Growth Energy™
Expanding America's Bioeconomy

December 4, 2025

Matt Botill
Division Chief
Industrial Strategies Division
1001 I Street
Sacramento, CA 95814
Via electronic submission

RE: Biofuels Land Use Change Public Forum

Mr. Botill:

We appreciate the opportunity to provide comments and recommendations in response to the November 6 Biofuels Land Use Change Public Forum. Growth Energy is the world's largest association of bioethanol producers, representing 97 producer plants, more than 130 associate members up and down the supply chain, and tens of thousands of biofuels supporters across the country. Together, we are working to bring better and more affordable choices at the fuel pump to consumers, improve air quality, and protect the environment for future generations.

As our comments during the rulemaking for the 2024 Amendments to the LCFS repeatedly noted, the long-outdated LUC value for bioethanol codified in the previous and current LCFS regulations warrants reconsideration.

A Large Body of Credible Scientific Evidence Supports a Lower LUC Value for Corn Bioethanol.

Since the inception of the LCFS, CARB has over-penalized crop-based biofuels due to the agency's misconceptions of the nature of their impact on land use change. Initially, in 2009, corn starch bioethanol was assigned a 30 gCO2e/MJ penalty[1], a number our industry argued was unsupported by credible evidence and lacking an empirical basis. In the rulemaking process that produced this hyper-conservative figure, scientists emphasized that there was "much uncertainty in measuring indirect emissions related to" biofuels, creating unresolved difficulties on "whether and how to calculate" indirect

[1] Even this value illustrates how LUC estimates decrease as models are refined. In the 2009 rulemaking process, CARB's estimate decreased from 35 gCO2e/MJ to 32 gCO2e/MJ and finally to 30 gCO2e/MJ as new model inputs were incorporated into the model. *See* Initial Statement of Reasons, Proposed Regulation to Implement the Low Carbon Fuel Standard (March 5, 2009), at IV-31 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2009/lcfs09/lcfsisor1.pdf

land use change.[2] CARB then acknowledged 30 gCO2e/MJ overstated estimated LUC and revised the figure downward to 19.8 in 2016, which, almost a decade later, remains the codified value.

Over the last decade, the models and underlying data sets used to estimate land use change have been greatly refined, resulting in a clear downward trend. For example, a 2021 review of the scientific literature derived a central best LUC estimate of 3.9 gCO_2e/MJ for corn bioethanol.[3] The U.S. Department of Energy, in conjunction with multiple federal agencies, recently updated the model for federal tax credit purposes under Section 45Z; that 2025 model incorporates a LUC estimate of 5.75 gCO_2e/MJ for corn bioethanol while relying on the same basic suite of models as CARB's 2015 figure.[4] And a November 2025 analysis published by Dr. Stefan Unnasch and economist Brian Healy of Lifecycle Associates evaluated a range of recent models with "updated data and refined treatment of co-products, livestock, and soil carbon," and concluded that such refinements result in LUC estimates of "roughly 5 gCO_2e/MJ."

In addition, recent testimony from Dr. Tristan Brown during the rulemaking process for New Mexico's Clean Transportation Fuel Standard provides a number of examples of updated data sets using more recent science than what is currently used by the LCFS for crop-based biofuels.[5] Since 2014, the LCFS uses a combination of GTAP-BIO and AEZ-EF modeling for land use change. Even in 2014, the data used in AEZ-EF was based on 8-year-old international GHG inventory methods and default values. In written testimony to New Mexico's Environmental Improvement Board, Dr. Brown notes there have been "steady improvements made to both the GTAP-BIO model and the overall CI score calculation methodology." Additionally, given GREET's status as the "primary means of calculating lifecycle GHG emissions", Argonne National Laboratory created the Carbon Calculator for Land Use Change from Biofuels Production (CCLUB). CCLUB is intended to "replace[s] the obsolete AEZ-EF model" and utilize the latest land use change research and observable data. Examples of these observations include a leveling-off, and in some cases, a decline in the acres harvested for corn bioethanol, all while yield increased. When using the most up-to-date research (GTAP-BIO + CCLUB), Dr. Brown concludes that corn bioethanol's LUC value is 6.1 gCO2e/MJ.

---

[2] https://ww2.arb.ca.gov/sites/default/files/BARCU/barcu-attach-old/lcfs09.archive/251-2009_liska_perrin_bbb.pdf
[3] Scully, et. al. *Carbon intensity of corn ethanol in the United States: state of the science*, 16 Environ. Res. Lett. 4 (2021).
[4] 45ZCF-GREET Model (January 2025), https://www.energy.gov/eere/greet
[5] https://www.env.nm.gov/opf/wp-content/uploads/sites/13/2025/09/2025-09-02-EIB-25-23-Growth-Energys-NOI-pj.pdf

Each of these four recent analyses are closely aligned around an estimated LUC range of 3.9 - 6.1 gCO2e/MJ; far lower than the decade-plus old 19.8gCO2e/MJ currently used in the LCFS.

Even these improved estimates likely overestimate LUC impacts. To elaborate, LUC theory assumes that biofuels consumption in California can and will increase crop commodity prices to a sufficient degree to drive farmers' planting and land conversion decisions across the globe. However, it is not possible in the real-world to isolate impacts of California biofuels consumption from the multitude of other factors that may more directly impact global crop commodities markets, including, for example, the impact of agricultural, tariff, and land use policies implemented by other state and foreign governments. This is particularly true in the context of corn bioethanol in California, where CARB projects that bioethanol demand will decline as light-duty electric vehicle penetration increases.[6] Where bioethanol demand is *declining*, it simply does not create any price signal that would drive *increases* in corn production.

Moreover, even if bioethanol demand were to remain steady or increase modestly, analysis of existing trends demonstrates that over 600 million gallons of additional bioethanol could be produced using the same corn acreage currently in production today as a result of yield increases and other efficiency improvements.[7] Indeed, separate analyses by both Stillwater Associates and Ramboll have concluded (in the context of the federal RFS program) that increased bioethanol demand in the U.S. has very little to no impact on global corn prices.[8] This is further affirmed by a growing body of empirical evidence: for example, a 2022 International Energy Agency report evaluated real-world data from 2005–2015 and found "no link" between increased U.S. biofuel production and corn production or deforestation in Brazil.[9] Instead, the report casts doubt on any relationship between biofuel production and corn prices or livestock production.

Despite the best available science converging around LUC estimates near 5 gCO2e/MJ and the lack of empirical evidence to validate LUC theory, CARB concerningly relies on

---

[6] CARB Standardized Regulatory Impact Assessment, 2024 LCFS Amendments (Dec. 19, 2023) at 18, Fig. 4.
[7] Stillwater Associates, LLC, RFS Set II Proposal Analysis at 17, https://downloads.regulations.gov/EPA-HQ-OAR-2024-0505-0646/attachment_3.pdf. *See also*
[8] *Id.* at 9 (finding that "the actual effect on corn prices" from the most recent RFS program volume incentives "is close to 0%."); Ramboll and Net Gain Ecological Services, Review of Environmental Effects and Economic Analysis of Corn Prices: EPA's Proposed RFS Standards for 2023-2025 at 23-24, Figure 3-5, 3-6 (finding that "the statistical dependency between corn prices and RFS volumes is either non-existent or very weak").
[9] IEA Bioenergy, Towards an improved assessment of indirect land-use change, Task 43 – Task 38 Report (October 2022).

repeatedly debunked studies from Searchinger et. al.[10] and Lark et. al.[11] for the Forum, indicating an institutional unwillingness to consider more recent scientific evidence. In contrast, we believe it is long past time for CARB to update the LUC values for crop-based biofuels in the LCFS consistent with the work of Dr. Brown, the U.S. DOE, and other credible researchers.

Sustainability Requirements Render LUC Penalty Obsolete

In the most recent amendments to the LCFS, CARB implemented requirements for crop-based biofuels purportedly to prove their sustainability, namely, to ensure that no feedstocks for LCFS pathways came from land converted into cropland after 2008, and verification processes to confirm sourcing.[12]

In the most recently rulemaking, CARB's Environmental Impact Analysis (EIA) acknowledges potential direct and indirect land use change "is at least partially (and potentially fully) accounted for by the LUC scores added to crop-derived pathways."[13] This acknowledgement renders the need for a sustainability certification moot and must be accounted for in CARB's current reconsideration of the LUC estimate appropriate to apply to bioethanol.

This double penalty is particularly unbalanced where CARB denies bioethanol producers the ability to utilize a wide range of on-farm practices to demonstrate GHG reductions. It should be noted that many of those on-farm practices are recognized by other California state agencies as tools to reduce the release of soil carbon.[14] The combination of an inflated LUC penalty untethered from the best available science with

---

[10] *See, e.g.* Zilberman, D, *Indirect land use change: much ado about (almost) nothing.* GCB Bioenergy, 9(3), 485-488. (2017) ("Searchinger et al. (2008) results may now be seen as fundamentally flawed not just because the ILUC is uncertain and estimates vary considerably, but also because it fails to capture the basic features of agricultural industries and land resources."); *see also* https://growthenergy.org/wp-content/uploads/2022/02/Net-Gain-Ramboll-studies.pdf

[11] *See, e.g.* Taheripour, et al., *Comments on "Environmental Outcomes of the US Renewable Fuel Standard"* (Mar. 21, 2022) (identifying "extreme" and "difficult to rationalize" inconsistencies in Lark et al. studies); Taheripour et al., *Response to comments from Lark et al. regarding Taheripour et al. March 2022 comments on Lark et al. original PNAS paper* (May 25, 2022) (reaffirming "major deficiencies, problematic assessments, and misinterpretation" and determining that "the Lark et al. paper is more problematic than what we initially evaluated"); *Review of Recent PNAS Publication on GHG Impacts of Corn Ethanol*, USDA (Dec. 14, 2022) (noting "major methodological flaws" and observing that Lark's findings "cannot be corroborated with USDA site level, modeled, or national datasets.").

[12] https://ww2.arb.ca.gov/sites/default/files/2025-07/atta1_finalcomparison_070125.pdf

[13] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/recirculated_draft_eia.pdf

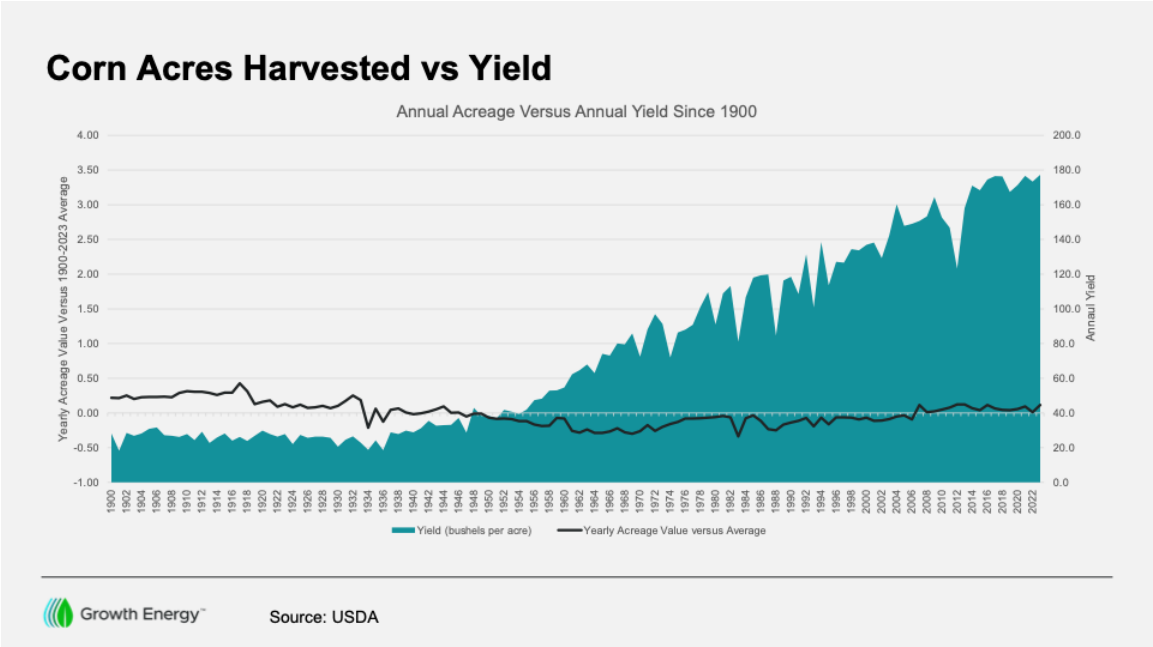
[14] https://www.gov.ca.gov/2020/10/07/governor-newsom-launches-innovative-strategies-to-use-california-land-to-fight-climate-change-conserve-biodiversity-and-boost-climate-resilience/

the failure to acknowledge scientifically-supported low-carbon agricultural practices creates a significant distortion in bioethanol carbon intensity scores that unfairly harms producers and California consumers.

Corn Acreage Unchanged Despite Increased Bioethanol Demand

Even as demand for bioethanol increased, the number of acres of corn planted and harvested have remained largely unchanged. As we have referenced in multiple previous comments during the most recent LCFS amendment rulemaking, the growth in corn production in the United States has come from improvements in yield while the number of acres used to produce corn are roughly the same number of acres used in 1900.

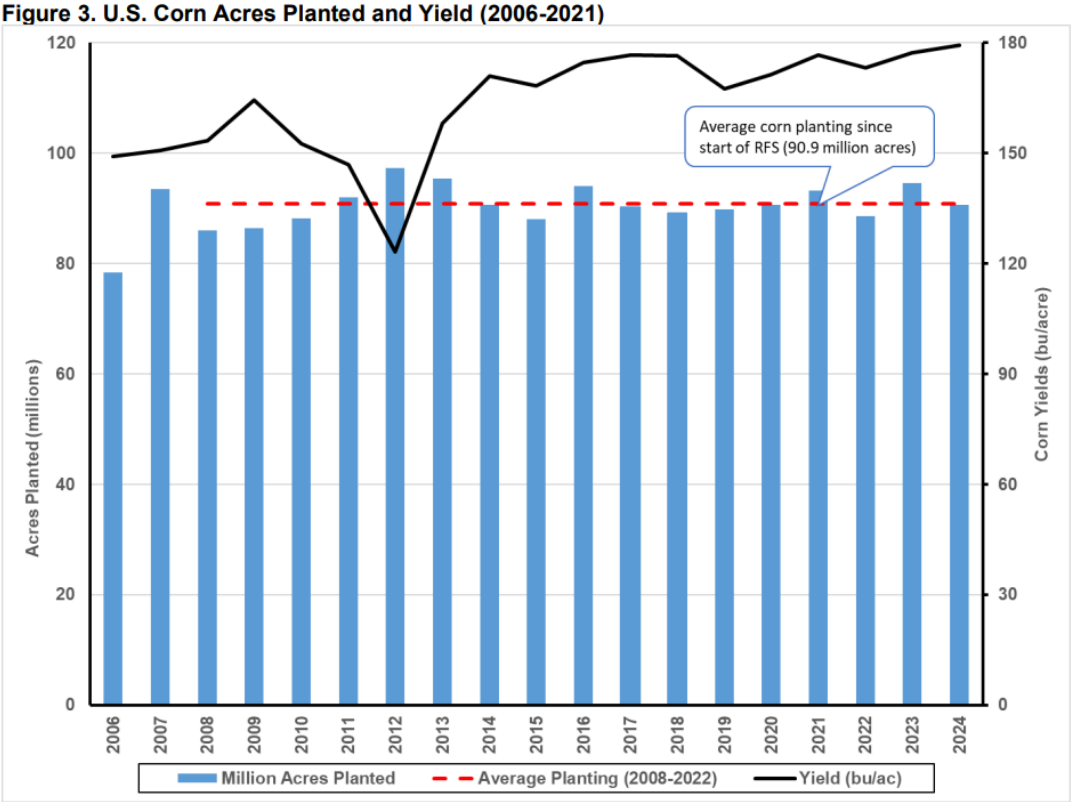
Since 1900, the top 25 years with the most increase in acreage relative to the nation's average of 77.745 million acres of corn production all occurred in or before 1933.[15]



[15] https://afdc.energy.gov/files/u/data/data_source/10337/10337_corn_yield_acres.xlsx

Analysis of more recent trends again demonstrates that corn plantings have remained stable while yield increased. The amount of land required to produce one billion gallons of bioethanol has decreased from 3.1 million acres in 2007 to 1.9 million acres in 2024.[16] Over this time, corn acres planted have remained constant, illustrating that both the LUC penalty and the burdensome sustainability requirements are unnecessary for corn starch bioethanol:

Figure 3. U.S. Corn Acres Planted and Yield (2006-2021)



***Source**: USDA, Stillwater analysis*

Conclusion and Recommendations

With the temporary approval of E15 via AB 30 and the subsequent rulemaking for permanent approval, liquid fuels with higher bioethanol content have the potential to significantly improve the carbon intensity of California's transportation fuel mix. CARB has a legal and policy imperative to expeditiously incorporate the best available science

[16] Stillwater Associates, LLC, RFS Set II Proposal Analysis at 9, https://downloads.regulations.gov/EPA-HQ-OAR-2024-0505-0646/attachment_3.pdf

on land use change estimates for bioethanol. As summarized above, the weight of the credible scientific evidence requires a substantial downward shift in bioethanol's LUC value.

Growth Energy also encourages CARB to allow the use of climate-smart agricultural practices, some of which include precision application of fertilizer, use of low CI fertilizer, no or low-till farming practices, and the use of cover crops.[17]

We appreciate the opportunity to provide input on land use change. We urge CARB to recognize the role biofuels have played and can continue to play in decarbonizing California's transportation fuel supply.

Sincerely,

Christopher P. Bliley
Senior Vice President of Regulatory Affairs
Growth Energy

[17] https://growthenergy.org/policy-priority/climate-smart-agriculture/