WORLD RESOURCES INSTITUTE

September 26, 2023

Liane Randolph, Chair
California Air Resources Board

Re: Risk that planned revisions to the Low Carbon Fuel Standard could increase, rather than reduce greenhouse gas emissions.

Dear Liane,

I write to call your attention to a serious risk that proposed revisions to the Low Carbon Fuel Standard currently being developed by CARB staff could have the unintended consequence of increasing greenhouse gas emissions, rather than lowering them, by driving a large increase in consumption of crop-based biofuels that result in greater emissions than petroleum-based transportation fuels. To prevent this perverse outcome, I urge CARB to establish a cap on the use of crop-based biofuels for LCFS compliance at 2022 levels while it revises its approach to calculating the Carbon Intensity of such fuels to properly account for their impacts on land use.

To be clear, I strongly support the LCFS and the proposal to strengthen its 2030 target. The LCFS has the potential to substantially help California meet its climate goals by accelerating transportation electrification and promoting innovation in the use of waste-based biofuels (such as woody materials removed from California forests to reduce wildfire risks). In the absence of appropriate safeguards, however, the LCFS could drive a large increase in biomass-based diesel (BBD) made from crops, which would undermine the goals of the program.

Until recently most BBD used for LCFS compliance has come from waste fats, oils, and greases, but the supply of these feedstocks is limited. As a result, recent increases in BBD supply to California and expected future increases would mostly be produced from virgin vegetable oils.[1] Two Bay Area California refineries have received approval to increase their renewable diesel production capacity to 1.8 billion gallons per year, and according to one estimate California consumption of BBD made from virgin vegetable oils could increase by more than 1 billion gallons by 2030.[2] CARB itself projects a more modest, but still significant increase in BBD consumption to more than 2 billion gallons in 2025 under the proposed amendments to the LCFS, after which BBD volumes are projected to decline somewhat as electricity becomes the dominant alternative fuel in California.[3]

[1] https://theicct.org/publication/lipids-cap-ca-lcfs-aug22/
[2] NRDC letter to CARB, June 14, 2023.
[3] CARB Standardized Regulatory Impact Assessment, September 8, 2023.

As discussed in detail in comments filed by Earthjustice and World Resources Institute as part of the federal Renewable Fuels Standard Set Rule process (attached[4]), scientific studies that account for the full opportunity cost of devoting productive farmland to biofuel production rather than food production or carbon sequestration find that crop-based biofuels increase, rather than decrease, GHG emissions.

This is particularly true of biomass-based diesel (BBD), such as renewable diesel made from soybean or other virgin vegetable oils, given the relatively low per acre yields of oil crops compared to corn (even when fully allocating the energy or economic value of biproducts such as soybean meal). The U.S. EPA examined this issue in a Model Comparison Exercise Technical Document[5] released alongside of the final RFS Set Rule and found that a hypothetical 1 billion gallon increase in soybean biodiesel demand would result in net increases in GHG emissions according to two of the three energy and land-use models they used (see attached article published by WRI[6]). Earthjustice has filed a petition for judicial review of the final RFS Set rule on behalf of the National Wildlife Federation based, in part, on EPA's failure to consider this analysis in setting the RFS volume requirements in this rule.[7]

An alternative result would make little sense. Soybeans and corn in the U.S. typically use the same lands in rotation. It is the diversion of land that ultimately incurs the cost of replacing food elsewhere. In fact, an evaluation of how much carbon is lost globally from vegetation and soils to produce a megajoule of soybean oil found that these emissions were roughly double those of corn ethanol and roughly four-fold the fossil emissions displaced[8]. Net increases in emissions are particularly likely given the fungibility of soybean oil and palm oil and the role that palm oil plantations have played in tropical deforestation.

The scale of the potential negative impact of failing to establish safeguards to prevent increased demand for BBD produced from virgin vegetable oil is huge. Assuming increased consumption of 1 billion gallons per year and that the actual carbon intensity of this BBD is 4 times that of petroleum diesel, then the emissions increase (due primarily to global land use impacts) would be 40 million metric tons of CO2-equivalent per year,[9] or more than the total annual benefits estimated for the entire LCFS program.

While this calculation may represent a worst-case scenario, other evidence demonstrates that the implications for global forests and carbon stocks of the treatment of BBD are vast. For example, HEFA from vegetable oil is generally the cheapest alternative aviation fuel. If vegetable oil supplies 25% of the world's likely consumption of aviation fuel in coming decades, the world would have to double global production of vegetable oil, the vast majority of which

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[4] Also available at https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0427-0644
[5] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf
[6] Also available at https://www.wri.org/insights/us-renewable-fuel-standards-emissions-impact
[7] https://earthjustice.org/press/2023/environmental-group-challenges-epas-2023-2025-renewable-fuel-standard-rule-failure-to-fully-consider-climate-and-land-impacts-violates-clean-air-act-and-administrative-procedure-act
[8] *Nature* 564:249 (2018); key chart reproduced on page 17, Table 1 of the attached comments.
[9] (40 kg/gal)(1 billion gal)

would result from the expansion of oil palm and soybean production in the wet tropics, where both are major sources of deforestation and other land use change.

I would also like to bring to your attention two recent papers of great relevance:

> In Merfort et al. authors at the Potsdam Institute for Climate Impact Research used their global land use model to estimate the land use change emissions of high-yielding cellulosic ethanol from energy crops.[10] They found that land use change emissions alone would exceed savings from fossil use over 30 years and beyond in any future scenario absent nearly perfect global protection of forests. This paper adds further weight to the finding that any dedication of land to biofuels has a reasonable likelihood of increasing global emissions.
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> In Richardson et al. a wide pool of distinguished scientists known for their work "planetary boundaries" found that the earth has already transgressed the planetary limit on the world's total use of land and its productive capacity, known as the human appropriation of net primary productivity.[11] Put simply, this paper signifies that the world cannot acceptably add yet more demands on land, such as the dedication of land to bioenergy production.

Fortunately, CARB can avoid the serious risk of perverse outcomes from the LCFS by adopting the simple safeguard of limiting the total volume of crop-based biofuel that can be used for compliance to the level used in 2022. Doing so would prevent lock-in of counter-productive compliance strategies, preserve incentives to improve the environmental performance of biofuels that are used for compliance, and focus investment on electrification, hydrogen, and carbon removal strategies that are central to California's pathway to net zero emissions.

Sincerely,

Dan Lashof, Ph.D.
U.S. Director, World Resources Institute

[10] *Nature Climate Change* 13:610-612 (2022).
[11] *Science Advances* 9:37 (2023).