



November 4, 2020

Rajinder Sahota  
Chief, Industrial Strategies Division  
California Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95812

RE: Inclusion of field-based practices in the Low Carbon Fuel Standard – Response to the Low Carbon Fuel Standard Public Workshop to Discuss Potential Regulation Revisions– October 14 and 15, 2020

Dear Ms. Sahota:

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.<sup>1</sup> Even with the Governor's goal that 100 percent of in-state sales of new passenger cars and trucks be zero-emission by 2035 and 100 percent of medium- and heavy-duty vehicles in the State be zero-emission by 2045,<sup>2</sup> transportation fuels won't be eliminated any time soon. According to CARB's own analysis, approximately 40 percent of light duty vehicles, approximately 20 million vehicles, will still contain internal combustion engines by 2050.<sup>3</sup> 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 innovative and market-based 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.<sup>4</sup> As the LCFS program prepares for its second decade of operation, we encourage CARB to consider the opportunities that field-based agricultural 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

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<sup>1</sup> CARB (2019) 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](https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf)

<sup>2</sup> Office of Governor Gavin Newsom. (September 23, 2020) Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California's Fight Against Climate Change. <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-text.pdf>

<sup>3</sup> Solecki, M. (July 15, 2020). Presentation at CARB Fuels and Infrastructure for a Carbon Neutral Economy workshop. [https://ww2.arb.ca.gov/sites/default/files/2020-07/ajw\\_cn\\_fuels\\_infra\\_july2020.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-07/ajw_cn_fuels_infra_july2020.pdf)

<sup>4</sup> CARB (May 16, 2019) Cleaner fuels have now replaced more than 3 billion gallons of diesel fuel under the Low Carbon Fuel Standard. <https://ww2.arb.ca.gov/news/cleaner-fuels-have-now-replaced-more-3-billion-gallons-diesel-fuel-under-low-carbon-fuel>

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.

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.<sup>5</sup> 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.”<sup>6</sup> 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.”<sup>7</sup>

In July 2020, Argonne National Laboratory, creator of the GREET model used to calculate the carbon intensity (CI) of fuels in California, published a paper estimating that field-based practices can reduce the CI of gasoline or diesel by as much as 44.4 g CO<sub>2</sub>/MJ.<sup>8</sup> At the October 15 CARB workshop, Farmers Business Network and POET presented their approach and discussed their pilot using the latest version of the GREET model. Through a pilot on more than 126,000 acres generating more than 7.5 million bushels of grain, they demonstrated that farmers could reduce the GHG emissions associated with the cultivation of corn by 25 percent.<sup>9</sup>

Indigo Ag strongly supports the crediting of field-based practices through the LCFS. Practices such as cover crops, conservation tillage, and crop rotations all show the potential to reduce nitrous oxide (N<sub>2</sub>O) emissions and increase soil organic carbon. Unfortunately, these valuable practices are not widely adopted. For example, conservation tillage practices have been implemented on less than 2 percent of cropland acres in California’s Central Valley.<sup>10</sup> Long-term studies in the San Joaquin Valley have demonstrated that no-till and cover cropping can increase soil carbon by more than 11 metric tons per

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<sup>5</sup> Sanderman, J., Hengl, T., Fiske, G.J. (2017) 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. <https://doi.org/10.1073/pnas.1706103114>

<sup>6</sup> 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>

<sup>7</sup> *ibid.*

<sup>8</sup> Liu, X. et. al. (2020) Shifting agricultural practices to produce sustainable, low carbon intensity feedstocks for biofuel production. *Environ. Res. Lett.* <https://doi.org/10.1088/1748-9326/ab794e>

<sup>9</sup> Farmers Business Network and Poet. Identity Preserved Low Carbon Grain (October 15, 2020) Presentation at the Low Carbon Fuel Standard Public Workshop to Discuss Potential Regulation Revisions. [https://ww2.arb.ca.gov/sites/default/files/2020-10/101520presentation\\_fbn-poet.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-10/101520presentation_fbn-poet.pdf)

<sup>10</sup> Mitchell, J.P., Klonsky, K., Shrestha, A., Fry, R., DuSault, A., Beyer, J., Harben, R. (2007) Adoption of conservation tillage in California: current status and future perspectives. *Aust. J. Exp. Agric.* 47 (12), 1383–1388.

acre.<sup>11</sup> Comparable long-term studies have been conducted in other regions of North America with similar results.<sup>12, 13</sup>

We propose adding field-based practices to the LCFS through the same process renewable natural gas has been included in the program. Dairies currently use CARB's Compliance Offset Protocol for Livestock Projects to quantify, monitor and verify the generation of renewable natural gas by dairy digesters. This same approach could be used to include field-based farming practices in the program.

The Climate Action Reserve<sup>14</sup> and Verified Carbon Standard<sup>15</sup> recently adopted carbon offset protocols which use a two-pronged approach to quantify the GHG reductions from field-based practices. This approach uses a biogeochemical model supported by field sampling to quantify the net changes in GHG emissions from implementing practices on croplands. Biogeochemical models are increasingly being used to calculate the methane, N<sub>2</sub>O, and carbon sequestration from agronomic practices. A recent paper demonstrated that these models are capable of calculating seasonal and annual N<sub>2</sub>O emissions from a diverse array of crops and these calculations are more accurate "than the Intergovernmental Panel on Climate Change emission factor approach."<sup>16</sup> The State already uses biogeochemical models to calculate N<sub>2</sub>O emissions from agricultural soil management in croplands.<sup>17</sup> 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.<sup>18</sup>

We recognize there is uncertainty in the use of any model or calculation methodology. The protocols address this uncertainty through routine soil sampling to confirm the results from the biogeochemical model. This is possible because 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 both by a detailed model and 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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<sup>11</sup> Mitchell, J.P., et. al. (2017) Cover cropping and no-tillage improve soil health in an arid irrigated cropping system in California's San Joaquin Valley, USA. *Soil & Tillage Research*. 165. 325–335. <http://dx.doi.org/10.1016/j.still.2016.09.001>

<sup>12</sup> Chahal, I., Vyn, R. J., Mayers, D., Van Eerd, L. L. (2020) Cumulative impact of cover crops on soil carbon sequestration and profitability in a temperate humid climate. *Scientific Reports*. 10 (13381). <https://doi.org/10.1038/s41598-020-70224-6>

<sup>13</sup> Olson, K., Ebelhar, S. A., Lang, J. M. (2014) Long-Term Effects of Cover Crops on Crop Yields, Soil Organic Carbon Stocks and Sequestration. *Open Journal of Soil Science*. 4, 284-292. <http://dx.doi.org/10.4236/ojss.2014.48030>

<sup>14</sup> Climate Action Reserve (September 30, 2020) Soil Enrichment Protocol. Version 1.0 <https://www.climateactionreserve.org/how/protocols/soil-enrichment/>

<sup>15</sup> Verified Carbon Standard (October 19, 2020) Methodology for Improved Agricultural Land Management. Version 1.0. [https://verra.org/wp-content/uploads/2020/10/VM0042\\_Methodology-for-Improved-Agricultural-Land-Management\\_v1.0.pdf](https://verra.org/wp-content/uploads/2020/10/VM0042_Methodology-for-Improved-Agricultural-Land-Management_v1.0.pdf)

<sup>16</sup> 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<sub>2</sub>O emissions from diverse Mediterranean agricultural ecosystems using a biogeochemical model. *Journal of Geophysical Research: Biogeosciences*, 123, 1557–1571. <https://doi.org/10.1029/2017JG004260>

<sup>17</sup> CARB (2018) CARB GHG Inventory Updates Documentation. p.8. [https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2016/ghg\\_inventory\\_00-16\\_method\\_update\\_document.pdf](https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_00-16_method_update_document.pdf)

<sup>18</sup> CARB (December 2018) Technical Support Document for the Natural & Working Lands Inventory. p.87. [https://ww3.arb.ca.gov/cc/inventory/pubs/nwl\\_inventory\\_technical.pdf](https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory_technical.pdf)



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We encourage the Transportation Fuels Branch to include the crediting of field-based practices in the update of the LCFS regulations scheduled to take effect in January of 2023. 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,

A handwritten signature in black ink, appearing to read "Ed Smith", is written over a light blue horizontal line.

Ed Smith  
Vice President, Carbon  
Indigo