Low Carbon Fuels Coalition

March 15, 2023

Cheryl Laskowski
Branch Chief, Transportation
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

RE: Recommendation to Recognize Climate Smart Agriculture within CA-GREET, and Request for Issue Inclusion in Future LCFS Workshop

(Comment submitted electronically)

Dear Dr. Laskowski,

This letter presents a limited scope proposal designed as a first step toward recognizing climate smart agriculture ("CSA") within the Low Carbon Fuel Standard ("LCFS"). This proposal is supported by a broad group of industry stakeholders including farmers, low carbon fuel producers, non-governmental organizations, and trade associations. We are recommending that the California Air Resources Board ("CARB") recognize certain farming practices that enable feedstock to be produced in a less carbon intensive manner. Specifically, we are encouraging CARB to recognize within the next iteration of the CA-GREET model incremental carbon intensity ("CI") reductions in feedstocks that result from adoption of the following CSA farming practices: the application of green ammonia; the reduced application of fertilizers; the reduced use of fuel in farm equipment used to grow crops; and the achievement of high yield rates (collectively, the "CSA Farming Practices"). We would recommend that the total feedstock CI reduction for a qualifying fuel pathway would be based on the aggregate net reduction achieved for all of the CSA Farming Practices as compared to the Tier 1 CA-GREET calculator standard value for these feedstock CI components.

We are confident that additional climate smart farming practices including changes in tillage practices and cover crops would provide substantial further CI reduction opportunities. Due to this vast potential, this letter references scientific research and analysis pertaining to the full GHG reduction that soil carbon sequestration provides. However, the letter proposes that for this rulemaking that CARB recognize only the most verifiable and impactful CSA farming practices. This limited proposal is based on the feedback that we have received that CARB has concerns regarding the feasibility of integrating soil carbon components during this rulemaking. We appreciate and respect the significant discussions and engagement that CARB staff and management has had with CSA stakeholders during this rulemaking on these issues. To supplement these valuable discussions, we request that CARB include discussion of the potential integration of CSA Farming Practices into the LCFS regulation as a topic for an upcoming informal workshop to receive additional stakeholder input.

We also encourage CARB to establish a process for expanding the scope of recognized CSA practices including soil carbon sequestration in future rulemakings. By recognizing CSA in CA-GREET and in LCFS pathways, CARB would take a leadership role in incentivizing climate-smart farming practices in all locations that grow feedstock for LCFS fuel pathways, build knowledge regarding the short and long-term effectiveness of various CSA strategies, and speed fulfillment of California's aggressive decarbonization goals.

GHG Reduction Potential of the Proposal

Feedstock production drives a significant portion of the carbon intensity (CI) of biofuels (for example, up to 30% of the CI for LCFS-qualifying corn ethanol). Incentivizing efficiencies in this area could deliver significant emissions reductions for the LCFS program. For example, N_2O emissions make up the bulk of the carbon intensity score for corn farming, but the USDA estimates that 40-80% of agricultural fertilizers—a significant driver of N_2O emissions—never make it into crops and are lost to the environment due to inefficient and improper fertilizer application.[1] Similarly, a 2021 study from Argonne National Lab found that 80% of corn acres in the U.S. have a surplus of nitrogen due to overapplication of fertilizers.[2] Modest improvements in this area could reduce emissions and improve water quality without negatively impacting yield.

We recognize that there may be trade-offs in GHG reductions between the CSA Farming Practices. For instance, the use of more fertilizer may result in higher yields. To address this issue, our proposal requires that all of the CSA Farming Practices be reported to CARB and be subjected to verification.

The anticipated benefits of the proposal are outlined in Exhibit A. Exhibit A depicts the carbon intensity reductions that the recognition of the CSA Farming Practices would be expected to provide relative to corn starch ethanol feedstock. From a percentage standpoint, the combined impact of a 20% farm fuel reduction, 20% fertilizer reduction, 20% yield increase and application of green ammonia would result in a 16% overall CI reduction of the feedstock portion of the pathway. In terms of CI score, this would be a CI reduction of 4.4 gCO_2e/MJ. Exhibit B depicts the total anticipated GHG emission reductions that would be achieved in the event that all corn starch ethanol used in the California marketplace was derived from this type of lower carbon intensity feedstock. If all corn starch feedstock utilized to produce ethanol supplied to California was grown using CSA Farming Practices, the total GHG savings are estimated at 474,000 tons per year.[3]

The Importance of Natural Solutions Including Soil Carbon

According to the Intergovernmental Panel on Climate Change ("IPCC"), soil carbon sequestration provides 89% of the global technical GHG emission mitigation potential from

[1] United States Department of Agriculture, "The Nutrient Challenge of Sustainable Fertilizer Management," (February 21, 2017), available at https://www.usda.gov/media/blog/2016/06/07/nutrient-challenge-sustainable-fertilizer-management

[2] Yushua Xia, Hoyoung Kwon, Michelle Wander, "Developing County-Level Data of Nitrogen Fertilizer and Manure Inputs for Corn Production in the United States," (August 2021 Journal of Cleaner Production), available at https://www.sciencedirect.com/science/article/pii/S0959652621011768

[3] See Exhibit B for detail, estimate is based on 470 million bushels of corn.

agriculture.[4] The National Academy estimates that negative emissions technologies will need to deliver ~10 Gt/year of CO_2 removals by 2050 to reach the climate goals of the Paris Agreement. These removals are in addition to the reductions achieved by more efficient and low-CI technologies.[5]

To identify negative emissions pathways that physically remove CO_2 from the atmosphere and strategies that can enable California to meet its goal of achieving carbon neutrality by 2045, the Lawrence Livermore National Laboratory developed the report, Getting to Neutral, Options for Negative Carbon Emissions in California ("Report").[6] The harnessing of the potential of Natural and Working Lands as carbon sinks constitute one of the three central pillars of the Report's strategy, with the authors concluding that California must, "*Capture and store as much carbon as possible through better management of natural and working lands.*"[7]

The Report found that, "These approaches are among the least expensive we examined, averaging $11 per ton of CO_2 removed from the atmosphere." The Report also recognized that these strategies have important co-benefits including improved soil health.[8] The Report went on to state:

> *Natural systems are always the first option for negative emissions, both due to their concomitant advantages (soil health, ecosystem services) and to their generally lower cost… Natural systems have the advantage that their system issues are perhaps the most simple, with the source of the CO_2 being the atmosphere and the ultimate sink being the natural system itself.*[9]

The IPCC has reached a similar conclusion. According to the IPCC 2018 report, the global technical GHG emission mitigation potential from all agriculture exceeds 5 gigatons of CO2e per year. Per the Agriculture chapter's Executive Summary, "Soil carbon sequestration

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[4] Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, B. Scholes, O. Sirotenko, 2007: Agriculture. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, at p. 499 (emphasis in original), available at https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg3-chapter8-1.pdf (last viewed July 16, 2020) (hereafter, 2018 IPCC Agriculture Chapter).

[5] National Academies of Sciences, Engineering, and Medicine. 2019. Negative Emissions Technologies and Reliable Sequestration: A Research Agenda. Washington, DC: The National Academies Press. https://doi.org/10.17226/25259, at p. 400.

[6] Sarah E. Baker, Joshuah K. Stolaroff, George Peridas, Simon H. Pang, Hannah M. Goldstein, Felicia R. Lucci, Wenqin Li, Eric W. Slessarev, Jennifer Pett-Ridge, Frederick J. Ryerson, Jeff L. Wagoner, Whitney Kirkendall, Roger D. Aines, Daniel L. Sanchez, Bodie Cabiyo, Joffre Baker, Sean McCoy, Sam Uden, Ron Runnebaum, Jennifer Wilcox, Peter C. Psarras, Hélène Pilorgé, Noah McQueen, Daniel Maynard, Colin McCormick, Getting to Neutral: Options for Negative Carbon Emissions in California, January, 2020, Lawrence Livermore National Laboratory, LLNL-TR-796100, at p. 29, available at https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf (hereafter "Getting to Neutral Report," footnotes omitted).

[7] Id. at p. 3.

[8] Id. at p. 4.

[9] Id. at p. 15.

(enhanced sinks) is the mechanism responsible for most of the mitigation potential (*high agreement, much evidence*), with an estimated 89% contribution to the technical potential."[10]

In order to achieve these substantial reductions, market signals must be provided to farmers that there are economic rewards for better practices. California's LCFS program can provide a critical market driver for these impactful climate-smart agricultural practices. The United States Department of Energy's Argonne National Laboratory found that "The prevalence of significant acreage that has not been optimized for CI suggests that policy changes that incentivize optimization of this parameter could provide significant additionality over current trends in farm efficiency and adoption of conservation practice."[11]

<u>Policy Benefits</u>

The following policy benefits of CSA recognition were developed through the work of stakeholder groups convened by the Great Plains Institute:

- It compensates farmers, on a purely voluntary basis, for climate-smart farming practices.
- It creates an incentive for continuous improvement to advance sustainable farming practices that sequester carbon and offers improved yields.
- It improves water quality and soil health.
- It will help to achieve scale more quickly and offer significantly more near-term greenhouse gas emission reductions than any voluntary private carbon market programs with much less attractive carbon prices for farmers.

<u>Specific Proposal</u>

The following are the key components of the proposal:

* Pathways that source feedstock grown using the CSA Farming Practices would be eligible to submit a Tier 1 application. The CSA components that CARB determines present the most substantial opportunities for CI reduction would be integrated into the Tier 1 calculator.
* Based on consensus scientific data review, these crop-based feedstock CI reduction factors currently would be fuel reduction, fertilizer reduction, yield increase, and use of green ammonia.
* To be recognized as a low carbon intensity crop-based feedstock, pathway applicants would be required to achieve a minimal reduction threshold of 10% net CI reduction to the feedstock component of the pathway as compared to the standard CI of that feedstock in the Tier 1 CA-GREET calculator.
* Qualifying CSA feedstock would be subject to existing LCFS rules pertaining to specified source feedstocks established by 17 CCR §95488.8(g).
* To ensure LCFS program integrity, mandatory third-party verifications of feedstock would be required for CSA pathway holders.

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[10] 2018 IPCC Agriculture Chapter (full cite at footnote 1), at p. 499.

[11] Michael Wang, Xinyu Liu, Hoyoung Kwon and Daniel Northrup, "Shifting Agricultural Practices to Produce Sustainable, Low Carbon Intensity Feedstocks for Biofuel Production," (July 20, 2020) at p.1 https://iopscience.iop.org/article/10.1088/1748-9326/ab794e

We have provided an example of regulatory language that could be used to enable the use of low-CI feedstock within the LCFS regulatory structure as Exhibit C.

Conclusion

Thank you for your consideration of our input. We would welcome the opportunity to provide any further information that would be value to ARB on this subject.

Respectfully,

Graham Noyes
Executive Director
Low Carbon Fuels Coalition

Exhibit A

GHG Impact of Improved Farming Practices

Prepared by: Steffen Mueller, PhD; Principal Economist, University of Illinois at Chicago Energy Resources Center

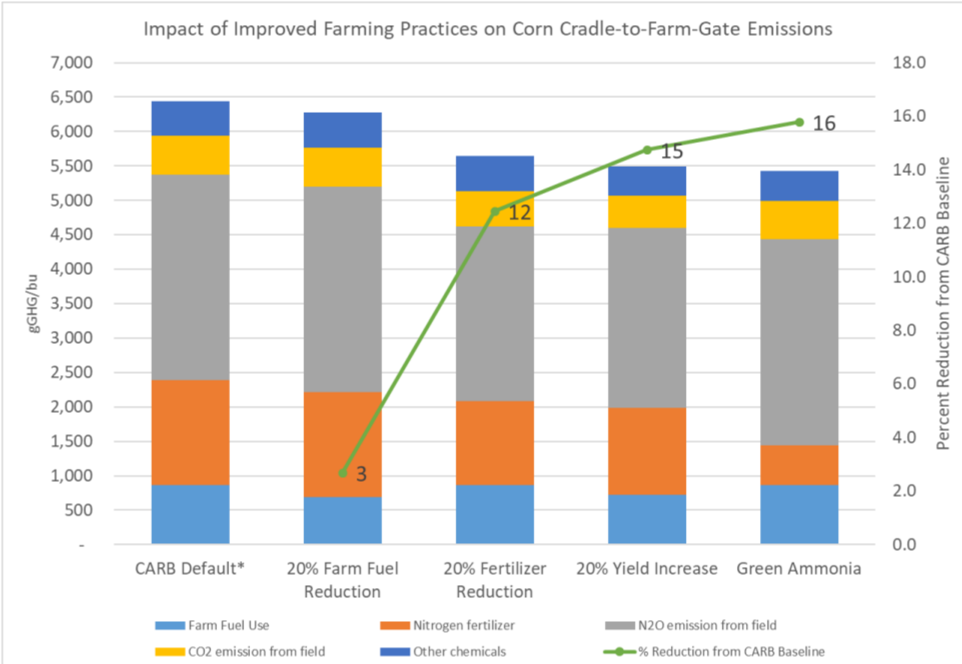


Figure A: GHG emissions per bushel from different climate smart agricultural practices and percent reduction relative to the LCFS baseline value for corn agriculture

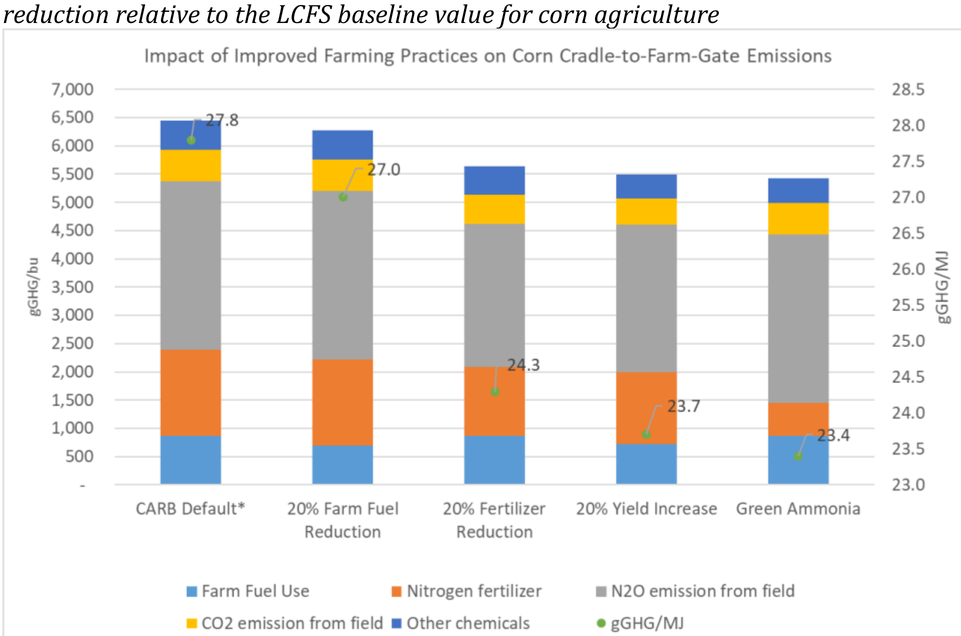
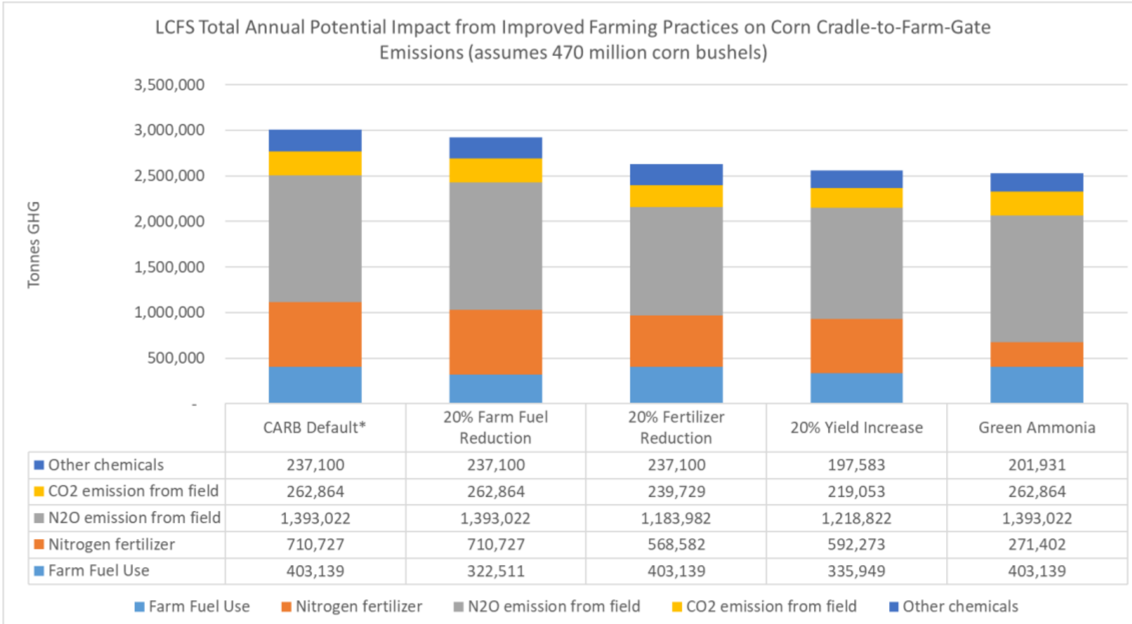
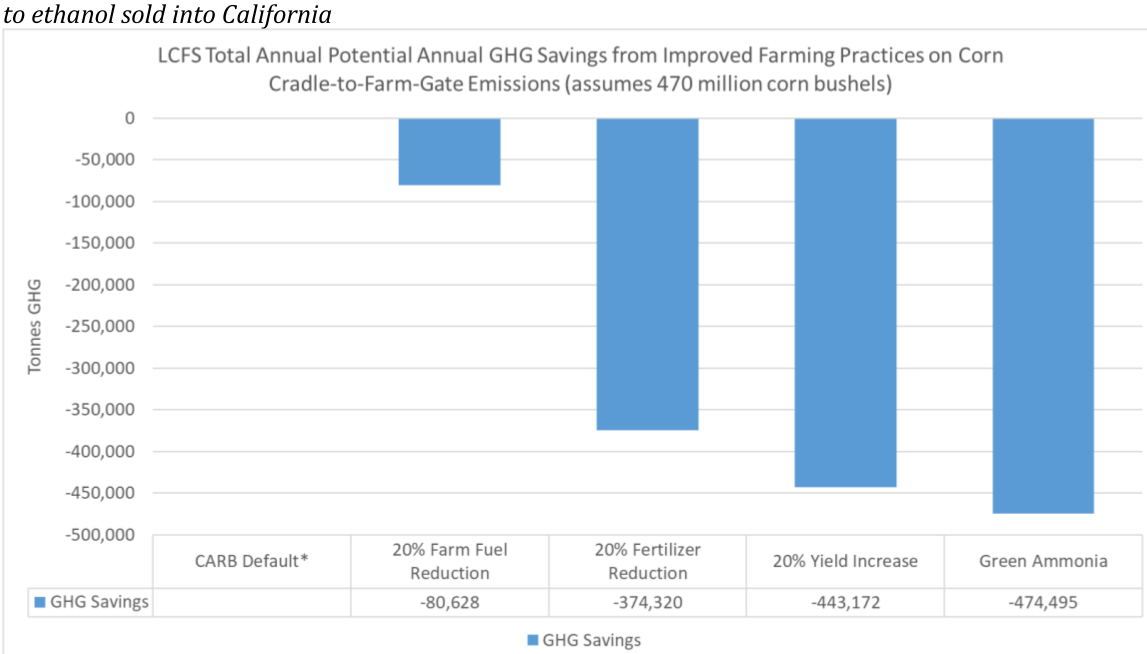


Figure B: GHG emissions per bushel from different climate smart agricultural practices and their carbon intensity impact



	CARB Default*	20% Farm Fuel Reduction	20% Fertilizer Reduction	20% Yield Increase	Green Ammonia
Other chemicals	237,100	237,100	237,100	197,583	201,931
CO2 emission from field	262,864	262,864	239,729	219,053	262,864
N2O emission from field	1,393,022	1,393,022	1,183,982	1,218,822	1,393,022
Nitrogen fertilizer	710,727	710,727	568,582	592,273	271,402
Farm Fuel Use	403,139	322,511	403,139	335,949	403,139

Figure C: GHG emissions from different climate smart agricultural practices for corn bushels converted to ethanol sold into California



	CARB Default*	20% Farm Fuel Reduction	20% Fertilizer Reduction	20% Yield Increase	Green Ammonia
GHG Savings		-80,628	-374,320	-443,172	-474,495

Figure D: Net GHG emissions reductions from different climate smart agricultural practices for corn bushels converted to ethanol sold into California

Exhibit C

Specified Source Provision from LCFS Regulation with Recommended Revisions in marked text:

§95488.8: Fuel Pathway Application Requirements Applying to All Classifications.

(...)

(g) *Specified Source Feedstocks.*

(1) *Pathways Utilizing a Specified Source Feedstock.* In order to be eligible for a reduced CI that reflects the lower emissions or credit associated with the use of a waste, residue, by-product or similar material as feedstock in a fuel pathway, fuel pathway applicants must meet the following requirements.

(A) *Specified source feedstocks include:*

1. Used cooking oil, animal fats, fish oil, yellow grease, distiller's corn oil, distiller's sorghum oil, brown grease, and other fats/oils/greases that are the non-primary products of commercial or industrial processes for food, fuel or other consumer products, which are used as feedstocks in pathways for biodiesel, renewable diesel, alternative jet fuel, and co-processed refinery products;
2. Biomethane supplied using book-and-claim accounting pursuant to section 95488.8(i)(2) and is claimed as feedstock in pathways for bio-CNG, bio-LNG, bio-L-CNG, and hydrogen via steam methane reformation;
3. Any feedstock whose supplier applies for separate CARB recognition using site-specific CI data;
4. Crop-based feedstocks such as corn starch and soy oil that are at least 10% lower in carbon intensity as compared with the standard CA-GREET carbon intensity of the feedstock based solely on the aggregated carbon intensity value of the recognized crop-based feedstock carbon intensity reduction factors; and
5. Other feedstocks designated as specified-

source at the time of pathway review and prior to certification.

(B) *Crop-based Carbon Intensity Reduction Factors.*

1. The following are the recognized crop-based feedstock carbon intensity reduction factors as compared to the Tier 1 CA-GREET calculator. All of these factors must be reported and verified.
   a. An increase in yield
   b. The use of green ammonia;
   c. The reduction of fuel use in farming equipment;
   d. The reduction of fertilizer use.

(C) *Chain-of-custody Evidence.* Fuel pathway applicants using specified source feedstocks must maintain either (1) delivery records that show shipments of feedstock type and quantity directly from the point of origin to the fuel production facility, or (2) information from material balance or energy balance systems that control and record the assignment of input characteristics to output quantities at relevant points along the feedstock supply chain between the point of origin and the fuel production facility. Chain- of-custody evidence is used to demonstrate proper characterization and accurate quantity. Chain-of-custody evidence must be provided to the verifier and to CARB upon request. Joint Applicants may assume responsibility for different portions of the chain-of-custody evidence but each such entity must meet the following requirements to be eligible for a pathway that utilizes a specified source feedstock:

1. Maintain records of the type and quantity of feedstock obtained from each supplier, including Feedstock transaction records, Feedstock Transfer Documents pursuant to section 95488.8(g)(1)(C), weighbridge tickets, bills of lading or other documentation for all incoming and outgoing feedstocks;
2. Maintain records used for material balance

and energy balance calculations.

3. Ensure CARB staff and verifier access to audit feedstock suppliers to demonstrate proper accounting of attributes and conformance with certified CI data.

(D) *Feedstock Transfer Documents.* A feedstock transfer document must prominently state the information specified below.

1. Transferor Company name, address and contact information;
2. Recipient Company name, address and contact information;
3. Type and amount of feedstock, including units;
4. Transaction date.