved in the production of various types of feedstocks. For instance, an increase in feedstock production for the bioenergy/biofuel industry also results in an increased production of co-products and residues that are in turn utilized as raw materials for several other sectors. For example, the cosmetics and pharmaceutical industries could benefit from the availability of glycerin, a by-product of biodiesel production (Sheelanere & Kulshreshtha, 2013). Additionally, if biofuels are produced using fermentation processes, by-products such as dried distillers grain can be instrumental in enhancing livestock production in the region (Sheelanere & Kulshreshtha, 2013). The U.S. Department of Agriculture states that dried distillers grains (DDGs) are typically used as protein-rich animal feed, both domestically and internationally. When DDGs are sold locally, it is typically in wet form, whereas it is dried when shipped longer distances. DDGs are most commonly used in feeding cattle, dairy cows, swine and some poultry.

Dumortier, Carriquiry & Elobeid (2021) state that, in the U.S., there is currently a strong dependence of agriculture on the future of fuel use. This dependence could be viewed as a potential disadvantage. Based on the information above, if biofuel consumption were to decline in the U.S., there would most likely be a negative effect on rural welfare. Lower biofuel consumption would cause commodity prices to decline, which in turn would reduce farm income. This suggested reliance also impacts rural employment. Rajagopal & Zilberman (2008) make the argument that the labor required in the production of biofuel feedstock and the conversion process is greater than that required for the extraction and processing of fossil fuels or other technologies like hydrogen or electric vehicles. A majority of these biofuel jobs take place in the rural sector.

In summary, the literature and research available on the topic of biofuels is somewhat mixed. As one would expect with such a complex topic, the benefits and disadvantages of biofuel usage presented in the studies offer differing views. Furthermore, when trying to determine the future of biofuels in the United States, as well as around the world, the consensus is still fairly uncertain.

V. Descriptive Statistics for Biofuel Tax Credits

A. Biofuel Retail Sales

Iowa Code section 452A.33 requires all Iowa fuel retailers to report motor fuel and diesel gallons to the Iowa Department of Revenue. The Department is then required to prepare and submit an annual report by April 1st to the Iowa Governor and Legislature. This annual report is known as the Retailers Fuel Gallons Annual Report and has been prepared since calendar year 2007. Although it is a requirement for retailers to complete the report, the 2023 participation rate for all retail locations across the state was 84.0 percent, which was up from the 71.0 percent response rate in 2022. The number of retail locations identified for calendar year 2023 was 2,264. The Retailers Fuel Gallons Annual Report data reflects actual retail sales to final consumers. This data is presented in Table 12 and will be discussed below.

The report data shows that ethanol sales were 998.9 million gallons in calendar year 2007 and then had a sharp increase to 1,269.9 million gallons in 2008. Since 2008, the number of gallons has remained relatively steady, however the total for 2023 was comparatively lower at 1,178.4 million gallons. The share of gasoline that was reported as an ethanol blend was 71.1 percent in calendar year 2007, but has since remained over 80 percent, reaching a high of 87.6 percent in calendar year 2023.

E85 sales were 4.2 million gallons in calendar year 2007 and showed a significant increase to 7.7 million gallons in 2008. E85 sales peaked in 2017 at 20.6 million gallons, and have decreased slightly since then, ending at 19.0 million gallons sold in calendar year 2023.

E15 sales, which include blends from E15 through E69, were first reported in calendar year 2011. In that year 0.1 million gallons were sold. Reported E15 sales have increased in every calendar year since, with 179.5 million gallons being reported in 2023. The increase that has been realized has been fairly dramatic when looking at the year-over-year increases, with the largest percentage increases occurring in 2012, 2015 and 2017.

Biodiesel sales, including blends ranging from B1 to B100, were 160.8 million gallons in calendar year 2007. Overall biodiesel sales have essentially tripled from the initial total reported in 2007 until 2023. Additionally, the biodiesel share of total diesel sales has experienced a noteworthy increase from 22.6 percent in 2007 to the 58.7 percent reported in 2023.

B. E15 Plus Gasoline Promotion Tax Credit Claims

The E15 Plus Gasoline Promotion Tax Credit was available on gallons sold on or after July 1, 2011. However, a few taxpayers claimed the E15 tax credit in tax year 2010 because they are fiscal year filers (see Table 13). After tax year 2010, the number of total claims increased steadily to 177 claims in tax year 2017. The next few years the number of claims trailed off slightly until 2021, when there was an increase to 166 claims. The following year, tax year 2022, had the highest number of claims at 212. Additionally, since tax year 2010 the total dollar amount of claims and average dollar amount of claims has steadily rose, until tax year 2022.

C. E85 Gasoline Promotion Tax Credit Claims

In tax year 2006, the number of E85 claimants to this tax credit started at 107, with pass-through taxpayers accounting for the largest group (see Table 14). The number of claimants increased to 315 in tax year 2017, with pass-through entities remaining the largest claimant group. Since 2017 the number of claimants has steadily decreased, with only 185 in tax year 2022. The total claim amount started at $0.5 million in 2006, climbing to just over $3.0 million in 2021. The average claim amount has for the most part increased every year, with a few exceptions. In tax year 2022 the average claim amount was just over $17,000.

D. Biodiesel Blended Fuel Tax Credit Claims

In tax year 2006, the number of the Biodiesel Blended Fuel Tax Credit claimants included 27 corporations, 6 individuals, and 43 pass-through taxpayers (see Table 15). The total number of claims increased from the 76 reported in the initial year, to a high of 451 claims in 2017. The sizable increase from 2011 to 2012 in the number of claims and the amount claimed was likely driven by the elimination of the 50 percent biodiesel sales requirement effective in 2012. Recall that in tax years 2006 through 2008, to be eligible for the credit, 50 percent of diesel sales must have been biodiesel sales company-wide; for tax years 2009 through 2011, the requirement applied by retail location. After 2017 the number of claims has slowly receded and stood at 325 in tax year 2022. For the tax years presented, the average claim amount was $112,666 for corporations, $15,892 for individuals, and $47,806 for pass-through taxpayers.

E. Ethanol Promotion Tax Credit Claims

As a reminder, the Ethanol Promotion Tax Credit expired on January 1, 2021. The number of EPTC claimants was 84 in tax year 2008 for taxpayers filing a fiscal year return that included sales made during calendar year 2009 (see Table 16). The number increased dramatically to 991 in 2009, but slowly declined every year thereafter. As would be expected with this tax credit being expired, the 2022 tax year showed no claims.

VI. Economic Analysis

A. Impact of Electric Vehicles on Biofuel Sales

A relevant question to ask in this study is what impact electric vehicles (EVs) will have on ethanol and biodiesel sales in the future. Based on information from the Iowa Department of Transportation, Iowa had 15,159 electric and plug-in hybrid electric vehicles registered in calendar year 2023 (see Table 17). This is up from the 10,712 vehicles reported one year prior, which results in an annual growth rate of approximately 41 percent. For comparison purposes, flex fuel vehicle registrations in Iowa decreased from 569,078 vehicles in 2022 to 566,078 vehicles in 2023, resulting in negative annual growth rate of 0.6 percent (see Table 18). As a reminder flex fuel vehicles are those that are capable of using E85 fuel. Additionally, the number of EV charging stations is on the rise in Iowa. Basic data on the number of EV charging stations is available from the U.S. Department of Energy, Alternative Fuels Data Center and states that Iowa had 134 charging locations with 341 charging ports as of January 1, 2020. The number of locations has increased to 350 charging locations and 804 charging ports as of January 1, 2024.

Electric and plug-in hybrid vehicle registrations are also increasing at the national level. Based on information for calendar years 2016 through 2022 from the U.S. Department of Energy Alternative Fuel Data Center, there were a total of 3,454,700 electric and plug-in hybrid electric vehicles registered in calendar year 2022. This was up from 2,241,200 vehicles in 2021, which is an increase of 54.1 percent (see Table 19). However, it is important to note that electric and plug-in hybrid electric vehicles still represent a small fraction of total vehicles registered in both Iowa and the United States. In 2023, EVs accounted for just 0.3 percent of the total vehicles registered in Iowa. At the national level, EVs constitute a slightly larger percentage at 1.2 percent in calendar year 2022. Additionally, electric vehicle technology has yet to be as prevalent in commercial and agricultural vehicles, such as semis, tractors and heavy equipment.

When looking at the future of EV ownership, there are a number of studies that suggest ownership of EVs will continue to grow in relationship to the total number of vehicles in the United States. These studies point to a number of factors that must be considered when projecting EV sales and ownership, including but not limited to: role of subsidies, manufacturers portfolio of light trucks versus sedans, cost of ownership, purchase price relative to gas-powered cars and technology related to EV range. Two studies that presented forecasts on electric vehicle sales and market share will be briefly summarized below.

The first study was conducted in 2009 and is titled Electric Vehicles in the United States: a new model with forecasts to 2030 (Becker, Sidhu, & Tenderich, 2009). The study suggests a baseline forecast for EVs to account for 64percent of U.S. light-vehicle sales by 2030 and comprise 24percent of the U.S. light-vehicle

market. In the most aggressive scenario presented in the study, EVs would account for 86% of U.S. light-vehicle sales by 2030 and achieve a 46% market share.

In a more recent study from 2022 entitled Future Paths of Electric Vehicle Adoption in the United States: Predictable Determinants, Obstacles, and Opportunities, the authors present three separate scenarios (Archsmith, Muehlegger, & Rapson, 2022). Their low-growth scenario leads to a nationwide EV market share of 10 percent in 2035. The medium and high-growth scenarios lead to EV market shares of 17 percent and 42 percent respectively. The authors also point out there are some geographic considerations in the study. For example, in the medium-growth scenario, EVs have a 2035 market share of 26 percent in California and New Jersey and 14 to 16 percent market share in states such as Mississippi, Arkansas and Louisiana.

As to be expected, applying different assumptions can lead to a wide range of values for the various EV sales and market share projections. Due to this fact determining electric vehicles future impact on biofuel sales is nearly impossible to predict with any degree of certainty. However, it is prudent to assume that EV sales and ownership will continue to grow in the United States in the upcoming years. The growth in EV ownership will undoubtedly result in fewer vehicles being powered by “traditional” fuels, which would include ethanol and biodiesel, potentially resulting in lower demand in the upcoming years.

B. Effect of Biofuels on the Agriculture Industry

Another consideration to explore in this study is the impact that increased biofuel production has on the agriculture industry. More specifically, if a relationship exists between biofuel usage and the prices of commodities, food and land. These topics will be discussed in further detail below.

In general, there is literature that has studied the bond between biofuels and commodity prices. One such study states the rise in biofuel production has caused a positive demand shock on agricultural markets, strengthening the linkages between energy and agricultural prices (Paris, 2018). The same study provides insight into the surge of production of biofuels since the turn of the century. Worldwide, ethanol daily production rose from 300 to 1,615 thousand barrels a day during a period from 2000 – 2014. The daily production of biodiesel increased from 15 to 528 thousand barrels during that same period. This increase in production has also led to a larger percentage of corn and soybeans grown that go towards biofuel production. To illustrate this point, between 2000 and 2018, the percentage of U.S. corn used for ethanol rose from 6.5 percent to 37.6 percent (Dumortier, Carriquiry, & Elobeid, 2021). Paris (2018) states that there is clear evidence that this growing biofuel production has contributed to agricultural price increases in recent years. Another study echoes this sentiment, stating the increased biofuel production has attracted attention from researchers

and policy makers due to the economic and environmental consequences in terms of higher crop prices (Dumortier, Carriquiry, & Elobeid, 2021).

To further explore this idea, the relationship between biofuels and commodity prices in Iowa was examined. Quarterly data was obtained for the prices of Iowa corn and soybeans, along with national prices for gasoline, ethanol, diesel and biodiesel (see Figures 1 and 2). It is important to note that in these two figures fuel volume data is measured in gasoline gallon equivalents (GGEs). GGE is the amount of an alternative fuel it takes to equal the energy content of one liquid gallon of gasoline. As a reminder, corn is the primary feedstock for ethanol production in the United States and soybean oil is the leading feedstock for U.S. biodiesel production. Based solely on a visual observation of the two figures, it would appear that the price of gasoline and E85 track each other very closely. The same could be said for the price of diesel, B20 and B99/B100.

When comparing the price of E85 with corn and the price of biodiesel with soybeans, the connection is not as obvious. Due to this the correlation coefficient was calculated in order to determine if a relationship exists between the variables. The correlation coefficient has values that range between +1.0 and -1.0. A value of +1.0 represents perfect positive correlation, i.e. as variable A increases, variable B increases. A value of -1.0 represents perfect negative correlation, i.e. as variable A increases, variable B decreases. The correlation coefficient between Iowa corn and E85 is 0.80, which is generally accepted to represent that the two variables are highly correlated (see Table 20). The correlation coefficient between Iowa soybeans and B20 biodiesel is 0.81. Similarly, the correlation between Iowa soybeans and B99/B100 was found to be 0.78. As mentioned previously, these results suggest that there is a high correlation between the variables. Furthermore, while not a guaranty, it could be assumed that an increase in the demand for biofuels could be associated with an increase in prices of corn and soybeans in Iowa, all other factors being held constant.

It is believed the additional demand for biofuel feedstock not only has an impact on crop prices, but also influences food prices. The principal concept is there is a somewhat limited amount of suitable land and many types of crops, produce and other vegetation compete for this finite space. Some research suggests that biofuel technology is land intensive and will put pressure on existing use of land, including food production (Rajagopal & Zilberman, 2008). For example, authors of a study estimated that an expansion in corn ethanol by one billion gallons in the U.S. increases food prices between 3 and 4 percent (Dumortier, Carriquiry, & Elobeid, 2021). However, not all literature supports the idea of increased food prices. A comparison of the average increase in consumer price index (CPI) showed no evidence of a higher rate of the CPI for food before and after the biofuel boom of 2000. The food price inflation rate from 1991 to 2000 (before the significant biofuel production era), and from 2000 to 2016 (after the biofuel boom)

were not significantly different from the 2.6 percent rate of average inflation for the entire range (Shrestha, Staab, & Diffield, 2019).

Additionally, it appears there are influences on agricultural land values that come along with added demand for biofuel feedstock. Rajagopal & Zilberman (2008) address land values in their study and state that one must consider the effects of large-scale production of biofuels such as rising land and input costs. It would be expected when demand for certain crops or biofuel feedstock increases, that the land needed to produce those items would increase in value. Dumortier, Carriquiry & Elobeid (2021) support this idea and state higher commodity prices lead to an increase in land values, especially in the U.S. Midwest. Another study provides further validation asserting the incentive to increase agricultural production will tend to increase land prices and farm output (Banse, van Meijl, & Woltjer, 2008).

VII. Conclusion

This evaluation study provides detailed information about the Iowa Biofuel Tax Credits, along with providing updates to the program that have occurred since the evaluation study conducted in 2019. As previously mentioned, the motivation of the tax credits is to encourage ethanol and biodiesel consumption in the state. Continued investment in biofuel promotion and technologies has the potential to stimulate lasting biofuel usage and benefit the agricultural industry in Iowa. However, the level at which Iowans adopt electric vehicle technology in the future will have an impact on the demand for biofuels and the effect of the biofuel tax credits. The E15 Plus Gasoline Promotion Tax Credit is set to be repealed in January 2026, while the E85 Gasoline Promotion Tax Credit and Biodiesel Blended Fuel Tax Credit are set to expire in January 2028. This will allow for more time to pass, which will make more data available on the effectiveness and interest in these tax credits.

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Iowa's Biofuel Tax Credits

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Tables and Figures

Table 1. E15 Plus Gasoline Promotion Tax Credit Rate Schedule

Calendar Years of Sales	Date of Sales		
	January 1-May 31	June 1-September 15	September 16-December 31
July 1, 2011-December 31, 2013	$0.03	$0.03	$0.03
2014-2022	$0.03	$0.10	$0.03
2023 and After	$0.09	$0.09	$0.09

Source: Iowa Code 422.11Y and 422.33(11D)

Table 2. E85 Gasoline Promotion Tax Credit Rate Schedule

Calendar Year of Sales	Credit Per Gallon Sold
2006-2008	$0.25
2009-2010	$0.20
2011	$0.10
2012 and After	$0.16

Source: Iowa Code 422.11O and 422.33(11B)

Table 3. Biodiesel Blended Fuel Tax Credit Rate Schedule

Calendar Year of Sales	Calculation: Designed Rate Per Gallon	X	Calculation: Number of Gallons of Biodiesel Blended Fuel Gallons Sold	Eligibility	Basis of Calculation
2006-2008	$0.03		B2 or higher	50 percent biodiesel sales requirement	Company-wide
2009-2011	$0.03		B2 or higher	50 percent biodiesel sales requirement	Retail station
2012	$0.02, $0.045		B2-B4, B5 or higher	B2 or higher	Company-wide
2013-2017	$0.045		B5 or higher	B5 or higher	Company-wide
2018-2022	$0.035, $0.055		B5-B10, B11 or higher	B5 or higher	Company-wide
2023 and After	$0.05, $0.07, $0.10		B11-B19, B20-B29, B30 or higher	B11 or higher	Company-wide

Source: Iowa Code 422.11P and 422.33(11C)

Table 4. Ethanol Promotion Tax Credit Rate Schedule

Calendar Year of Sales	Credit Rate Per Gallon of Pure Ethanol Sold			Biofuel Distribution Percentage					
				Large Retailers			Small Retailers		
				Retail Dealers Selling More Than 200,000 Gallons Per Year			Retail Dealers Selling 200,000 or Fewer Gallons Per Year		
	Rate 1	Rate 2	Rate 3	No Less Than Threshold	Below Threshold by 0.01% - 2.00%	Below Threshold by 2.01% - 4.00%	No Less Than Threshold	Below Threshold by 0.01% - 2.00%	Below Threshold by 2.01% - 4.00%
2009	$0.065	$0.045	$0.025	10%	8%	6%	6%	4%	2%
2010	$0.065	$0.045	$0.025	11%	9%	7%	6%	4%	2%
2011	$0.08	$0.06	$0.025	12%	10%	8%	10%	8%	6%
2012	$0.08	$0.06	$0.04	13%	11%	9%	11%	9%	7%
2013	$0.08	$0.06	$0.04	14%	12%	10%	12%	10%	8%
2014	$0.08	$0.06	$0.04	15%	13%	11%	13%	11%	9%
2015	$0.08	$0.06	$0.04	17%	15%	13%	14%	12%	10%
2016	$0.08	$0.06	$0.04	19%	17%	15%	15%	13%	11%
2017	$0.08	$0.06	$0.04	21%	19%	17%	17%	15%	13%
2018	$0.08	$0.06	$0.04	23%	21%	19%	19%	17%	15%
2019	$0.08	$0.06	$0.04	25%	23%	21%	21%	19%	17%
2020	$0.08	$0.06	$0.04	25%	23%	21%	25%	23%	21%

Source: Iowa Code 422.11N and 422.33(11A).

Table 5. Comparison of Tax Credits for Biofuel Sales by Retailers and Blenders

State	Tax Credit Name	Tax Type	Current Tax Credit Rate	Eligible Biofuels	Tax Credit Cap	Refundable	Carry Forward	Dates Applicable
Iowa	E15 Plus Gasoline Promotion Tax Credit	Income Tax	$0.09 per gallon	E15	No	Yes	No	January 1, 2006 through December 31, 2025
	E85 Gasoline Promotion Tax Credit		$0.16 per gallon	E85	No	Yes	No	January 1, 2006 through December 31, 2027
	Biodiesel Blended Fuel Tax Credit		$0.05 per gallon of B11-B19; $0.07 per gallon of B20-B29; $0.10 per gallon of B30 or higher	B11 or higher	No	Yes	No	January 1, 2006 through December 31, 2027
Kansas	Renewable Fuel Retailer Tax Incentive	Sales Tax	$0.065 per gallon of renewable fuel sold, $0.03 per gallon of biodiesel sold, if the threshold percent is met.	Renewable fuels, including biodiesel	No	No	No	January 1, 2009 through January 1, 2026. (Unfunded from 2013 to date)
Missouri	Biodiesel and Ethanol Retailer Tax Credit	Income Tax	$0.02 per gallon of B5-B10; $0.05 per gallon of B11-B20; $0.05 per gallon of E15-E85	B5 to B20 and E15 to E85	Yes	No	Yes	January 1, 2023 through January 1, 2029
Montana	Biodiesel Tax Refund	Special Fuel Tax	$0.01 per gallon refund of taxes paid by retailers on biodiesel produced entirely from Montana components.	Biodiesel produced entirely from Montana components	No	No	No	Not Available
Nebraska	Biodiesel Retailer Tax Credit	Income Tax	Retail dealers that sell 100% biodiesel at a service station are eligible for a tax credit of $0.14 per gallon.	B100	Yes	Yes	Yes	January 1, 2024 through December 31, 2029
North Dakota	Biodiesel and Renewable Diesel Blender Tax Credit	Income Tax	$0.05 per gallon for fuel containing at least 5% biodiesel or renewable diesel.	B5 or higher	No	No	5 years	Not Available
Oklahoma	Ethanol Fuel Retailer Tax Credit	Motor Fuel Tax	$0.016 for each gallon of ethanol blend of gasoline containing up to 15% ethanol by volume (E15) sold if retailer provides a price reduction of equal amount.	Ethanol up to E15	No	No	No	January 1, 2006 to present
South Dakota	Ethanol Blend Tax Refund	Motor Fuel Tax	$0.05 for each gallon of E15.	E15	Yes	No	No	January 1, 2025 to December 31, 2029

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
Department of Revenue website for each state

Table 6. State Comparison of Other Incentive Programs for Biofuel Sales

State	Incentive for Sales	Description
Alaska	Ethanol Fuel Blend Tax Rate Reduction	The tax rate on fuel containing ethanol is $0.06 per gallon less than the tax rate on other motor fuels in certain geographic areas. This reduced rate is in effect during months ethanol fuel blends must be sold, transferred or used to operate motor vehicles to reduce carbon monoxide emissions and attain federal or state air quality standards.
Colorado	Special Fuels Tax Rate Reduction	The special fuels (including diesel fuel, kerosene and ethanol blends of more than 10 percent ethanol, when used for the generation of power to propel a motor vehicle on highways) tax is assessed at a rate of $0.205 per gallon, compared to $0.22 tax per gallon for gasoline and E10
Indiana	Special Fuel Tax Exemption	The sale of biodiesel, blended biodiesel and natural gas used to power an internal combustion engine or motor is exempt from state gross retail tax.
	Biodiesel Blend Tax Exemption	Biodiesel blends of at least 20% (B20) that are used for personal, noncommercial use by the individual that produced the biodiesel portion of the fuel are exempt from the special fuel license tax. The maximum number of gallons of fuel for which the exemption may be claimed is based on the percentage volume of biodiesel in each gallon used.
Iowa	Motor Fuel Tax Rate Reduction	Beginning July 1, 2024, the ethanol blended gasoline E-15 or higher tax rate is $0.045 per gallon lower than gasoline ($0.255 compared to $0.30); the biodiesel B20 or higher tax rate is $0.03 per gallon lower than diesel ($0.295 compared to $0.325).
Kansas	E85 Tax Rate Reduction	The minimum motor vehicle fuel tax rate on E85 is $0.17 per gallon, compared to the conventional motor fuel tax rate of $0.24 per gallon.
Maine	Excise Tax Rate Reduction	Biodiesel blends of 90-100% have a tax rate of $0.287 per gallon, compared to $0.312 per gallon for diesel.
Montana	Biodiesel Tax Refund	A licensed distributor who pays the special fuel tax on biodiesel may claim a refund equal to $0.02 per gallon of biodiesel sold during the previous quarter if the biodiesel is made entirely from components produced in Montana.
Nevada	Alternative Fuel Tax Reduction	Special fuels, including biodiesel, biodiesel blends, biomass-based diesel, biomass-based diesel blends and liquefied natural gas (LNG), have a reduced tax rate of $0.27 per gallon. Liquefied petroleum gas (LPG or propane) and compressed natural gas (CNG) are taxed at a rate of $0.064 and $0.21 per gallon, respectively.

Table 6. State Comparison of Other Incentive Programs for Biofuel Sales (continued)

State	Incentive for Sales	Description
Nebraska	Ethanol and Biodiesel Tax Exemption	Motor fuels sold to an ethanol or biodiesel production facility and motor fuels manufactured at and sold from an ethanol or biodiesel facility are exempt from certain motor fuel tax laws enforced by the Motor Fuels Division of the Nebraska Department of Revenue.
New Mexico	Biodiesel Tax Deduction	Entities and individuals that receive or manufacture and deliver biodiesel within the state for blending or resale are eligible for a tax deduction for the fuel.
North Carolina	Alternative Fuel Tax Exemption	The retail sale, use, storage or consumption of alternative fuels is exempt from the state retail sales and use tax.
Rhode Island	Biodiesel Tax Exemption	Biodiesel is exempt from the $0.34 per gallon state motor fuel tax. Biodiesel may be blended with other fuel for use in motor vehicles, but only the biodiesel portion of the blended fuel is exempt.
South Dakota	Biodiesel Tax Reduction	The tax imposed on biodiesel or biodiesel blends shall be reduced by two cents per gallon in the quarter after biodiesel production facilities in South Dakota reach a name plate capacity of at least twenty million gallons per year and fully produce at least ten million gallons of biodiesel within one year. This tax reduction will be repealed in the quarter after thirty-five million gallons of taxed biodiesel and biodiesel blended fuel are sold.
Tennessee	Methanol Tax Exemption	Methanol sold for use as a motor fuel that is not blended with gasoline, diesel or other fuels or petroleum products is exempt from gasoline and diesel fuel use taxes.
Texas	Biofuel Blend Tax Exemption	The biodiesel, renewable diesel or ethanol portion of blended fuel containing taxable diesel is exempt from the diesel fuel tax.
Washington	Biodiesel Feedstock Tax Exemption	Waste vegetable oil, specifically cooking oil gathered from restaurants or commercial food processors, used by an individual to produce biodiesel for personal use is exempt from state sales and use taxes. The purchaser must provide the seller with an exemption certificate from the Washington Department of Revenue.
Wisconsin	Alternative Fuel Tax Exemption	A county, city, village, town or other political subdivision may not levy or collect any excise, license, privilege or occupational tax on motor vehicle fuel, alternative fuels or the purchase, sale, handling or consumption of motor vehicle fuel or alternative fuels.

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
Department of Revenue website for each state

Table 7. Iowa Fuel Excise Tax Rates at Rack Level, 1989 - July 2024

Effective Date of Change	Gasoline Tax Rate	Ethanol (E10 to E14) Tax Rate	E15+ Tax Rate	E85 Tax Rate	Diesel Tax Rate (including B0-B10)	B11+ Tax Rate	B20+ Tax Rate	Tax Rate Reduction for Ethanol	Tax Rate Reduction for B11 Plus
1989	$0.200	NA	NA	$0.19	$0.225	NA	NA	$0.010	NA
1-Jul-02	$0.201	NA	NA	$0.19	$0.225	NA	NA	$0.011	NA
1-Jul-03	$0.203	NA	NA	$0.19	$0.225	NA	NA	$0.013	NA
1-Jul-04	$0.205	NA	NA	$0.19	$0.225	NA	NA	$0.015	NA
1-Jul-05	$0.207	NA	NA	$0.19	$0.225	NA	NA	$0.017	NA
1-Jan-06	$0.207	NA	NA	$0.19	$0.225	NA	NA	$0.017	NA
1-Jul-06	$0.210	NA	NA	$0.19	$0.225	NA	NA	$0.020	NA
1-Jul-07	$0.207	NA	NA	$0.19	$0.225	NA	NA	$0.017	NA
1-Jul-08	$0.210	NA	NA	$0.19	$0.225	NA	NA	$0.020	NA
1-Mar-15	$0.310	NA	NA	$0.29	$0.325	NA	NA	$0.020	NA
1-Jul-15	$0.308	NA	NA	$0.293	$0.325	$0.295	NA	$0.015	$0.03
1-Jul-16	$0.307	NA	NA	$0.29	$0.325	$0.295	NA	$0.017	$0.03
1-Jul-17	$0.305	NA	NA	$0.29	$0.325	$0.295	NA	$0.015	$0.03
1-Jul-18	$0.307	NA	NA	$0.29	$0.325	$0.295	NA	$0.017	$0.03
1-Jul-19	$0.305	NA	NA	$0.29	$0.325	$0.295	NA	$0.015	$0.03
1-Jul-20	$0.300	$0.30	$0.24	NA	$0.325	$0.301	NA	$0.060	$0.02
1-Jul-21	$0.300	$0.30	$0.24	NA	$0.325	$0.304	NA	$0.060	$0.02
1-Jul-22	$0.300	$0.30	$0.24	NA	$0.325	$0.301	NA	$0.060	$0.02
1-Jul-23	$0.300	$0.30	$0.245	NA	$0.325	$0.298	NA	$0.055	$0.03
1-Jul-24	$0.300	$0.30	$0.255	NA	$0.325	NA	$0.295	$0.045	$0.03

Source: Iowa Department of Revenue, also see Iowa Code 452A.3.

Note: January 1, 2006 through July 1, 2007, the Fuel Tax Rate for E85 was 17 cents per gallon.

Note: The Ethanol Blended Gasoline E15 or Higher is a new fuel group effective 7/1/2020.

Note: The Ethanol Blended Gasoline E85 fuel group was not used for transactions after 7/1/2020. These fuels are now reported with the new E15 or Higher group.

Table 8. State Comparison of Tax Credits for Investments in Biofuel Infrastructure by Retailers

State	Tax Credit Name	Eligible Investments	Tax Type	Tax Credit Rate	Tax Credit Cap	Refundable	Carry Forward	Dates Applicable
Kansas	Alternative Fueling Infrastructure Tax Credit	Cost of installing alternative fueling infrastructure after January 1, 2009. Qualified property must be directly related to the delivery of alternative fuel into the fuel tank of a motor vehicle propelled by such fuel. The credit is only available to entities with corporate income tax liability.	Income Tax	40% of the total cost	Up to $100,000 per fueling station	No	4 years	2003 to present
North Dakota	Biodiesel and Renewable Diesel Sales Equipment Tax Credit	Costs to adapt or add equipment that enables a facility to sell at least 2% biodiesel blends.	Income tax	10% of direct costs	Limited to $50,000 cumulative credit claims per taxpayer for all taxable years, credit is allowed in each of five taxable years beginning the year biodiesel sales begin	No	5 years	January 1, 2005 to present
South Carolina	Biofuels Distribution Infrastructure Tax Credit	Qualified commercial facilities for distributing or dispensing biofuels. Qualifying fuels include blends containing at least 70% ethanol (E70) dispensed at the retail level for use in motor vehicles and pure ethanol or biodiesel fuel dispensed	Income tax	Up to 25% of the purchase, construction and installation costs for the fueling facility including pumps, storage tanks and related equipment taken in three equal annual installments	No	No	10 years	January 1, 2007 through January 1, 2026

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
Department of Revenue website for each state

Table 9. Federal and State Comparison of Other Incentives for Investment in Biofuel Infrastructure by Retailers

Government	Incentive for Investment	Type of Incentive	Description
Federal	Ethanol Infrastructure Grants and Guaranteed Loans	Grants and Loans	The Rural Energy for America Program (REAP) provides loans and grants to agricultural producers and rural small businesses to purchase renewable energy systems or make energy efficiency improvements. Eligible renewable energy systems include flexible fuel pumps or blender pumps, that dispense intermediate ethanol blends. This program's funding is subject to congressional appropriations.
	Higher Blends Infrastructure Incentive Program	Grants	The U.S. Department of Agriculture provides grants to expand the sales and use of renewable fuels. Eligible uses include the installation, retrofitting and upgrading of dispensers or pumps, infrastructure and related equipment at qualified facilities.
Iowa	Renewable Fuels Infrastructure Program	Grants	The program is designed to assist retail operators of motor fuel dispensing sites or fueling stations in the conversion of their equipment to allow the expanded use of renewable fuels in Iowa. The program utilizes grant incentives to encourage these upgrades. Reimbursement can be for 50% of the costs for specific components of a project with a three-year commitment required to sell certain renewable fuels. A five-year commitment to store and sell renewable fuels and install certain equipment can result in up to 70% reimbursement for specific equipment or installation costs. Heat biodiesel terminal equipment and/or infrastructure can receive funding for up to $100,000 per project.
Nebraska	AFV and Fueling Infrastructure Loans	Loans	Nebraska Energy Office administers the Dollar and Energy Saving Loan Program which makes low-cost loans available for the construction or purchase of a refueling station or equipment. The maximum loan amount is $500,000 per borrower and the interest rate is 5% or less.
Oregon	Alternative Fuel Loans	Loans	The Oregon Department of Energy administers the State Energy Loan Program (SELP) which offers low-interest loans for qualified projects. Eligible alternative fuel projects include fuel production facilities, dedicated feedstock production, fueling infrastructure and fleet vehicles.
Texas	Clean Vehicle and Infrastructure Grants	Grants	The Texas Commission on Environmental Quality administers the Emissions Reduction Incentive Grants Program and Rebate Grants Program as part of the Texas Emissions Reduction Plan (TERP). The ERIG Program provides grants for various types of clean air projects to improve air quality in the state's nonattainment areas and other affected counties. Eligible projects include those that involve replacement, retrofit, repower or lease or purchase of new heavy-duty vehicles; alternative fuel dispensing infrastructure; idle reduction and electrification infrastructure; and alternative fuel use.
Washington	Alternative Fueling Infrastructure Grant Program	Grants	The Washington State Department of Transportation offers competitive grants to strengthen and expand the West Coast Electric Highway network by deploying Level 2 and direct current fast charging electric vehicle chargers and hydrogen fueling infrastructure along highway corridors in Washington.

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
Iowa Economic Development Authority
Iowa Department of Agriculture & Land Stewardship
Department of Revenue website for each state

Table 10. Iowa Renewable Fuel Infrastructure Program Projects and Grants, Fiscal Years 2007 – 2024

Fiscal Year	Number of Projects						Total Amount of Grants					
	E15	E85	Biodiesel	Replace Pump	Bonus	**Total**	E15	E85	Biodiesel	Replace Pump	Bonus	**Total**
2007	0	35	53	0	0	**88**	$0	$654,159	$1,378,115	$0	$0	**$2,032,274**
2008	0	19	48	0	0	**67**	$0	$583,400	$1,297,400	$0	$0	**$1,880,800**
2009	0	31	73	1	5	**110**	$0	$1,294,600	$2,446,400	$26,300	$30,000	**$3,797,300**
2010	0	19	28	0	6	**53**	$0	$778,600	$1,037,400	$0	$36,000	**$1,852,000**
2011	0	32	25	1	8	**66**	$0	$1,500,500	$1,048,800	$22,300	$48,000	**$2,619,600**
2012	0	29	31	0	8	**68**	$0	$1,350,700	$1,371,850	$0	$48,000	**$2,770,550**
2013	0	16	23	0	4	**43**	$0	$791,391	$941,626	$0	$24,000	**$1,757,018**
2014	0	23	31	0	2	**56**	$0	$1,082,947	$1,152,156	$0	$12,000	**$2,247,102**
2015	0	11	22	0	3	**36**	$0	$518,272	$992,897	$0	$18,000	**$1,529,169**
2016	2	48	30	0	11	**91**	$100,000	$2,148,838	$1,506,770	$0	$66,000	**$3,821,608**
2017	3	30	37	0	7	**77**	$125,151	$1,473,027	$1,623,018	$0	$42,000	**$3,263,196**
2018	18	13	27	0	0	**58**	$644,226	$650,000	$1,399,070	$0	$0	**$2,693,296**
2019	19	4	12	0	5	**40**	$950,000	$200,000	$533,161	$0	$30,000	**$1,713,161**
2020	9	25	51	0	0	**85**	$417,228	$1,224,945	$2,357,902	$0	$0	**$4,000,075**
2021	18	0	19	0	4	**41**	$875,138	$0	$936,224	$0	$24,000	**$1,835,362**
2022	36	6	40	0	4	**86**	$1,721,918	$300,000	$1,869,617	$0	$24,000	**$3,915,535**
2023	72	6	38	0	7	**123**	$3,518,020	$270,000	$1,827,482	$0	$42,000	**$5,657,502**
2024	76	3	47	0	0	**126**	$3,743,909	$103,250	$2,267,613	$0	$0	**$6,114,772**
Total	**253**	**350**	**635**	**2**	**74**	**1,314**	**$12,095,589**	**$14,924,629**	**$25,987,501**	**$48,600**	**$444,000**	**$53,500,320**
Share of Total	19.3%	26.6%	48.3%	0.2%	5.6%	100.0%	22.6%	27.9%	48.6%	0.1%	0.8%	100.0%

Source: Iowa Department of Agriculture & Land Stewardship

Table 11. Federal and State Biofuels Mandates or Goals

Government	Mandate or Goal	Biofuel Type	Description
Federal	Mandate	Renewable fuel	The United States Environmental Protection Agency's (EPA) current volume targets are 21.54 billion gallons of renewable fuel in 2024 and 22.33 billion gallons in 2025.
Hawaii	Mandate	Alternative fuels	Alternative fuels will provide 20% of highway fuel demand by 2020 and 30% by 2030. For the purposes of the alternative fuels standard, cellulosic ethanol is equivalent to 2.5 gallons of non-cellulosic ethanol.
Louisiana	Mandate	Ethanol and biodiesel	Within six months following the point at which cumulative monthly production of denatured ethanol produced in the state equals or exceeds an annual production volume of at least 50 million gallons, 2% of the total gasoline sold by volume in the state must be denatured ethanol produced from domestically grown feedstock or other biomass materials. Within six months following the point at which cumulative monthly production of biodiesel produced in the state equals or exceeds an annual production volume of 10 million gallons, 2% of the total diesel sold by volume in the state must be biodiesel produced from domestically grown feedstock.
Minnesota	Mandate	E10	All gasoline sold or offered for sale in Minnesota must contain at least: 10% corn-based ethanol by volume or the maximum percent by volume of corn-based ethanol authorized in a waiver issued by the U.S. EPA, whichever is greater; or 10% other biofuel authorized in an EPA waiver by volume or a biofuel formulation registered by EPA under Title 42 of the Code of Federal Regulations, section 7545. Any biofuel may be used to meet the standards above, but corn-based ethanol may comprise no less than the following percentages of the total biofuel use in the state by the date specified: by January 1, 2020, 60%; by January 1, 2025, no minimum.
		B5, B10, B20	During the months of April through September, diesel fuel sold in the state must contain at least 20% biodiesel (B20). Diesel fuel sold during the remainder of the year must contain at least 5% biodiesel (B5). From April 1 to April 14, diesel fuel sold in the state can be a lower blend than B20, but not less than 10% biodiesel (B10).
Missouri	Mandate	E10	All gasoline sold or offered for sale at retail stations within the state must contain 10% ethanol. This requirement is waived only if a distributor is unable to purchase ethanol or ethanol-blended gasoline at the same or lower price as unblended gasoline. Premium gasoline is exempt from this requirement.
New Mexico	Mandate	B5	All diesel fuel sold for use in on-road motor vehicles to state agencies, political subdivisions of the state and public schools must contain at least 5% biodiesel (B5). All diesel fuel sold to consumers for use in on-road motor vehicles is mandated to contain at least B5. This biodiesel blend mandate is currently suspended.
Oregon	Mandate	E10, B2 or B5	All gasoline sold in the state must be blended with at least 10% ethanol (E10). Gasoline with an octane rating of 91 or above is exempt from this mandate, as is gasoline sold for use in certain non-road applications. Gasoline that contains at least 9.2% agriculturally derived ethanol that meets ASTM Standard D4806 complies with the mandate. For the purpose of the mandate, ethanol must meet ASTM Standard D4806. The governor may suspend the renewable fuels mandate for ethanol if the Oregon Department of Energy finds that a sufficient amount of ethanol is not available. All diesel fuel sold in the state must be blended with at least 5% biodiesel (B5). For the purpose of this mandate, biodiesel is defined as a motor vehicle fuel derived from vegetable oil, animal fat, or other non-petroleum resources, that is designated as B100 and complies with ASTM Standard D6751. Renewable diesel qualifies as a substitute for biodiesel in the blending requirement.

Table 11. Federal and State Biofuels Mandates or Goals (continued)

Government	Mandate or Goal	Biofuel Type	Description
Pennsylvania	Mandate	E10+, B5+, B10+,B20+	One year after in-state production has reached 350 million gallons of cellulosic ethanol and sustained this volume for three months, all gasoline sold in Pennsylvania must contain at least 10% cellulosic ethanol. All diesel fuel sold in Pennsylvania must contain at least 2% biodiesel (B2) one year after in-state production of biodiesel reaches 40 million gallons. The mandated biodiesel blend level will continue to increase according to the following schedule: -5% biodiesel (B5) one year after in-state production of biodiesel reaches and sustains 100 million gallons for three months; -10% biodiesel (B10) one year after in-state production of biodiesel reaches and sustains 200 million gallons for three months; and -20% biodiesel (B20) one year after in-state production of biodiesel reaches and sustains 400 million gallons for three months
Rhode Island	Goal	NA	The Petroleum Savings and Independence Advisory Commission (Commission) was established to provide recommendations and monitor programs designed to reduce the state's dependence on petroleum-based fuels in the transportation and heating sectors. Established targets may not provide less than a 30% overall reduction in petroleum consumption from 2007 levels by 2030 and a 50% overall reduction from 2007 levels by 2050.
Washington	Mandate	B2+	At least 2% of all diesel fuel sold in Washington must be biodiesel or renewable diesel. This requirement will increase to 5% 180 days after the Washington State Department of Agriculture (WSDA) determines that in-state feedstocks and oil-seed crushing capacity can meet a 3% requirement. Renewable diesel is defined as a diesel fuel substitute produced from non-petroleum renewable sources, including vegetable oils and animal fats, meets the federal registration requirements for fuels and fuel additives and ASTM specification D975. At least 2% of the total gasoline sold in the state must be denatured ethanol. The ethanol requirement increases if the Washington Department of Ecology determines that this increase will not jeopardize continued attainment of federal Clean Air Act standards, and WSDA determines that the state can economically support the production of higher ethanol blends
Wisconsin	Goal	Renewable fuel	The Wisconsin Legislature sets goals for minimum annual renewable fuel sales volumes based on annual renewable fuel volumes required under the federal Renewable Fuel Standard.
Fifteen States	Goal	Renewable sources	Agricultural products will provide 25% of the total energy consumed in the United States by the year 2025.

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
Department of Revenue website for each state
United States Environmental Protectin Agency

Table 12. Ethanol and Biodiesel Retail Sales in Iowa, Calendar Years 2007 to 2023

	Total Ethanol Sales (E10, E15, E20, E85, Other Ethanol)			Total E85 Sales			Total E15 or E20 Sales			Total Biodiesel Sales		
Calendar Year	Million Gallons	Year-over-Year Increase	Ethanol Share of Total Gasoline Sales	Million Gallons	Year-over-Year Increase	E85 Share of Total Gasoline Sales	Million Gallons	Year-over-Year Increase	E15 or E20 Share of Total Gasoline Sales	Million Gallons	Year-over-Year Increase	Biodiesel Share of Total Diesel Sales
2007	998.9	NA	71.1%	4.2	NA	0.3%	NA	NA	NA	160.8	NA	22.6%
2008	1,269.9	27.1%	82.3%	7.7	84.5%	0.5%	NA	NA	NA	226.8	41.1%	30.0%
2009	1,203.3	-5.2%	81.4%	5.9	-23.2%	0.4%	NA	NA	NA	175.7	-22.5%	31.9%
2010	1,289.7	7.2%	82.5%	10.0	70.0%	0.6%	NA	NA	NA	239.8	36.5%	32.4%
2011	1,187.6	-7.9%	82.1%	10.7	6.5%	0.7%	0.1	NA	NA	245.2	2.3%	33.7%
2012	1,199.2	1.0%	81.7%	9.0	-15.5%	0.6%	2.1	1884.0%	0.1%	285.8	16.6%	42.6%
2013	1,198.9	0.0%	82.2%	11.2	23.7%	0.8%	2.6	24.6%	0.2%	347.8	21.7%	49.2%
2014	1,285.7	7.2%	85.8%	12.1	8.3%	0.8%	4.0	51.2%	0.3%	354.8	2.0%	48.9%
2015	1,341.3	4.3%	85.9%	13.2	8.9%	0.8%	8.7	121.1%	0.6%	342.0	-3.6%	41.3%
2016	1,369.4	2.1%	86.2%	13.5	2.4%	0.8%	9.0	3.3%	0.6%	379.8	11.0%	45.1%
2017	1,364.3	-0.4%	87.2%	20.6	52.7%	1.3%	28.9	219.7%	1.8%	435.0	14.5%	51.9%
2018	1,356.7	-0.6%	87.0%	20.2	-2.0%	1.3%	36.5	26.2%	2.3%	458.9	5.5%	55.5%
2019	1,353.4	-0.2%	86.5%	19.0	-5.6%	1.2%	50.0	37.2%	3.2%	495.1	7.9%	59.1%
2020	1,141.1	-15.7%	85.1%	14.8	-22.0%	1.1%	61.7	23.4%	4.6%	493.7	-0.3%	60.7%
2021	1,233.7	8.1%	87.1%	19.3	29.7%	1.4%	87.9	42.4%	6.2%	454.6	-7.9%	59.2%
2022	1,114.0	-9.7%	87.3%	19.6	1.9%	1.5%	122.3	39.2%	9.6%	489.7	7.7%	56.9%
2023	1,178.4	5.8%	87.6%	19.0	-3.1%	1.4%	179.5	46.8%	13.3%	486.5	-0.6%	58.7%

Source: The Retailers Fuel Gallons Annual Reports

Table 13. Taxpayer Claims to E15 Plus Gasoline Promotion Tax Credit, Tax Years 2010 to 2022

	Number of Claims				Total Claims				Average Claims			
Tax Year	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total
2010	2	0	2	4	$1,217	$0	$275	$1,492	$609	$0	$138	$373
2011	10	0	18	28	$13,132	$0	$5,120	$18,252	$1,313	$0	$284	$652
2012	21	0	37	58	$27,000	$0	$6,580	$33,580	$1,286	$0	$178	$579
2013	30	0	52	82	$46,344	$0	$10,408	$56,752	$1,545	$0	$200	$692
2014	27	0	63	90	$71,086	$0	$22,134	$93,220	$2,633	$0	$351	$1,036
2015	31	0	61	92	$149,505	$0	$26,235	$175,740	$4,823	$0	$430	$1,910
2016	31	0	71	102	$205,996	$0	$219,756	$425,752	$6,645	$0	$3,095	$4,174
2017	26	48	103	177	$138,555	$446,045	$1,479,038	$2,063,638	$5,329	$9,293	$14,360	$11,659
2018	28	8	118	154	$205,875	$5,809	$1,905,902	$2,117,586	$7,353	$726	$16,152	$13,751
2019	29	9	110	148	$312,524	$18,218	$2,921,595	$3,252,337	$10,777	$2,024	$26,560	$21,975
2020	23	4	108	135	$461,434	$13,685	$3,615,495	$4,090,614	$20,062	$3,421	$33,477	$30,301
2021	20	9	137	166	$645,210	$18,024	$4,901,234	$5,564,468	$32,261	$2,003	$35,775	$33,521
2022	20	29	163	212	$1,409,135	$575,029	$1,883,047	$3,867,211	$70,457	$19,829	$11,552	$18,242
Total	298	107	1043	1,448	$3,687,013	$1,076,810	$16,996,819	$21,760,642	$12,373	$10,064	$16,296	$15,028

Source: Iowa Department of Revenue Tax Credit Claim Data

Note: Individual taxpayers include estate and fiduciary taxpayers

Table 14. Taxpayer Claims to E85 Gasoline Promotion Tax Credit, Tax Years 2006-2022

	Number of Claims				Total Claims				Average Claims			
Tax Year	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total
2006	24	7	76	107	$334,958	$5,510	$164,261	$504,729	$13,957	$787	$2,161	$4,717
2007	31	29	91	151	$600,878	$20,075	$355,006	$975,959	$19,383	$692	$3,901	$6,463
2008	38	25	142	205	$492,908	$21,798	$852,546	$1,367,252	$12,971	$872	$6,004	$6,670
2009	44	21	242	307	$485,269	$41,088	$790,368	$1,316,725	$11,029	$1,957	$3,266	$4,289
2010	41	11	191	243	$301,886	$24,681	$1,203,891	$1,530,458	$7,363	$2,244	$6,303	$6,298
2011	50	16	207	273	$381,088	$14,627	$734,273	$1,129,988	$7,622	$914	$3,547	$4,139
2012	50	13	194	257	$396,469	$10,649	$1,019,360	$1,426,478	$7,929	$819	$5,254	$5,550
2013	50	24	207	281	$643,554	$34,941	$1,220,222	$1,898,717	$12,871	$1,456	$5,895	$6,757
2014	46	30	200	276	$628,407	$58,303	$1,269,264	$1,955,974	$13,661	$1,943	$6,346	$7,087
2015	47	28	192	267	$789,019	$60,349	$1,330,985	$2,180,353	$16,788	$2,155	$6,932	$8,166
2016	48	66	200	314	$714,099	$92,041	$1,261,131	$2,067,271	$14,877	$1,395	$6,306	$6,584
2017	37	58	220	315	$648,105	$133,577	$1,906,343	$2,688,025	$17,516	$2,303	$8,665	$8,533
2018	36	15	246	297	$688,996	$27,732	$2,150,928	$2,867,656	$19,139	$1,849	$8,744	$9,655
2019	36	10	233	279	$797,094	$22,502	$2,003,071	$2,822,667	$22,142	$2,250	$8,597	$10,117
2020	32	12	204	248	$799,583	$23,879	$1,392,859	$2,216,321	$24,987	$1,990	$6,828	$8,937
2021	25	10	161	196	$921,888	$36,563	$2,058,399	$3,016,850	$36,876	$3,656	$12,785	$15,392
2022	18	16	151	185	$1,039,504	$52,668	$2,064,441	$3,156,613	$57,750	$3,292	$13,672	$17,063
Total	653	391	3,157	4,201	$10,663,705	$680,983	$21,777,348	$33,122,036	$16,330	$1,742	$6,898	$7,884

Source: Iowa Department of Revenue Corporate and Individual Tax Returns.

Note: Individual taxpayers include estate and fiduciary taxpayers

Table 15. Taxpayer Claims to Biodiesel Blended Fuel Tax Credit, Tax Years 2006-2022

	Number of Claims				Total Claims				Average Claims			
Tax Year	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total
2006	27	6	43	76	$1,282,814	$58,921	$1,301,735	$2,643,470	$47,512	$9,820	$30,273	$34,783
2007	20	54	95	169	$522,557	$373,068	$3,853,828	$4,749,453	$26,128	$6,909	$40,567	$28,103
2008	16	35	101	152	$347,454	$150,080	$4,168,153	$4,665,687	$21,716	$4,288	$41,269	$30,695
2009	16	22	126	164	$213,020	$164,509	$5,026,497	$5,404,026	$13,314	$7,478	$39,893	$32,951
2010	14	9	77	100	$411,345	$102,649	$5,188,478	$5,702,472	$29,382	$11,405	$67,383	$57,025
2011	14	12	131	157	$482,895	$76,683	$6,448,337	$7,007,915	$34,493	$6,390	$49,224	$44,636
2012	26	13	222	261	$1,526,476	$110,104	$11,390,022	$13,026,602	$58,711	$8,470	$51,306	$49,910
2013	35	18	230	283	$3,151,067	$94,993	$12,920,590	$16,166,650	$90,030	$5,277	$56,176	$57,126
2014	37	38	260	335	$2,817,563	$240,233	$12,589,077	$15,646,873	$76,150	$6,322	$48,420	$46,707
2015	42	35	275	352	$2,871,754	$146,101	$13,558,865	$16,576,720	$68,375	$4,174	$49,305	$47,093
2016	41	72	305	418	$2,946,859	$401,985	$13,291,849	$16,640,693	$71,875	$5,583	$43,580	$39,810
2017	35	68	348	451	$3,448,447	$1,020,987	$14,997,231	$19,466,665	$98,527	$15,015	$43,095	$43,163
2018	32	25	278	335	$5,078,248	$199,403	$15,249,544	$20,527,195	$158,695	$7,976	$54,854	$61,275
2019	33	14	302	349	$7,401,473	$205,852	$15,743,068	$23,350,393	$224,287	$14,704	$52,129	$66,907
2020	29	16	284	329	$7,687,481	$189,448	$15,725,667	$23,602,596	$265,086	$11,841	$55,372	$71,740
2021	32	10	288	330	$7,248,109	$273,422	$14,444,740	$21,966,271	$226,503	$27,342	$50,155	$66,564
2022	22	45	258	325	$5,628,574	$4,010,792	$7,303,268	$16,942,634	$255,844	$89,129	$28,307	$52,131
Total	**471**	**492**	**3,623**	**4,586**	**$53,066,136**	**$7,819,230**	**$173,200,949**	**$234,086,315**	**$112,667**	**$15,893**	**$47,806**	**$51,044**

Source: Iowa Department of Revenue Corporation and Individual Tax Returns.

Note: Individual taxpayers include estate and fiduciary taxpayers

Table 16. Taxpayer Claims to Ethanol Promotion Tax Credit, Tax Years 2008-2022

Tax Year	Number of Claims				Total EPTC Claims				Average EPTC Claims			
	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total	Corporation	Individual	Pass-Through	Total
2008	69	3	12	84	$1,045,613	$9,465	$56,278	$1,111,356	$15,154	$3,155	$4,690	$13,230
2009	128	125	738	991	$2,551,173	$175,242	$1,956,452	$4,682,867	$19,931	$1,402	$2,651	$4,725
2010	127	133	667	927	$2,019,846	$118,200	$1,696,016	$3,834,062	$15,904	$889	$2,543	$4,136
2011	105	84	530	719	$1,505,285	$67,108	$1,759,735	$3,332,128	$14,336	$799	$3,320	$4,634
2012	72	48	407	527	$677,303	$30,013	$1,377,096	$2,084,412	$9,407	$625	$3,384	$3,955
2013	63	50	342	455	$707,672	$25,006	$1,590,881	$2,323,559	$11,233	$500	$4,652	$5,107
2014	51	24	290	365	$583,126	$8,261	$1,249,625	$1,841,012	$11,434	$344	$4,309	$5,044
2015	38	26	288	352	$329,956	$6,430	$1,102,779	$1,439,165	$8,683	$247	$3,829	$4,089
2016	23	8	230	261	$267,907	$1,545	$317,341	$586,793	$11,648	$193	$1,380	$2,248
2017	16	10	242	268	$367,902	$1,713	$357,747	$727,362	$22,994	$171	$1,478	$2,714
2018	11	1	206	218	$236,715	$443	$319,126	$556,284	$21,520	$443	$1,549	$2,552
2019	12	4	154	170	$201,061	$642	$327,414	$529,117	$16,755	$161	$2,126	$3,112
2020	6	4	134	144	$76,217	$2,831	$281,863	$360,911	$12,703	$708	$2,103	$2,506
2021	0	1	7	8	$0	$1,560	$101,794	$103,354	N/A	$1,560	$14,542	$12,919
2022	0	0	0	0	$0	$0	$0	$0	N/A	N/A	N/A	N/A
Total	721	521	4,247	5,489	$10,569,776	$448,459	$12,494,147	$23,512,382	$14,660	$861	$2,942	$4,284

Source: Iowa Department of Revenue Corporation and Individual Tax Returns

Note: Individual taxpayers include estate and fiduciary taxpayers

Table 17. Number of Electric and Plug-in Hybrid Electric Vehicles Registered in Iowa, Calendar Years 2020-2023

Calendar Year	Electric Vehicles (EV)	Plug-in Hybrid Electric Vehicles (PHEV)	Total EV and PHEV	Total EV and PHEV Annual Growth Rate	Total Vehicles	Percentage of EV and PHEV of Total Vehicles
2020	2,518	2,654	5,172	NA	4,549,289	0.1%
2021	4,264	4,106	8,370	61.8%	4,590,386	0.2%
2022	5,987	4,725	10,712	28.0%	4,596,501	0.2%
2023	8,772	6,387	15,159	41.5%	4,612,891	0.3%

Source:
Electric Vehicle Supplemental Fee Reports, Iowa Department of Transportation
Vehicle Registrations by Year, Iowa Department of Transportation

Table 18. Number of Flexible Fuel Vehicles Registered in Iowa, Calendar Years 2010-2023

Calendar Year	Passenger FFVs	Light Truck FFVs	Total FFVs	Total FFVs Annual Growth Rate	Total Vehicles	Percentage of FFVs of Total Vehicles
2010	94,759	44,043	138,802	NA	4,141,397	3.4%
2011	109,446	59,353	168,799	21.6%	4,176,857	4.0%
2012	122,442	75,900	198,348	17.5%	4,203,979	4.7%
2013	150,346	91,708	242,054	22.0%	4,250,858	5.7%
2014	176,774	106,075	282,849	16.9%	4,282,200	6.6%
2015	202,176	112,397	314,573	11.2%	4,341,801	7.2%
2016	224,535	117,258	341,793	20.8%	4,408,540	7.8%
2017	243,938	121,127	365,065	6.8%	4,462,565	8.2%
2018	259,078	124,404	383,482	5.0%	4,517,539	8.5%
2019	239,292	108,474	347,766	-9.3%	4,531,728	7.7%
2020	356,922	202,371	559,293	60.8%	4,549,289	12.3%
2021	362,256	206,436	568,692	1.7%	4,590,386	12.4%
2022	361,612	208,125	569,737	0.2%	4,596,501	12.4%
2023	359,434	206,644	566,078	-0.6%	4,612,891	12.3%

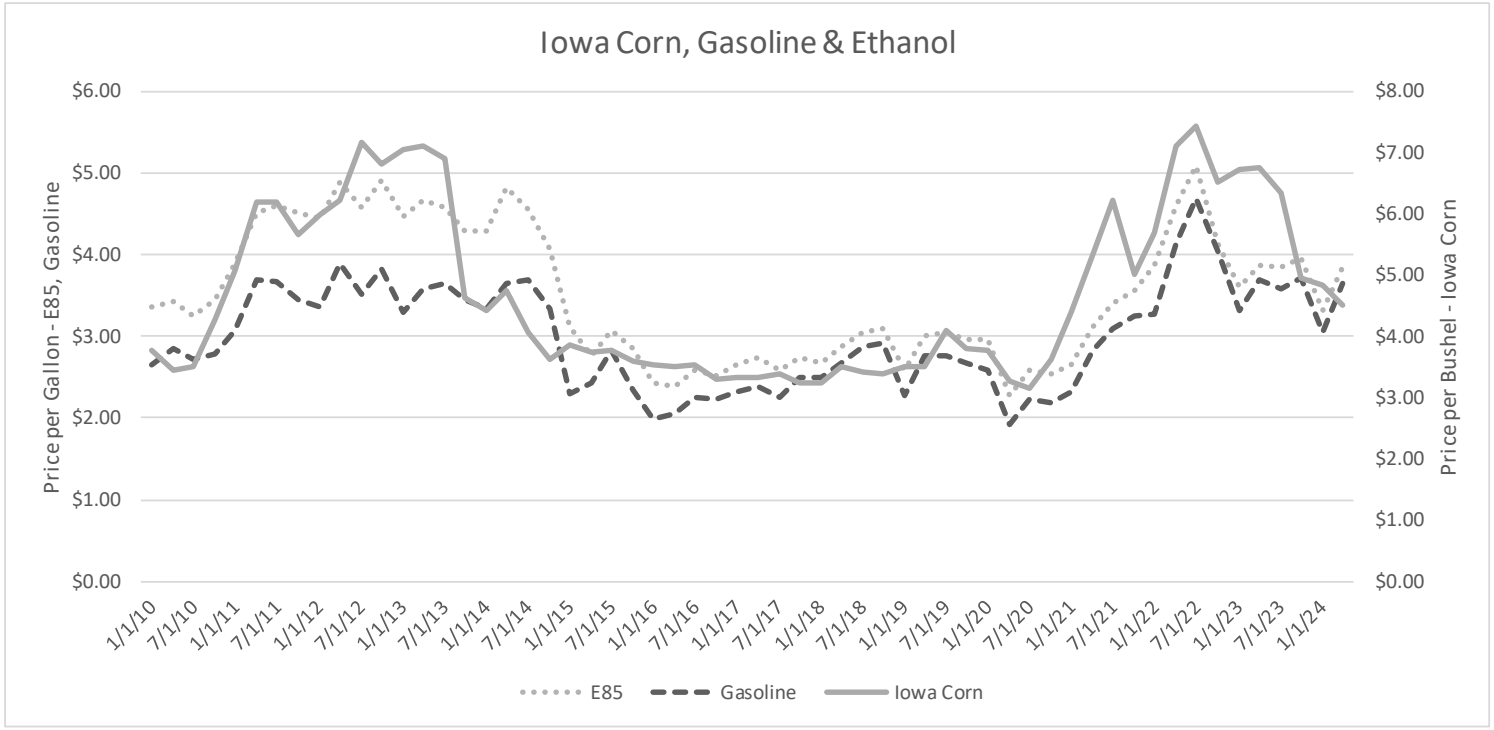
Source:
Flex Fuel Vehicles - Registrations by Year, Iowa Department of Transportation
Vehicle Registrations by Year, Iowa Department of Transportation

Table 19. Number of Electric and Plug-in Hybrid Electric Vehicles Registered in United States, Calendar Years 2016-2022

Calendar Year	Electric Vehicles (EV)	Plug-in Hybrid Electric Vehicles (PHEV)	Total EV and PHEV	Total EV and PHEV Annual Growth Rate	Total Vehicles	Percentage of EV and PHEV of Total Vehicles
2016	280,300	254,000	534,300	NA	262,727,300	0.2%
2017	377,100	344,600	721,700	35.1%	268,353,500	0.3%
2018	572,600	461,300	1,033,900	43.3%	272,206,100	0.4%
2019	783,600	536,600	1,320,200	27.7%	276,458,900	0.5%
2020	1,018,900	594,400	1,613,300	22.2%	278,299,200	0.6%
2021	1,454,400	786,800	2,241,200	38.9%	280,882,200	0.8%
2022	2,442,300	1,012,400	3,454,700	54.1%	283,509,000	1.2%

Source: U.S. Department of Energy, Alternative Fuels Data Center

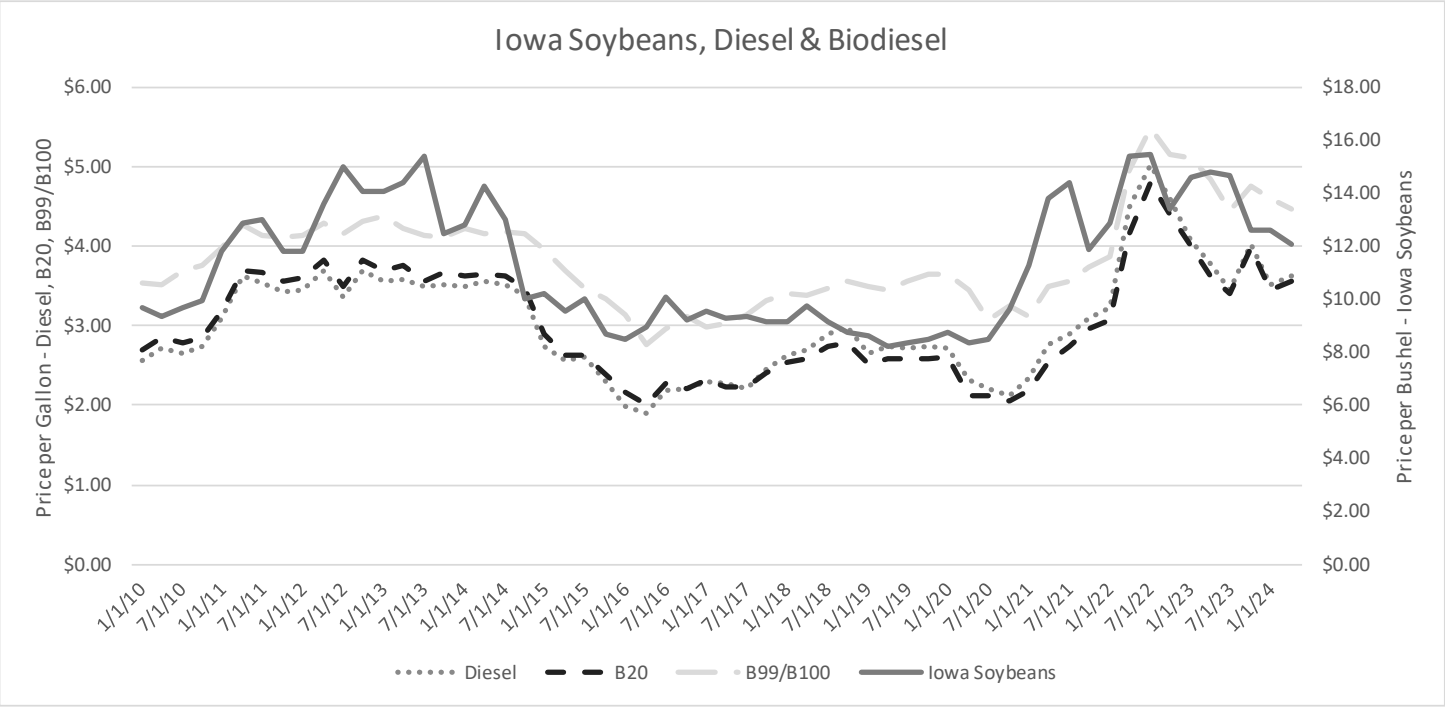
Figure 1. Price of Corn in Iowa per Bushel versus Price of Gasoline & Ethanol in United States per Gallon, Calendar Quarters January 2010 – April 2024



Sources:
U.S. Department of Energy, Alternative Fuels Data Center
USDA National Agricultural Statistics Service

Note:
Fuel volumes are measured in gasoline gallon equivalents (GGEs). GGE is the amount of an alternative fuel it takes to equal the energy content of one liquid gallon of gasoline.

Figure 2. Price of Soybeans in Iowa per Bushel versus Price of Diesel & Biodiesel in United States per Gallon, Calendar Quarters January 2010 – April 2024



Sources:
U.S. Department of Energy, Alternative Fuels Data Center
USDA National Agricultural Statistics Service

Note:
Fuel volumes are measured in gasoline gallon equivalents (GGEs). GGE is the amount of an alternative fuel it takes to equal the energy content of one liquid gallon of gasoline.

Table 20. Correlation Coefficients – Corn, Soybeans, Gasoline, Ethanol, Diesel and Biodiesel

	Gasoline	*E85*	*Diesel*	*B20*	*B99/B100*	*Iowa Corn*	*Iowa Soybeans*
Gasoline	1						
E85	0.933639125	1					
Diesel	0.953754887	0.861610839	1				
B20	0.953766334	0.917172609	0.980256681	1			
B99/B100	0.883827942	0.794204324	0.96532981	0.953499212	1		
Iowa Corn	0.813879016	0.804580638	0.801103918	0.801581145	0.775553103	1	
Iowa Soybeans	0.837578544	0.819507595	0.807812508	0.812582091	0.776357427	0.919756252	1

Sources:
U.S. Department of Energy, Alternative Fuels Data Center
USDA National Agricultural Statistics Service