POET
900 7th St. NW, Suite 820
Washington, D.C. 20001
Ph: (605) 965-2200
poet.com

May 31, 2023

Cheryl Laskowski
Chief, Transportation Fuels Branch
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Submitted online via:
https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=lcfscalculators23-ws&comm_period=1

RE: Proposed New Tier 1 Simplified Calculators—Starch and Fiber Ethanol

Dear Ms. Laskowski:

POET, the world's largest producer of biofuels, is pleased to submit comments in response to the California Air Resource Board's ("CARB's") Proposed New Tier 1 Simplified Calculators, Starch and Fiber Ethanol ("Proposed Calculator"). POET strongly supports CARB's dedication to decarbonizing the transportation sector and believes the low carbon fuel it produces will play an integral role in CARB's emissions reduction strategy.

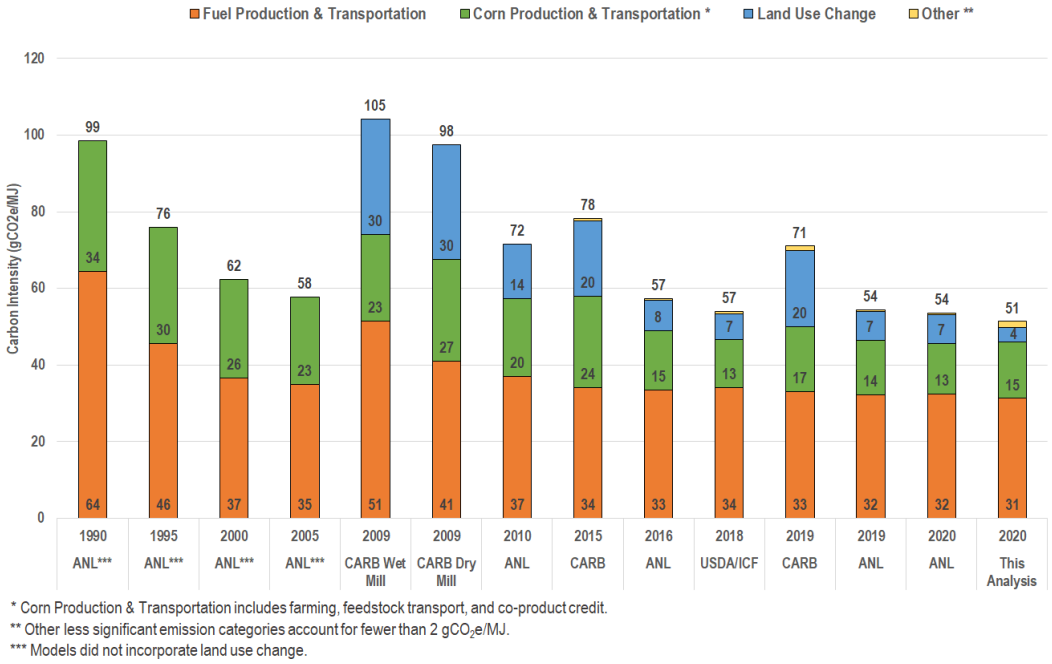
These comments respond to CARB's Proposed Calculator and suggest ways the calculator and LCFS more broadly should be modified to maximize the program's greenhouse gas ("GHG") reduction potential.

I. About POET

POET's vision is to create a world in sync with nature. As the world's largest producer of biofuels and a global leader in sustainable bioproducts, POET creates plant-based alternatives to fossil fuels that utilize the power of agriculture and cultivate opportunities for America's farm families. Founded in 1987 and headquartered in Sioux Falls, POET operates 34 bioprocessing facilities across eight states and employs more than 2,200 team members. With a suite of bioproducts including Dakota Gold and NexPro feed, Voilà corn oil, purified alcohol, renewable CO_2 and JIVE asphalt rejuvenator, POET is committed to innovation and advancing solutions to some of the world's most pressing challenges. POET holds more than 80 patents and continues to break new ground in biotechnology, yielding ever-cleaner and more efficient renewable energy. In 2021, POET released its inaugural Sustainability Report pledging carbon neutrality by 2050.

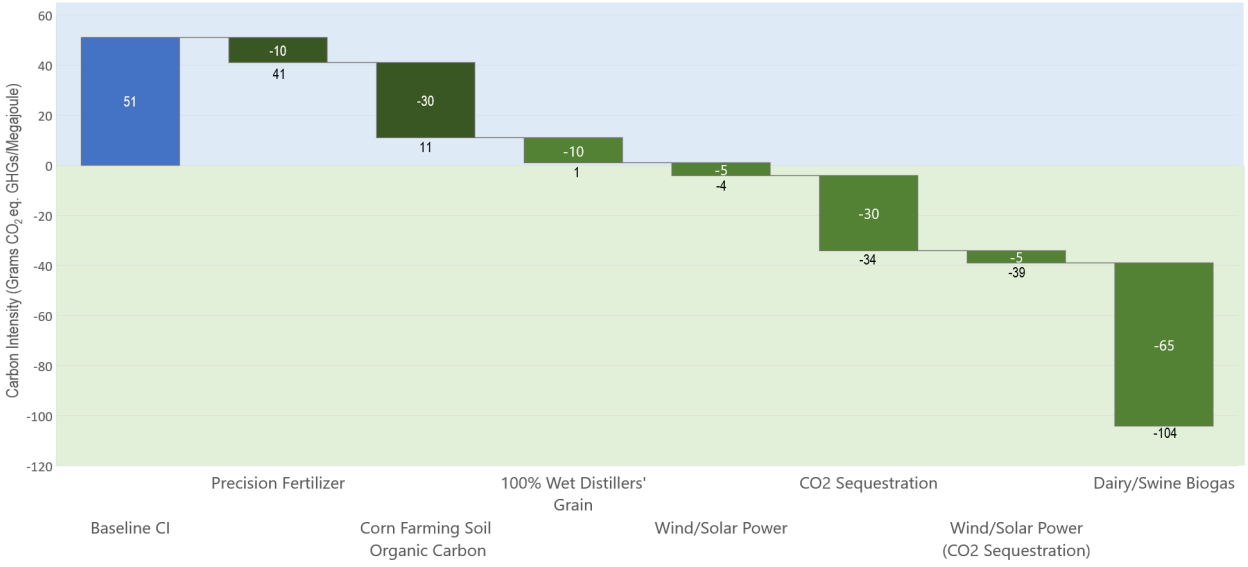
II. The Case for Bioethanol

Bioethanol has effectively displaced fossil fuels and reduced net GHG emissions in California and is poised to make even greater contributions to the LCFS program moving forward. As shown in the chart below, a recent analysis by Scully *et al.*[1] shows that bioethanol carbon intensity values have decreased over time.



* Corn Production & Transportation includes farming, feedstock transport, and co-product credit.
** Other less significant emission categories account for fewer than 2 gCO_2e/MJ.
*** Models did not incorporate land use change.

With technologies already being implemented or on the cusp of commercialization, bioethanol has the ability to become a zero-carbon fuel.



[1] Sully, Melissa *et al.*, *Carbon intensity of corn ethanol in the United States: state of the science*, 2021 Environ. Res. Lett 16 043001, 4 (2021), https://iopscience.iop.org/article/10.1088/1748-9326/abde08.

Given bioethanol's ability to reduce transportation emissions, POET believes that CARB should attempt to harmonize the LCFS program with the federal government's policies on decarbonization, both with respect to restoring the role of bioethanol in Renewable Fuel Standard ("RFS") compliance and the promotion of sustainable aviation fuel.

With respect to the former, bioethanol has long played a key role in RFS compliance with the largest number of RINs generated by bioethanol derived from corn starch. In its recent proposed rule, EPA is increasing RFS volumes closer to those called for by Congress and laying the groundwork for continued recognition of bioethanol as a significant type of renewable fuel. Through its policy making, CARB should act in a manner consist with federal policies promoting bioethanol use.

The federal Administration's policies on sustainable aviation fuel also point to a potential long-term role for bioethanol in hard-to-decarbonize markets. A number of companies are deriving ways turn bioethanol into jet fuel, and the Department of Energy has recently conducted significant research on the potential for bioethanol to jet conversion.[2] As such, CARB's policies with respect to bioethanol no longer impact only the passenger vehicle sector, but also impact aviation fuel and other potential fuel derivatives of bioethanol.

Bioethanol has been a key part of the LCFS program's success, and producers are working hard to lower their product's CI in ways that can meaningfully reduce national and global GHG emissions. Bioethanol is poised to remain a key element of the low carbon fuels market for decades to come. Assigning CI values for corn starch bioethanol not only impacts the light duty fuel mix, but also impacts the availability and attractiveness of bioethanol-based jet and other derivatives. Therefore, CARB must assure that the CI values associated with corn starch bioethanol are accurate.

III. CARB's Proposed Calculator

POET has the below comments as CARB finalizes the Proposed Calculator. We propose a number of recommendations to ensure that emissions associated bioethanol are calculated accurately and that low-carbon renewable fuels will be incentivized under the LCFS program.

a. CARB Should Retain Proposed Calculator Formatting Changes.

First, POET would like to express support for the new format in the Proposed Calculator. The Proposed Calculator includes all inputs in one tab, making it easier to copy and paste into the calculator. In contrast, GREET3.0 ("Current Calculator") intertwined inputs with other numbers, and it was more arduous to complete. We appreciate this new layout and encourage CARB to keep these formatting changes in the final calculator.

[2] *DOE Announces Nearly $65 Million for Biofuels Research to Reduce Airplane and Ship Emissions*, DEPARTMENT OF ENERGY (2021), https://www.energy.gov/articles/doe-announces-nearly-65-million-biofuels-research-reduce-airplane-and-ship-emissions.

b. CARB Should Adopt Global Warming Potential Values from the IPCC AR5 Report.

POET recommends that CARB adopt Global Warming Potential ("GPW") values from the Intergovernmental Panel on Climate Change ("IPCC")'s Fifth Assessment Report ("AR5").[3] CARB is currently using GPW values from the IPCC Fourth Assessment Report ("AR4") which was published in 2007.[4] The GPW values in AR4 are now outdated. Other agencies, like the U.S. Environmental Protection Agency, are moving to AR5.[5] Additionally, the United Nations Framework on Climate Change now requires parties to use GPW values from AR5.[6] CARB should adopt AR5 to ensure the LCFS program uses the most up-to-date science to accurately calculate emissions.

c. CARB Should Provide Additional Information Regarding Farming Emissions.

POET requests that CARB provide more information regarding the farming emissions value in the Proposed Calculator. The Proposed Calculator has a value of 6,945 gCO_2e/bushel. CARB lists GREET 2022 as the source of this value, but ANL-GREET 2022 AR6 GWP has a value of 6,762 gCO_2e/bushel for farming emissions. POET requests that CARB provide additional details as to how the farming emissions value was calculated in the Proposed Calculator.

d. CARB Should Update Co-Product Emissions Value.

POET recommends that CARB update its co-product emissions value. CARB is proposing to use the same co-produce emissions value in the Current Calculator. However, the co-product emissions value is based on the amount of corn, soy, and urea emissions offset per pound of co-product. CARB is updating the corn emissions in the Proposed Calculator; therefore, co-product emissions should be updated accordingly.

CARB should also include an enteric emissions credit in the co-product emissions section of the Proposed Calculator. ANL-GREET 2022 includes a co-product emissions credit for reduced enteric emissions, but the Proposed Calculator does not. Feed containing DDGs reduces enteric emissions, and CARB should provide a credit to recognize this emissions benefit.

e. CARB Should Reevaluate Denaturant CI Values.

POET urges CARB to reevaluate the value for denaturant in the Proposed Calculator. Emissions calculations are incorrectly allocated on a denatured basis instead of an undenatured basis as done with the Current Calculator. This approach ultimately results in over calculating the final fuel's carbon intensity. For the final version of the Proposed Calculator, CARB should allocate emissions on an undenatured basis consistent with the Current Calculator.

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[3] *Climate Change 2014: Synthesis Report*, IPCC (2014), https://archive.ipcc.ch/report/ar5/syr/.
[4] *Climate Change 2007: Synthesis Report*, IPCC (2007) https://www.ipcc.ch/assessment-report/ar4/.
[5] *See* pg. 37 https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf
[6] *See Framework Convention on Climate Change, Decision on Common Metrics*, UNITED NATIONS (2022), https://unfccc.int/sites/default/files/resource/cp2022_10a01_adv.pdf.

Additionally, POET recommends CARB allow user-defined inputs for the denaturant emission factor. Currently, CARB assumed CARBOB reformulated gasoline blend stock is used for denaturant, when in practice a mixture of hydrocarbons extracted from natural gas known as natural gasoline or pentanes plus[7] is used by most of the bioethanol industry. Natural gasoline has a carbon intensity of approximately 86 g/MJ compared to the 100.82 g/MJ CARBOB assumption in the proposed calculator. Furthermore, renewable naphtha produced at renewable diesel and sustainably aviation fuel facilities can also be used as a denaturant. However, the use of a renewable denaturant such as renewable naphtha would require a Tier 2 pathway application. User-defined denaturant inputs in the Proposed Calculator would allow for the use of renewable denaturant in Tier 1 pathways, reducing the number of Tier 2 applications CARB receives and incentivizing the use of renewable fuel as denaturant.

f. CARB Should Include a Carbon Capture and Sequestration Input.

CARB should consider adding a carbon capture and sequestration ("CCS") input in the Proposed Calculator. CCS is quickly becoming standard practice in the bioethanol industry. Currently, bioethanol plants using CCS must go through a Tier 2 pathway. As more producers implement CCS, CARB will see an influx of Tier 2 pathway applications. By adding an input for CCS into the Proposed Calculator, CARB would avoid the administrative burden of dealing with increased Tier 2 pathway applications due to CCS.

g. CARB Should Allow User-Defined Process Chemical Usage for Ethanol Pathways.

CARB should modify the Proposed Calculator's treatment of process chemicals used in bioethanol pathways. The Proposed Calculator does not allow the pathway applicant to specify use of low-CI process chemicals, which distorts the CI value of POET's bioethanol. Specifically, POET's patented BPX process uses a less carbon-intensive group of chemicals than most bioethanol producers. A simple change to the Proposed Calculator to allow user-defined process chemical usage could cure this inaccuracy. This modification would be consistent with the calculator's accommodation of a variety of other user-defined inputs from denaturant to feedstock transportation distance. As with all CI inputs, verification requirements would apply to user-defined process chemical usage, allowing the verifier and CARB to ensure claimed CI reductions are accurate.

If CARB elects not to allow user-defined process chemical usage, CARB should at least revisit the current chemicals emission factor of 2.02 g/MJ. This value is grossly overestimated and is based on industry data over a decade old that did not represent the group of chemicals utilized in POET's patented BPX process. POET would welcome the opportunity to work with CARB to update the chemicals emission factor.

[7] "Natural gasoline: A commodity product commonly traded in NGL markets that comprises liquid hydrocarbons (mostly pentanes and hexanes) and generally remains liquid at ambient temperatures and atmospheric pressure. Natural gasoline is equivalent to pentanes plus." *U.S. Energy Information Administration, Glossary* (last visited May 31, 2023), https://www.eia.gov/tools/glossary/index.php?id=N#nat_gasoline.

h. CARB Should Distinguish Between Electricity Usage in Wet and Dry DDGS Pathways.

Next, we recommend a minor correction to the Proposed Calculator's treatment of wet versus dry DDGS produced at the same facility. Specifically, the Proposed Calculator distinguishes between wet and dry DDGS pathways for the use of thermal energy but does not do so with regard to electricity usage. Electricity usage for production of wet DDGS is demonstrably lower than that needed to produce dry DDGS. Accordingly, POET recommends that CARB distinguish between electricity usage in wet and dry pathways as the Proposed Calculator does with thermal energy.

i. Wet DG Pathway Allocation Should Include Syrup.

The Proposed Calculator's Wet DG Pathway allocation includes quantities of wet, modified, and dry DG. Syrup production is excluded from this allocation and is only included to quantify total co-product production for the co-product credit calculations. However, both syrup and wet DG completely bypass the drying system. From an emissions standpoint, the two products are identical. Therefore, syrup should be included in the Wet DG Pathway allocation.

j. CARB Should Add Coal as a Process Energy Input in the Proposed Calculator.

POET urges CARB to add coal as a process energy input under the "Pathway Inputs" section in the Proposed Calculator. Currently, bioethanol producers using coal as process energy must submit a Tier 2 pathway application. This places an undue burden on producers as well as CARB only because there is no explicit input into the Tier 1 calculator. To remedy this, CARB should either add a new input to the Proposed Calculator to include coal as process energy or expand the use of an existing input such as "Biomethane" or "Biomass".

k. The Proposed Calculator Should Allocate a Portion of the Cellulosic Enzyme Emissions to Starch Gallons.

The Proposed Calculator allocates cellulosic enzymes solely to fiber ethanol gallons. However, these cellulosic enzymes not only convert fiber but also promote increased starch conversion and corn oil recovery. Therefore, cellulosic enzymes should be allocated to both fiber and starch gallons. POET believes additional research likely is needed to determine how cellulosic enzymes should be allocated between starch and fiber gallons. We would welcome the opportunity to work with CARB to study this issue.

l. CARB Should Deduct Corn/Sorghum Distiller's Oil Extraction Emissions from Starch and Fiber Ethanol to Prevent Double Counting Emissions.

The Proposed New Tier 1 Simplified Calculators for Biodiesel and Hydroprocessed Ester, and Fatty Acid Fuels currently include corn/sorghum distiller's oil extraction emissions embedded in the feedstock emission factors. These emissions are also included in the inputs for the Proposed Calculator with no mechanism to deduct these emissions. Thus, the Proposed Calculator double counts corn/sorghum distiller's oil extraction emissions. CARB should include a mechanism in

the final Proposed Calculator to deduct the extraction emissions for corn/sorghum distiller's oil used as a feedstock for renewable fuels.

In addition, the corn/sorghum distiller's oil extraction emissions value utilized for the feedstock emission factors is overstated by approximately 200% and needs to be updated. POET would gladly provide CARB with actual operational data in order to determine the correct corn/sorghum distiller's oil extraction emissions.

m. CARB Should Update the Land Use Change Value to Reflect Best-Available Science.

In previous workshops, CARB has noted that many stakeholders have requested that CARB reevaluate CI values associated with land use change ("LUC"), and that it is open to considering new data and research related to this topic. While POET understands that CARB has heard a diversity of views on LUC, POET does not believe that the divergent positions deserve equal weight. POET believes that the body of scientific evidence when vetted for evidentiary basis and analytical rigor clearly indicates that CARB's prior LUC assessments with respect to corn starch bioethanol are too high, skewing the LCFS program's incentives.

More specifically, current scientific literature indicates that California's LUC analysis overstates CI values for LUC for corn ethanol. While the Proposed Calculator incorporates a LUC value of 19.8 gCO2e/MJ, the best-available scientific literature supports far lower values of approximately 4 gCO2e/MJ taking into account direct and indirect LUC. Some studies go further, and indicate biofuel production does not induce any ILUC.[8]

Since 2008, scientific assessments of LUC associated with ethanol production have changed substantially. These studies have shown downward trends in LUC carbon impacts:[9]

[8] Kim S, Dale BE. 2011. *Indirect land use change for biofuels: Testing predictions and improving analytical methodologies.* BIOMASS AND BIOENERGY, 35(7):3235-3240. 10.1016/j.biombioe.2011.04.039; Kline KL, Oladosu GA, Dale VH, McBride AC. *Scientific analysis is essential to assess biofuel policy effects: In response to the paper by Kim and Dale on "Indirect land-use change for biofuels: Testing predictions and improving analytical methodologies"*. (10):4488-4491. 10.1016/j.biombioe.2011.08.011.

[9] Sully, *supra* note 1 at pg. 6.

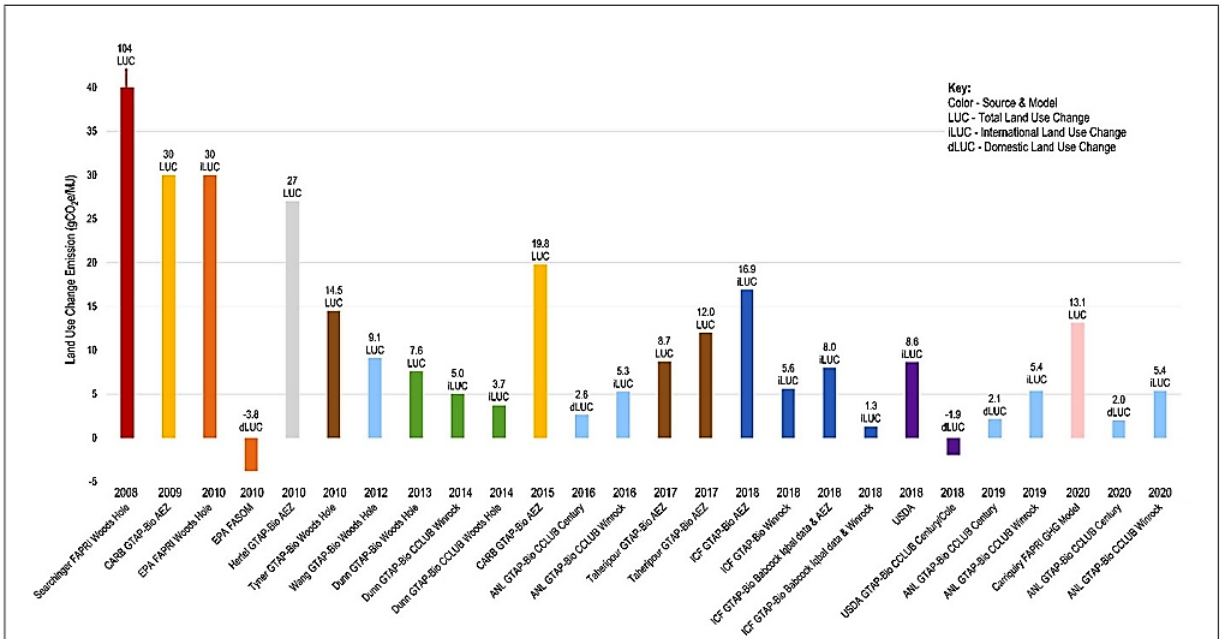

Figure 2. Timeline of estimated GHG emissions associated with corn ethanol-related LUC, 2008–2020.

LUC estimates are now converging on substantially lower estimates than those established through CARB's prior analysis in the March 2015 Staff Report on ILUC values.[10] Specifically, reliable analyses of LUC impacts generally draw from the GTAP agro-economic model, and have consistent approaches to the economic baseline year (2004), incorporation of yield price elasticity (of approximately .25), and, significantly, address the concept of land intensification.[11] Scientific literature supports that land intensification, producing greater volumes of a crop or multiple crops on existing land, is a key factor in appropriately assessing LUC.[12] Studies indicate that from 2005 to 2012 during which the United States experienced a significant increase in ethanol production, the surge in harvested crop was due primarily to land intensification rather than conversion of land to agricultural uses both domestically and internationally.[13] Land intensification, a critical model feature, is not currently addressed in the Proposed Calculator.

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[10] California Environmental Protection Agency Air Resources Board, *Staff Report: Calculating Life Cycle Carbon Intensity Values in Transportation Fuels in California,* (March, 2015), https://ww2.arb.ca.gov/sites/default/files/classic//fuels/lcfs/peerreview/050515staffreport_ca-greet.pdf.

[11] *See* e.g., Rosenfeld J, Lewandrowski J, Hendrickson T, Jaglo K *et al*., *A Life-Cycle Analysis of the Greenhouse Gas Emissions from Corn-Based Ethanol.*, ICF (2018) (under USDA contract No. AG-3142-D-17-0161); Taheripour F, Zhao X, Tyner WE, *The impact of considering land intensification and updated data on biofuels land use change and emissions estimates.* BIOTECHNOL. BIOFUELS, (2017) DOI: 10:191. 10.1186/s13068-017-0877-y.

[12] Sully, *supra* note 1 at pg. 7.

[13] Babcock BA, Iqbal Z, *Using Recent Land Use Changes to Validate Land Use Change Models,* CARD Staff Reports (2014); Taheripour F, Cui H, Tyner WE, *An Exploration of agricultural land use change at the intensive and extensive margins: implications for biofuels induced land use change*, BIOENERGY AND LAND USE CHANGE:19-37 (2017a).

POET strongly encourages CARB to engage in additional dialog on LUC now rather than putting off such analysis to the future. Bioethanol's CI value has wide-ranging impacts beyond the simple incentivization of bioethanol use. LUC corrections can allow the LCFS program to become more stringent and allow bioethanol-derivatives to access hard to decarbonize sectors such as aviation more easily.

If CARB elects not to update the LUC analysis from the 2015 LCFS re-adoption, CARB should at least make a minor change to the results.[14] CARB averaged 30 scenario runs using the GTAP-BIO and AEZ-EF models with a shock of 11.59 billion gallons, resulting in 19.8 g/MJ. The 11.59-billion-gallon shock represents the difference between the 2004 corn ethanol production of 3.41 billion gallons and the 15-billion-gallon volume approved through the RFS. The 19.8 g/MJ result from the LUC analysis only relates to the 11.59-billion-gallon shock, and therefore no LUC is associated with the 3.41 billion gallons in production prior to 2004. However, there is currently no mechanism in the LCFS to distinguish between the corn ethanol production before and after 2004. To correct this error, CARB should either allocate the LUC emissions across the full 15-billion-gallon volume from the RFS or grandfather in the 3.41 billion gallons that were in production prior to 2004. Allocating the LUC emissions across the full 15 billion gallons would result in a LUC value of approximately 15.3 g/MJ.

n. CARB Should Recognize Off-Site Renewable Energy Production for Bioethanol Plants.

California LCFS regulations prohibit use of indirect accounting mechanisms to demonstrate production of fuel using low-CI process energy.[15] Instead, the regulations require that renewable energy generation equipment be "directly connected through a dedicated line" to the fuel producer's facility.[16] This is technically infeasible for many producers and stymies their use of low-CI electricity to produce lower-CI fuels.

To drive growth in renewable energy generation and facilitate lower-CI fuel production, CARB should remove this regulatory barrier. POET recommends that CARB allow producers to demonstrate use of low-CI process energy through means such as power purchase agreements and book and claim accounting. Recognition of off-site renewable energy production as a means to reduce GHG emissions is common in carbon markets. CARB should use its authority to encourage more renewable energy use in the transportation supply chain, not just with respect to certain fuel types. This would incentivize the generation of low-CI energy through large-scale renewables projects, thereby reducing the transportation sector's lifecycle GHG emissions.

o. CARB Should Expand Emissions Avoidance Credits to Beyond Dairy and Swine Manure.

[14] *See Detailed Analysis for Indirect Land Use Change*, CALIFORNIA AIR RESOURCES BOARD (2015), at I-8, I-23--I-27, https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/iluc_assessment/iluc_analysis.pdf.
[15] *See* 17 C.C.R. § 95488.8(h).
[16] *Id*. § 95488.8(h)(1)(B).

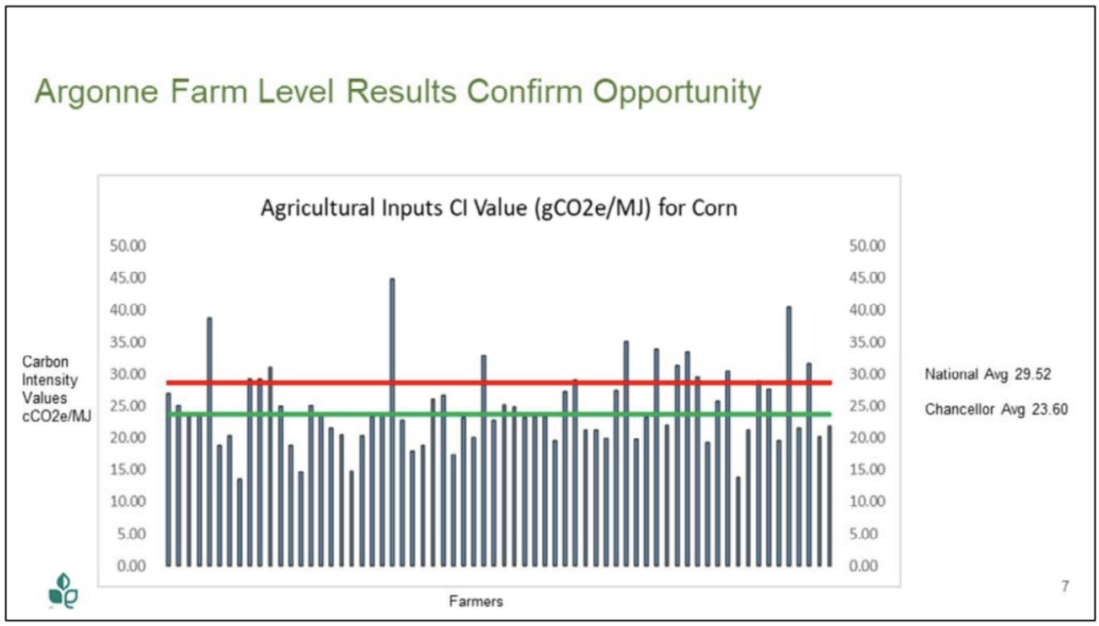
California's LCFS program offers avoidance credits for GHG emissions reductions associated with the installation of biogas control systems for manure management on dairy cattle and swine farms.[17] In the Proposed Calculator, CARB should expand this program to include other farm animals such as beef cattle. Expanding the program to additional farm animals would incentivize fuel production entities to utilize biogas from nearby farm animals as energy sources for fuel production. Increased usage of biogas from nearby farm animals would reduce fuel production emissions, lowering lifecycle GHG emissions in California's transportation sector.

p. CARB Should Incentivize Sustainable Low Carbon Farming Practices.

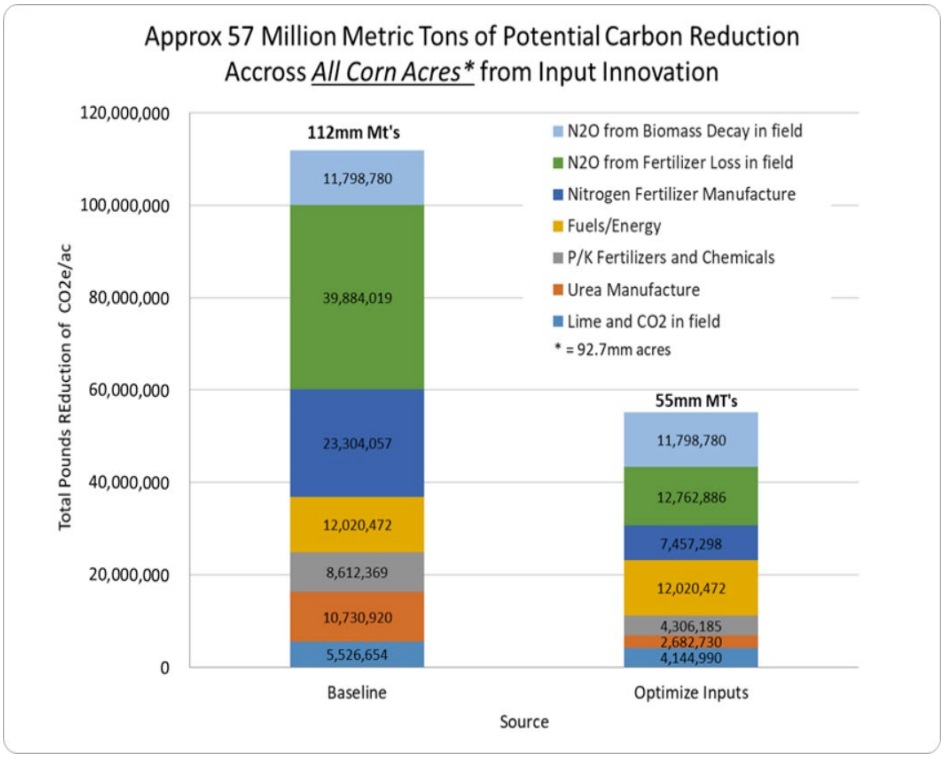
POET urges CARB to include user-defined inputs for farming in the Proposed Calculator. In previous workshop presentations, CARB has noted that many stakeholders have requested consideration of site-specific agricultural inputs in fuel pathway lifecycle analyses. POET in fact presented on this topic at a CARB workshop in October 2020. POET is among the stakeholders who believe that CARB is in a position to incentivize enormous changes in the agricultural supply chain that would lead to significant reductions in agricultural greenhouse gas emissions. By allowing site-specific agricultural inputs, CARB can encourage reduced agricultural GHG emissions through readily available technologies such as better tillage practices and nitrogen and biodiversity management as well as incentivize the agricultural supply chain to reduce greenhouse gas impacts in new and innovative ways.

POET's project Gradable illustrates the potential GHG emissions reductions achievable through sustainable farming. POET worked with the Farmers Business Network and Argonne National Labs to create Gradable, a pilot program to encourage sustainable farming, validate data inputs, and calculate CI scores for agricultural inputs. Gradable's trial involving 64 area farms supplying corn to POET's Chancellor plant showed a 25 percent reduction in GHG emissions from corn cultivation and farm energy use compared to the assumptions embedded in CA-GREET:

[17] *Livestock Projects*, CALIFORNIA AIR RESOURCES BOARD (last visited Nov. 18, 2021), https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/compliance-offset-protocols/livestock-projects.



Gradable illustrates that CI values are highly sensitive to different agronomic practices, even within the same area with similar soil types and weather patterns. This suggests that if farmers had the incentive to engage in such practices, widespread adoption of low-CI farming practices could readily result in CI reductions. The prospect of extrapolating these lessons to the entire industry is worthy of CARB's focus in this rulemaking process. The below graphic illustrates the potential carbon reduction possible with sustainable farming techniques.



POET encourages CARB to include an input for "identity-preserved" feedstocks (i.e. those used by renewable fuel producers because of their verifiably lower CI characteristics) in its Proposed Calculator.

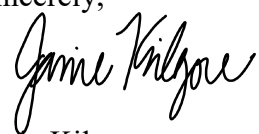
Other commenters may encourage CARB to include assessments of soil organic carbon ("SOC") in farming related CIs and to credit farms that sequester carbon in the form of SOC. POET agrees that SOC is a potential tremendous reservoir to sequester CO_2 emissions. However, we also understand that some have pointed to technological challenges in measuring SOC and SOC fluctuations over time. If CARB believes that current SOC measurement methodologies are too unreliable to be included in farming CI scores, POET strongly encourages CARB to allow for individually tailored farming CIs for other farming inputs (such as those mentioned in the above discussion of Gradable) in its Proposed Calculator and to return to the consideration of SOC at a later date.

CARB has expressed concern that allowing site-specific agricultural inputs could result in a leakage problem where projects with low-CI farming practices would report site-specific data while projects with higher emissions would report average values. The LCFS program's success illustrates that industry will follow market incentives toward compliance. To that end, POET recommends that feedstocks not participating in the identify-preserved program could be assigned a CI value of the default CA-GREET score with an adder or multiplier supplementing the CI value to correct for this leakage effect. This will send the appropriate market signal to farmers, incentivizing them to adopt individualized scoring and the accompanying sustainable farming techniques that reduce scores. Even in the absence of a multiplier or adder, however, POET believes that average CI values for farming practices will decrease as lower CI farming practices gather momentum and usage. If the LCFS program's farming practices average values are accurate and updated periodically, leakage will not be a significant issue because the widespread adoption and standardization of lower-CI farming practices will drive down the average.

* * *

POET strongly supports CARB's LCFS Program. We appreciate CARB's consideration of these comments and look forward to engaging in a productive dialogue with CARB on the LCFS program and the role biofuels play in helping California achieve its GHG reduction goals. If you have any questions, please contact me at Janie.Kilgore@POET.COM or (202)756-5603.

Sincerely,



Janie Kilgore
Associate Regulatory Counsel
POET, LLC