PAN
PESTICIDE ACTION NETWORK • NORTH AMERICA

CPR
Californians For Pesticide Reform

California Rural Legal Assistance Foundation
Advocates For Justice

CCEJN
CENTRAL CALIFORNIA ENVIRONMENTAL JUSTICE NETWORK

CLEAN WATER ACTION

the climate center

Roots of Change

CVAQ
CENTRAL VALLEY AIR QUALITY COALITION

AGRICULTURE AND LAND-BASED TRAINING ASSOCIATION
ALBA

WHOLLY H2O

PSR LA
Physicians for Social Responsibility
Los Angeles

FACTS
Families Advocating for Chemical & Toxics Safety
A project of
Center for Environmental Health

PSR
SF BAY CHAPTER

January 5, 2022

California Air Resources Board (CARB)
1001 I Street
Sacramento, California, 95814
Submitted Online

Re: 2022 Scoping Plan Update – Natural and Working Lands Scenarios Technical Workshop

Dear Chair Randolph:

Thank you for the opportunity to comment in response to the 2022 Scoping Plan Update: Natural and Working Lands Scenarios Technical Workshop. The undersigned groups strongly support the inclusion of strategies that reduce the agricultural sector's climate impacts in the modeling scenarios. Alternative agricultural systems like agroecology and diversified organic agriculture not only contribute to climate mitigation, adaptation and resilience, but also reduce the use of chemical pesticides and fertilizers. The reduction of synthetic inputs provides critical public health benefits to environmental justice communities fighting for their rights to clean air and water across California. However, the current scenarios fall short of evaluating the full impacts of the proposed management strategies on the climate, public health and equity.

To address these gaps, we urge CARB staff to:
1. Restructure scenarios to model progressive percentage increases in the adoption of all proposed management strategies
2. Evaluate public health and equity outcomes for all management strategies
3. In addition to carbon, model methane and nitrous oxide emissions from agriculture, including from livestock production
4. Model the full life cycle greenhouse gas and public health impacts of fumigant pesticides
5. Include diversified organic agriculture in all scenarios at 30% of total agricultural acreage

1. Restructure scenarios to model progressive percentage increases in the adoption of all proposed management strategies
Currently, the different scenarios emphasize varying management strategies, which, ideally, should be implemented together in order to achieve maximum climate benefits. For instance, organic agriculture is mentioned in Scenario 2, but left out of Scenario 1, and maximizing perennial biomass carbon is mentioned in Scenario 1, but not in Scenario 2. However, both are critical climate solutions that should be incorporated into all scenarios.

We urge CARB staff to create new scenarios that would evaluate progressive percentage increases in adoption rates of all management strategies. For example, Scenario 5 would consider a 0% change in current agricultural management practices, while Scenario 1 would evaluate a 100% adoption rate of all proposed management strategies, such as climate smart agriculture practices, organic agriculture, nutrient cycling and minimal agricultural conversion rates. Scenarios 2-4 would then consider progressive increases in the adoption of all proposed management strategies. Such an approach would ensure that all management practices with the potential to mitigate climate change are incentivized in tandem for maximum climate benefits, instead of a piecemeal approach, which would have a much lesser impact.

2. Evaluate public health and equity outcomes for all management strategies
Industrial agriculture is a dominant source of pollution in many communities across California, particularly for people of color. Industrial agriculture threatens the health of communities through water and air contamination and the overuse of chemical inputs like pesticides. Therefore, it is critical that public health and equity outcomes be included in modeling all management strategies.

The California agricultural sector applies pesticides at a rate 4.5 times higher than the national average,[i] with extensive scientific literature confirming that pesticide exposure causes debilitating and fatal diseases from Parkinson's disease to cancer.[ii] Pesticide use is highly concentrated in areas with higher numbers of residents of color. For instance, research by the California Environmental Protection Agency found that "60% of zip codes with the highest proportion of residents of color host >95% of agricultural pesticide use in the state."[iii]

Industrial agriculture's health impacts extend beyond pesticide impacts. For instance, a recent study showed that fine particulate matter (PM 2.5) air pollution related to agriculture causes 15,900 deaths in the US per year, with California as the state with the highest number of associated deaths concentrated in predominantly Latinx counties.[iv] Another study found agricultural soils to be a major source of nitrogen oxide emissions – a main component of air pollution – estimating agricultural soils make up 20 to 51% of the state's nitrogen oxide budget.[v] Additionally, conventional agriculture is a predominant source of water pollution. Nitrate leaching is a leading source of water pollution in California, also affecting predominantly Latinx communities in California.[vi]

Given the historical inequities and environmental injustices created by industrial agriculture, it's critical that public health and equity outcomes be considered not only for all scenarios, but for all proposed management strategies. Modeling public health and equity is particularly important given that certain agricultural management practices labeled "climate-smart", such as reduced till, no-till or even cover cropping practices can cause increases in pesticide dependence and usage in conventional agricultural systems.[vii] Therefore, strong goals

and incentives to reduce pesticide use must be put in place as part of the Scoping Plan process to serve as guardrails to prevent an increase in pesticide use. **We recommend a target of a 50% reduction in synthetic pesticide use by 2030, mirroring the E.U.'s Farm to Fork Strategy.**

Importantly, we strongly oppose carbon offsets, credits, or any carbon market benefits for producers that adopt more climate-friendly practices, as this approach can de-emphasize climate mitigation through reduction in fossil fuel use. The EJAC should be a critical thought partner and decision-maker during the public health modeling process.

3. In addition to carbon, model methane and nitrous oxide emissions from agriculture, including from livestock production

In addition to carbon, the modeling scenarios must also include methane and nitrous oxide emissions, given their large contributions to total emissions from the agricultural sector.

As CARB cites, dairy and livestock make up more than half of California's total methane emissions. The EPA also estimates that agricultural soil management practices, such as the applications of synthetic fertilizers, make up 75.4% of total US nitrous oxide emissions.[viii] Therefore, the agricultural sector, and livestock sector in particular, is a significant contributor to both methane and nitrous oxide emissions, and these contributions must be modeled and included in the scenarios and Scoping Plan if California is to meet its climate neutrality goal.

Furthermore, management practices that increase soil carbon sequestration can increase other greenhouse gas emissions, and these effects must be evaluated and modeled. For instance, given the close coupling between carbon and nitrogen cycles, multiple studies show a positive correlation between increased soil organic carbon and nitrous oxide emissions, with research demonstrating that nitrous oxide emissions have the potential to offset carbon sequestration benefits from certain agricultural management practices, such as reduced tillage, enhanced crop residue incorporation, and manure application.[ix] Therefore, given these potential tradeoffs and their significant contributions to California's total greenhouse gas emissions, methane, nitrous oxide and livestock emissions should be included and modeled in the scenarios.

4. Model the full life cycle greenhouse gas and public health impacts of fumigant pesticides

Fumigants, a type of pesticide applied to soil, pose special public health hazards and contribute to greenhouse gas emissions from cradle to grave. Approximately 38 million pounds of fumigants are applied each year in California, making up about 20% of all pesticides used in California.[x] All 19 fumigants registered in California are listed by the state as Toxic Air Contaminants.[xi] They are among the most toxic and drift-prone pesticides used in the state and must be modeled in the NWL scenarios due to their contributions to greenhouse gas emissions, particularly tropospheric ozone and nitrous oxide emissions.

Fumigants contribute to the formation of Volatile Organic Compounds (VOCs), creating smog as well as tropospheric ozone (O_3)[xii], the third most important greenhouse gas after carbon dioxide (CO_2) and methane (CH_4).[xiii] In addition, at least three fumigants, chloropicrin, metam-sodium, and dazomet, significantly increase nitrous oxide emissions 7- to 100-fold, a greenhouse gas 300 times more potent than carbon dioxide.[xiv] Compared to fertilizer-induced nitrous oxide emissions, which generally return to background rates within two weeks after application, the effect of fumigant-induced nitrous oxide emissions were found to last more than 48 days.[xv] Approximately 20 million pounds of these three fumigants are used in California each year.[xvi] Other fumigants can serve as greenhouse gases themselves; sulfuryl fluoride, the use of which in California makes up 50-60% all global use, has a Global Warming Potential of 6,840.[xvii]

All stages of fumigants' lifecycle can contribute to greenhouse gas emissions, including extraction of raw materials, manufacturing, transportation, storage, application, disposal and clean up. Chemical production, including pesticide manufacturing, is the largest consumer of primary energy in U.S. manufacturing, and many pesticides are in and of themselves petrochemicals, with petrochemical manufacturing being the most energy-intensive of all chemical manufacturing.[xviii] Therefore, we urge CARB staff to study and model full lifecycle greenhouse gas emissions from fumigants in California.

5. Include organic agriculture in all scenarios at 30% of total agricultural acreage
Absent a restructuring of the agricultural scenarios as included in our first recommendation above, we strongly urge CARB staff to include diversified organic agriculture in all modeling scenarios, rather than only Scenario 2 and 4. Increasing diversified organic agriculture has clear applicability to Scenario 1, which emphasizes minimizing disturbances, prioritizing conservation, and maximizing short-term carbon. Diversified organic agriculture is associated with multiple conservation benefits, including increased biodiversity, enhanced ecosystem services, improved soil health, and decreased water pollution.[xix]

Multiple studies and meta-analyses document organic agricultural systems' ability to sequester more carbon relative to conventional agricultural systems[xx], with one study showing organic management to increase soil organic carbon by 36% after 12 years in California cropping systems.[xxi] Recently, UC Davis researchers studying nine different farming systems over a 19-year field trial found **the only farming system that resulted in increased soil organic carbon was the organically-managed system**.[xxii] They estimated a 6.6% increase in soil carbon per year over the 19-year period. Therefore, Scenario 1 must include an increase in organic agriculture in order to meet CARB's goal to "maximize soil carbon stocks" in this scenario.

Scenario 3, which focuses on modeling mixes of current strategies and plans, also leaves out organic agriculture. However, organic agriculture should be considered a current state strategy, given that CDFA incentivizes organic agriculture through the State Organic Program and

includes organic plans in the Conservation Agriculture Planning Grants Program, which is designed to promote conservation plans that mitigate climate change. As mentioned above, organic farming also has clear benefits to biodiversity and therefore should be considered under climate-smart agricultural practices focused on biodiversity in Scenario 3.

Therefore, absent the structural changes to the current scenarios as mentioned in our first recommendation above, we strongly urge CARB staff to model organic agriculture in all scenarios. **The scenarios should model 30% of total farmland as under organic production by 2030, similar to the E.U. Farm to Fork Strategy, in order to achieve the maximum climate, conservation and public health benefits of organic agriculture that Californians urgently need.**

Thank you for the opportunity to comment, and we are available to discuss any of the above recommendations with CARB staff.

Sincerely,

Asha Sharma, Organizing Co-Director
Pesticide Action Network

Jane Sellen and Sarah Aird, Co-Directors
Californians for Pesticide Reform

Anne Katten, Pesticide and Work Health and Safety Specialist
California Rural Legal Assistance Foundation

Michael R. Dimock, Program Director
Roots of Change – a program of the Public Health Institute

Maya Flores, Organizer
SASS

Alastair Iles, Associate Professor
University of California, Berkeley

Ellie Cohen, CEO
The Climate Center

Andria Ventura, Legislative and Policy Director
Clean Water Action

Mechelle Perea-Ryan, FNP/Professor
California Nurses for Environmental Health and Justice

Dr. Elizabeth Dougherty, Director
Wholly H2O

Cristel Jensen, Community Driven Strategist
California Institute for Rural Studies

Catherine Garoupa White, Executive Director
Central Valley Air Quality Coalition

Robert M. Gould, MD, President
San Francisco Bay Physicians for Social Responsibility

Martha Arguello, Executive Director
Los Angeles Physicians for Social Responsibility

Patricia Carrillo, Executive Director
Agriculture & Land Based Training Association

Nayamin Martinez, Executive Director
Central California Environmental Justice Network

Catherine Dodd, PhD RN, Advisor
Families Advocating for Chemical & Toxic Safety

[i] Ferguson, Rafter, Kristina Dahl, and Marcia DeLonge. (2019). Farmworkers at Risk: The Growing Dangers of Pesticides and Heat. Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/resources/farmworkers-at-risk.

[ii] Sanborn, M., Kerr, K. J., Sanin, L. H., Cole, D. C., Bassil, K. L., & Vakil, C. (2007). Non-cancer health effects of pesticides: systematic review and implications for family doctors. *Canadian family physician*, *53*(10), 1712-1720.

[iii] Cushing, L., Faust, J., August, L. M., Cendak, R., Wieland, W., & Alexeeff, G. (2015). Racial/ethnic disparities in cumulative environmental health impacts in California: evidence from a statewide environmental justice screening tool (CalEnviroScreen 1.1). *American Journal of Public Health*, 105(11), 2341-2348.

[iv] Domingo, N. G., Balasubramanian, S., Thakrar, S. K., Clark, M. A., Adams, P. J., Marshall, J. D., ... & Hill, J. D. (2021). Air quality–related health damages of food. *Proceedings of the National Academy of Sciences*, *118*(20).

[v] Almaraz, M., Bai, E., Wang, C., Trousdell, J., Conley, S., Faloona, I., & Houlton, B. Z. (2018). Agriculture is a major source of NOx pollution in California. *Science advances*, *4*(1), eaao3477.

[vi]Environmental Working Group. Nitrate in Drinking Water, 2003-2017: California. https://www.ewg.org/interactive-maps/2020-nitrate-pollution-of-drinking-water-for-more-than-20-million-americans-is-getting-worse/ca/.

[vii] Huggins, D. R., & Reganold, J. P. (2008). No-till: the quiet revolution. *Scientific American*, *299*(1), 70-77.

[viii] US Environmental Protection Agency. (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019

[ix] Li, C., Frolking, S., & Butterbach-Bahl, K. (2005). Carbon sequestration in arable soils is likely to increase nitrous oxide emissions, offsetting reductions in climate radiative forcing. *Climatic Change*, 72(3), 321-338.

[x] California Department of Pesticide Regulation. Summary of Pesticide Use Report Data - 2018. https://www.cdpr.ca.gov/docs/pur/pur18rep/18sum.htm.

[xi] California Department of Pesticide Regulation. Toxic Air Contaminant Program. https://www.cdpr.ca.gov/docs/emon/pubs/tacmenu.htm.

[xii] California Department of Pesticide Regulation. Volatile Organic Compound (VOC) Emissions from Pesticides. https://www.cdpr.ca.gov/docs/emon/vocs/vocproj/vocmenu.htm

[xiii] Atmospheric Chemistry and Greenhouse Gases - IPCC https://www.ipcc.ch/site/assets/uploads/2018/03/TAR-04.pdf

[xiv] Spokas, K., & Wang, D. (2003). Stimulation of nitrous oxide production resulted from soil fumigation with chloropicrin. *Atmospheric Environment*, *37*(25), 3501-3507. https://doi.org/10.1016/S1352-2310(03)00412-6; Spokas, K., Wang, D., & Venterea, R. (2005). Greenhouse gas production and emission from a forest nursery soil following fumigation with chloropicrin and methyl isothiocyanate. *Soil Biology and Biochemistry*, *37*(3), 475-485.

[xv] Spokas, K., Wang, D., & Venterea, R. (2005). Greenhouse gas production and emission from a forest nursery soil following fumigation with chloropicrin and methyl isothiocyanate. *Soil Biology and Biochemistry*, *37*(3), 475-485.

[xvi] California Department of Pesticide Regulation. Summary of Pesticide Use Report Data - 2018. https://www.cdpr.ca.gov/docs/pur/pur18rep/18sum.htm.

[xvii] Gallagher, G., Zhan, T., Hsu, Y. K., Gupta, P., Pederson, J., Croes, B., ... & Wolf, K. (2014). High-global warming potential F-gas emissions in California: Comparison of ambient-based versus inventory-based emission estimates, and implications of refined estimates. *Environmental Science & Technology,* 48(2), 1084-1093.

[xviii] Brueske, S., Sabouni, R., Zach, C., & Andres, H. (2012). *US Manufacturing energy use and greenhouse gas emissions analysis* (No. ORNL/TM-2012/504). Oak Ridge National Lab.(ORNL), Oak Ridge, TN (United States); Building Technologies Research and Integration Center.
[xix] Underwood, T., McCullum-Gomez, C., Harmon, A., & Roberts, S. (2011). Organic agriculture supports biodiversity and sustainable food production. *Journal of Hunger & Environmental Nutrition*, *6*(4), 398-423; Bengtsson, J., Ahnström, J., & WEIBULL, A. C. (2005). The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of applied ecology*, *42*(2), 261-269; Kramer, S. B., Reganold, J. P., Glover, J. D., Bohannan, B. J., & Mooney, H. A. (2006). Reduced nitrate leaching and enhanced denitrifier activity and efficiency in organically fertilized soils. *Proceedings of the National Academy of Sciences*, *103*(12), 4522-4527; Cambardella, C. A., Delate, K., & Jaynes, D. B. (2015). Water quality in organic systems. *Sustainable Agriculture Research*, *4*(526-2016-37933); Williams, D. M., Blanco-Canqui, H., Francis, C. A., & Galusha, T. D. (2017). Organic farming and soil physical properties: An assessment after 40 years. *Agronomy journal*, *109*(2), 600-609.
[xx] Gattinger, A., Muller, A., Haeni, M., Skinner, C., Fliessbach, A., Buchmann, N., ... & Niggli, U. (2012). Enhanced top soil carbon stocks under organic farming. *Proceedings of the National Academy of Sciences*, *109*(44), 18226-18231.
[xxi] Horwath, W. R., Devêvre, O. C., Doane, T. A., Kramer, T. W., and van Kessel, C. (2002). Soil carbon sequestration management effects on nitrogen cycling and availability. In "Agricultural Practices and Policies for Carbon Sequestration in Soil" (J. M. Kimble, R. Lal, and R. F. Follett, Eds.), 155–164.
[xxii] Tautges, N. E., Chiartas, J. L., Gaudin, A. C., O'Geen, A. T., Herrera, I., & Scow, K. M. (2019). Deep soil inventories reveal that impacts of cover crops and compost on soil carbon sequestration differ in surface and subsurface soils. *Global Change Biology*, *25*(11), 3753-3766.