July 9, 2021

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

Re: Pesticides must be included in the 2022 Scoping Plan Update

Dear Members of the California Air Resources Board:

On behalf of the Pesticide Action Network (PAN) and the statewide coalition Californians for Pesticide Reform (CPR), we thank you for the opportunity to comment. We urge CARB to include pesticide reduction strategies within the 2022 Scoping Plan Update. Reducing pesticides not only mitigates climate change, but also addresses serious environmental justice concerns affecting predominantly Latinx rural and farm-working communities throughout California.

Pesticide Action Network (PAN) North America is one of five regional centers worldwide representing hundreds of organizations in more than 90 countries. We work to promote the transition to a more just and sustainable food and agriculture system that is free from hazardous pesticides. We represent more than 5,000 California members. The statewide coalition Californians for Pesticide Reform (CPR) is a statewide coalition of 190+ organizations working together to protect public health, improve environmental quality and support a sustainable and just agricultural system by building a diverse movement across California to change statewide and local pesticide policies and practices.

During the Public Workshop Series, we were pleased that agriculture was included as part of the state's climate mitigation strategies for the 2022 Scoping Plan Update under Natural and Working Lands. However, critically missing as part of this discussion is reducing the use of pesticides, which has significant potential to mitigate climate change.

Furthermore, agricultural practices currently emphasized in the Scoping Plan and the Draft California 2030 Natural and Working Lands Climate Change Implementation Plan, such as no-till, could result in an increase in pesticide use unless pesticide reduction is actively incentivized. For instance, a recent meta-analysis of peer-reviewed articles from 1985–2016 showed a greater concentration of atrazine, cyanazine, dicamba, and simazine in runoff from no-till than conventional till fields.[1]

Evidence of the importance of pesticide reduction to achieving both climate change and environmental justice goals is included below. However, in general there is a lack of scientific

[1] Elias, D., Wang, L., & Jacinthe, P. A. (2018). A meta-analysis of pesticide loss in runoff under conventional tillage and no-till management. *Environmental monitoring and assessment*, 190(2), 1-17.

studies that analyze the full, cumulative effects of pesticide production, transport and application on climate change and these numbers could be vastly underestimated.

Pesticides and Climate Change

Numerous studies have concluded that use of synthetic pesticides results in greenhouse gas emissions. Current research provides a compelling case for why the reduction of pesticide use is critical to meeting California's greenhouse gas reduction targets. Some of the most significant studies are highlighted below.

Nitrous Oxide Emissions

- Soil fumigants, which are injected as a gas or applied via irrigation into soil to control weeds, pests and soil borne diseases, can emit nitrous oxide (N_2O). They represent roughly one-fifth of the pesticides used in California. A recent study shows that the application of the third most commonly used fumigant in California -- chloropicrin -- can increase N_2O production by 700-800%[2]. Researchers concluded that similar classes of fumigants would yield similar increases in emissions.
- A later study found that, in addition to chloropicrin, two other fumigants (metam sodium and dazomet) also increase nitrous oxide production significantly.[3] Altogether nearly 20 million pounds of these three fumigants are used every year on California fields.[4] This study didn't consider metam potassium, a common fumigant (approximately 8.5 million pounds are applied in California each year), which we expect would produce the same impact.

Carbon Sequestration

- A recent review of almost 400 studies showed pesticide use was associated with damage to soil invertebrates in more than 70% of the studies.[5] Soil invertebrates are critical to carbon sequestration in soils, being responsible for the formation of more than 50% of soil aggregates, which are essential to building soil organic carbon.[6]
- Research shows that soil microbial activity decreases proportionally to the amount of pesticides applied to the soil.[7] Not only are soil microbes essential for the breakdown of carbon from organic matter, but they also help form stable soil organic carbon and persistent soil organic matter (SOM) through the formation of soil microaggregates,

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[2] Spokas K., Wang D. 2003. Stimulation of nitrous oxide production resulted from soil fumigation with chloropicrin. *Atmospheric Environment* 37 (2003) 3501–3507. https://doi.org/10.1016/S1352-2310(03)00412-6

[3] Spokas K., Wang D., Venterea. R. 2004. Greenhouse gas production and emission from a forest nursery soil following fumigation with chloropicrin and methyl isothiocyanate. *Soil Biology & Biochemistry* 37 (2005): 475–485. https://doi.org/10.1016/j.soilbio.2004.08.010.

[4] Department of Pesticide Regulation annual Pesticide Use Reports. https://www.cdpr.ca.gov/docs/pur/purmain.htm.

[5] Gunstone et al. (2021) Pesticides and Soil Invertebrates: A Hazard Assessment, Frontiers in Environmental Science. 9, 122. https://www.frontiersin.org/article/10.3389/fenvs.2021.643847.

[6] Stork, N. E., and Eggleton, P. (1992). Invertebrates as determinants and indicators of soil quality. Am. J. Altern. Agric. 7, 38–47. doi: 10.1017/S0889189300004446.

[7] AL-Ani, M. A., Hmoshi, R. M., Kanaan, I. A., & Thanoon, A. A. (2019, September). Effect of pesticides on soil microorganisms. *Journal of Physics: Conference Series* (Vol. 1294, No. 7, p. 072007). IOP Publishing.

which protect SOM from decomposition.[8] This process is essential for carbon sequestration in soils.

- Organic agricultural systems, which avoid the use of synthetic fertilizers and pesticides, have been found to significantly reduce greenhouse emissions -- with one study showing organic management to increase soil organic carbon by 36 percent after 12 years in California cropping systems.[9]
- Multiple meta-analyses comparing thousands of farms have shown that organic farming results in higher stable soil organic carbon and reduced nitrous oxide emissions when compared to conventional farming.[10]
    - One meta-analysis of 59 studies found total soil organic carbon to be on average 19% higher in organic than conventional systems.[11]
    - Another metaanalysis found that organic farming practices led to soil organic carbon stocks that were 3.50 ± 1.08 Mg C ha−1 higher than in nonorganic systems over a 14 year period, and could offset 36% of total emissions from the agricultural sector in the United States.[12]

Sulfuryl Fluoride Emissions

- Sulfuryl fluoride is considered a toxic air contaminant and an extremely potent short-lived climate pollutant, reported to have a 20-year Global Warming Potential (GWP) of 6,840. It's also one of the most common agricultural fumigants in the state, with almost 3 million pounds applied in California in 2018.[13] Between 50 to 60% of the entire global usage of sulfuryl fluoride takes place in California.[14] It is an extremely toxic pesticide and a neurotoxin, causing fatalities, illness and disabilities.

Energy Emissions

- Greenhouse gas emissions also occur from pesticide production itself. Pesticide production is an energy-intensive process. One study on drip-irrigated tomato production found pesticides were responsible for 89.5% of carbon emission (15.3 kg C/kg

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[8] Gougoulias, C., Clark, J. M., & Shaw, L. J. (2014). The role of soil microbes in the global carbon cycle: tracking the below−ground microbial processing of plant−derived carbon for manipulating carbon dynamics in agricultural systems. *Journal of the Science of Food and Agriculture*, 94(12), 2362-2371.

[9] Horwath, W. R., Deveˆvre, 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.

[10] Ghabbour E, G. Davies G, Misiewicz T, Alami R, Askounis E, Cuozzo N, Filice A, Haskell J, Moy A, Roach A, and Shade J. 2017. National Comparison of the Total and Sequestered Organic Matter Contents of Conventional and Organic Farm Soils. *Advances in Agronomy*.146: 1-35. https://doi.org/10.1016/bs.agron.2017.07.003.

[11] Lori M., Symnaczik S., Mäder P., De Deyn G., Gattinger A. 2017. Organic farming enhances soil microbial abundance and activity – A meta-analysis and meta-regression. *PLOS ONE*. 25. https://doi.org/10.1371/journal.pone.0180442 July 12.

[12] Gattinger, A., A. Muller, M. Haeni, C. Skinner., A. Fliessbach, N. Buchmann, P. Madder, M. Stolze, P. Smith, N.E. Scialabba, and U. Niggli. 2012. Enhanced topsoil carbon stocks under organic farming, *PNAS*. 109 (44) 18826-18231. https://doi.org/10.1073/pnas.1209429109

[13] Department of Pesticide Regulation annual Pesticide Use Reports. https://www.cdpr.ca.gov/docs/pur/purmain.htm.

[14] 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.

substance) and 61% of agrochemical-GHG emissions (5991 kg CO_2-eq/ha) in this cropping system.[15] These results only accounted for energy from the production, transportation and storage of pesticides.

- A review of multiple studies also shows that organic farming has consistently lower energy use per acre than conventional farming.[16] One study showed energy use to be reduced by up to 53% on organic farms compared to conventional.[17]

Pesticides as a Critical Environmental Justice Issue

In addition to the climate mitigation benefits of reducing pesticides in agriculture, there are significant benefits to rural communities impacted by the overuse of pesticides in industrial agricultural systems:

- Pesticides pollute air and water and impact community health, putting the health of Latinx and farmworker communities at disproportionate risk. According to the latest DPR data, about 20% of the 200 million pounds of pesticides applied each year in California are carcinogenic and many more are linked to a variety of health impacts including asthma, autism, Parkinson's Disease, and developmental and reproductive harms.[18]
- Research by the California Environmental Protection Agency found that "60% of zip codes with the highest proportion of residents of color host [more than] 95% of agricultural pesticide use in the state."[19] Pesticides were one of the top two pollutants whose distribution was most correlated with race and ethnicity.
- In California, more than 90% of farmworkers are from Mexico.[20] Farmworkers and their families experience high rates of exposure to pesticides because of lack of protective clothing or gear, their homes' proximity to pesticide application, crowded and low quality housing, and lack of access to supplies needed to clean work clothes.[21]
- According to DPR, the top counties in terms of overall volume of pesticides applied are the Central Valley counties of Fresno, Kern and Tulare. All three counties are majority Latinx.[22]

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[15] Jones, C. D., Fraisse, C. W., & Ozores-Hampton, M. (2012). Quantification of greenhouse gas emissions from open field-grown Florida tomato production. *Agricultural Systems*, 113, 64-72.

[16] Schader, C., Stolze, M., & Gattinger, A. (2011). Environmental performance of organic farming. *Green Technologies in Food Production and Processing*, 183–210. doi:10.1007/978-1-4614-1587-9_8

[17] Mäder, P., A. Fließbach, D. Dubios, L. Gunst, P. Fried, and U. Niggli. 2002. Soil fertility and biodiversity in organic farming. *Science* 296: 1694–1697.

[18] Department of Pesticide Regulation annual Pesticide Use Reports. https://www.cdpr.ca.gov/docs/pur/purmain.htm.

[19] 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.

[20] https://www.alrb.ca.gov/wp-content/uploads/sites/196/2018/05/CalifFarmLaborForceNAWS.pdf

[21] McCauley, L. A., Lasarev, M. R., Higgins, G., Rothlein, J., Muniz, J., Ebbert, C., & Phillips, J. (2001). Work characteristics and pesticide exposures among migrant agricultural families: a community-based research approach. *Environmental health perspectives*, 109(5), 533-538.

[22] US Census Bureau. https://www.census.gov/quickfacts/fact/table/tularecountycalifornia,kerncountycalifornia,fresnocountycalifornia/PST045219,.

- A 2013 report from the Center for Biological Diversity found that more than half of all glyphosate applications in California occurred in the 8 lowest-income counties in California, with a combined population that is 53% Latinx, compared with 38% for California as a whole.[23]
- Pesticides also put Latinx children in particular at higher risk.
    - Pesticide exposure in children has been linked to severe illnesses including cancer, neurodevelopmental harms and learning disabilities.[24]
    - Data from the California Department of Public Health shows Latinx children are 91% more likely than white children to attend schools near the highest levels of most hazardous pesticide use.[25]
    - Research shows pesticide exposure to be a primary factor contributing to childhood asthma in the San Joaquin Valley.[26] The population of the San Joaquin Valley is 52% Latinx.[27]
    - CDC data show the childhood asthma rate in California is higher than the national average for children (15.4 vs 8.6 percent) and out of the 11 counties in California that have asthma rates over 20 percent, 10 are in rural, agricultural counties.[28]

Despite these facts, CARB's 2019 draft California 2030 Natural and Working Lands Climate Change Implementation Plan failed to mention environmental justice, which should be central to any workshops and recommendations that the Natural and Working Lands Program puts forward. We urge that future iterations of CARB's Scoping Plan and the Natural and Working Lands Climate Change Implementation Plan be amended to ensure environmental justice is fully considered for all recommendations and strategies.

Recommendations

In light of pesticides' climate change impacts and harms to rural and Latinx communities, we urge CARB to:

- Add pesticide reduction and organic farming to the practices under the agriculture pathway that the state will use to meet its AB 32 goals under the Natural and Working Lands program, and include specific acreage and pesticide use reduction goals
- Add the Department of Pesticide Regulation (DPR) as a primary collaborating department with CARB on the 2022 Scoping Plan Update

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[23] Donnaly, N. (2015). Lost in the Mist. *The Center for Biological Diversity.* https://www.biologicaldiversity.org/campaigns/pesticides_reduction/pdfs/LostInTheMist.pdf.

[24] Pesticide Action Network. (2016). Kids on the Frontline: How pesticides are undermining the health of rural children. *Pesticide Action Network North America.*

[25] California Department of Public Health. (2014). Agricultural Pesticide Use Near Public Schools in California. *California Environmental Health Tracking Program.* https://www.phi.org/thought-leadership/agricultural-pesticide-use-near-public-schools-in-california/.

[26] von Glascoe, C. A., & Schwartz, N. A. (2019). Bad lungs/bad air: childhood asthma and ecosyndemics among Mexican immigrant farmworkers of California's San Joaquin Valley. *Human Organization*, 78(2), 110-121.

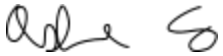
[27] https://cviic.org/wp-content/uploads/2019/01/SJVCRP_Survey_Findings_Report_011819-small.pdf

[28] Pesticide Action Network. (2016). Kids on the Frontline: How pesticides are undermining the health of rural children. *Pesticide Action Network North America.*

- Develop a greenhouse gas measurement tool that enables the state to measure the greenhouse gas emissions of the full life cycle of synthetic pesticides (from production to end use)
- Fully integrate the Environmental Justice Advisory Committee (EJAC) into future Workshops and Board Meetings, rather than schedule separate EJAC sessions, and ensure the committee can provide meaningful input into all pre-scoping activities, research, workshops and the 2022 Scoping Plan itself
- Adopt a holistic approach towards climate change mitigation in agricultural systems that incorporates outcomes to community health rather than agriculture and climate change alone
- We also urge CARB to counter the siloization that has kept pesticides out of prior scoping plans by coordinating efforts across agencies and departments to adopt the following solutions to help move agriculture in California away from reliance on chemical pesticides in support of the state's climate change goals:
    - Align incentives to favor the reduction of pesticide use in agriculture
    - Identify a sustainable funding source to support agroecological and regenerative organic farming. All public funding, research and implementation support should be shifted away from chemical reliance to support agroecological and regenerative organic farming
    - Provide funding, technical assistance and other support to help California farmers transition off of agricultural pesticides to more ecological farming that focuses on prevention of pest and disease problems through building resilience through support of plant vigor and soil health
    - Support the transition to organic farming by subsidizing expenses including the development of organic plans and certification, particularly for farmers of color and small to midsize farms
    - Establish scheduled public procurement goals, requiring government institutions such as public schools, hospitals, prisons, etc., to gradually increase the percentage of their purchases from organic farmers, especially small- and medium-sized operations and farmers of color, with a goal of 100% organic by 2040
    - Allocate resources for studying the long-term impacts of pesticides on human health in California agriculture

Thank you again for the opportunity to comment, and we would welcome a discussion with you or your staff on these topics to address any further questions or comments.

Sincerely,



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