July 17, 2020

James Duffy
Branch Chief, Transportation Fuels Branch
California Air Resources Board
Industrial Strategies Division
P.O. Box 2815
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RE: Inclusion of field-based in the Low Carbon Fuel Standard – Comments to the Fuels and Infrastructure for a Carbon Neutral Economy Workshop – July 15, 2020

Dear Mr. Duffy:

Indigo Agriculture (Indigo Ag) applauds the significant efforts by the California Air Resources Board (CARB) to reduce the greenhouse gas (GHG) emissions from transportation since the passage of the Global Warming Solutions Act (AB32) in 2006. Unfortunately, while the state has decreased statewide GHG emissions 14 percent since their peak in 2004, emissions from transportation have increased every year since 2013 and transportation now accounts for more than 40 percent of the state's emissions.[1] Furthermore, transportation fuels won't be eliminated any time soon. According to CARB data, approximately 40 percent of light duty vehicles, approximately 20 million vehicles, will still contain internal combustion engines by 2050.[2] An even higher percentage of heavy-duty vehicles and aviation will require liquid fuels through 2050. Therefore, it is critically important that the State continues to focus on programs such as the Low Carbon Fuel Standard (LCFS) to reduce the carbon intensity of fuels sold and used in California. Since the LCFS program started in 2011, it has reduced GHG emissions from transportation fuels by more than 47 million metric tons. As the LCFS program prepares for its second decade of operation, we encourage CARB to consider the opportunities that field-based practices can play in generating additional GHG reductions for the LCFS program and support the State's transition to a carbon neutral economy.

Indigo Ag uses microbiology and digital technology to improve the quality, yields and environmental sustainability of agriculture. We are now expanding our expertise to streamline the ability of farms to tap into environmental markets. Using a combination of rigorous testing, biogeochemical models and remote sensing (including satellite analytics), Indigo Ag can accurately determine the current carbon footprint of a farm and implement changes to decrease that footprint. Working with the 7M+ acres that have contracted to be a part of IndigoCarbon, Indigo Ag is helping these growers to decrease net GHG emissions by more than 1 metric ton per acre of farmland.

[1] CARB. California Greenhouse Gas Emission Inventory: 2000-2017, 2019 Edition. p.3-5. https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf
[2] Solecki, M. Presentation at CARB Fuels and Infrastructure for a Carbon Neutral Economy workshop. July 15, 2020. https://ww2.arb.ca.gov/sites/default/files/2020-07/ajw_cn_fuels_infra_july2020.pdf

The State's 2030 LCFS goal is ambitious and will require new technologies and practices if we are to meet it. Agricultural crops can play a significant role in meeting that goal. Historically the cultivation of crops to supply biofuels to the California market has left soils severely depleted – croplands soils around the world have lost on average 26 percent of the carbon in the top 30 cm of soil.[3] Fortunately, the agricultural community recognizes the importance of soil carbon and is working to restore it. According to the National Academy of Sciences, there are many conservation practices that can "increase carbon stocks in soils and are successfully practiced by progressive farmers and ranchers."[4] Furthermore, these practices are not limited to their GHG benefits; they provide "additional ecosystem service benefits, including watershed protection, increased biodiversity, and improved soil health and fertility."[5] A recent study by Argonne National Laboratory, creator of the GREET model used to calculate the carbon intensity (CI) of fuels in California, has estimated that field-based practices can reduce the CI of gasoline or diesel by as much as 44.4 g CO_2/MJ.[6]

To quantify the GHG reductions from field-based practices, we are proposing a two-tiered method consisting of a biogeochemical model supported by field sampling to quantify the reductions in GHG fluxes from the grain used to create biofuels. Biogeochemical models are increasingly being used to calculate the methane, nitrous oxide (N_2O), and carbon sequestration from agronomic practices. A recent paper demonstrated that these models are capable of calculating seasonal and annual total N_2O emissions from a diverse array of crops and these calculations are more accurate "than the Intergovernmental Panel on Climate Change emission factor approach."[7] The State already uses biogeochemical models to calculate N_2O emissions from agricultural soil management in croplands.[8] These same models will be used in future versions of the State's Natural and Working Land Inventory for the calculation of soil carbon fluxes.[9]

We recognize that there is uncertainty in the use of any models or calculation methodologies. This is particularly true for the sequestration of carbon in the soil. To address this challenge, we advocate for routine soil sampling to confirm the results of any model. The cost of measuring soil carbon has decreased to the point where it can be broadly scaled up. Therefore, the practices farmers implement that reduce a fuel's CI can be supported by the sampling and analysis of the fields at least every five years. This measurement approach provides a reconciliation between the modeled and directly measured approaches and ensures that the practices farmers implement are improving the fuel's CI. In addition, these samples can be used to further develop and improve the accuracy of these models.

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[3] Sanderman, J., Hengl, T., Fiske, G.J. Soil carbon debt of 12,000 years of human land use. *Proceedings of the National Academy of Sciences of the United States of America* 114 (36) 9575-9580 (2017). https://doi.org/10.1073/pnas.1706103114

[4] 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.

[5] ibid.

[6] Liu, X. et. al. Shifting agricultural practices to produce sustainable, low carbon intensity feedstocks for biofuel production. *Environ. Res. Lett.* (2020) in press. https://doi.org/10.1088/1748-9326/ab794e

[7] Deng, J., Li, C., Burger, M., Horwath, W. R., Smart, D., Six, J., et al. (2018). Assessing short-term impacts of management practices on N_2O emissions from diverse Mediterranean agricultural ecosystems using a biogeochemical model. *Journal of Geophysical Research: Biogeosciences*, 123, 1557–1571. https://doi.org/10.1029/2017JG004260

[8] CARB. CARB GHG Inventory Updates Documentation, 2018 Edition. p.8. https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_00-16_method_update_document.pdf

[9] CARB. Technical Support Document for the Natural & Working Lands Inventory. December 2018 Draft. p.87. https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory_technical.pdf

We encourage the Transportation Fuels Branch to include the crediting of field-based practices in the next update of the LCFS regulations. We believe these practices can generate valuable GHG reductions from the production fuels as well as protect watersheds, increase biodiversity, and improve soil health and fertility.

CARB has done a tremendous job developing programs to reduce the GHG emissions from transportation and the inclusion of field-based practices will continue the State's leadership. We thank CARB for this opportunity to offer these comments and look forward to continued collaboration to implement policies and strategies that further reduce emissions from the transportation sector.

Sincerely,

Ed Smith
Vice President, Carbon
Indigo