



September 17, 2021

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

Re: Pesticides Must Be Included In the Cap-and-Trade Auction Proceeds Fourth Investment Plan

Dear Members of the California Air Resources Board (CARB):

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 and organic farming strategies within the Fourth Cap-and-Trade Auction Proceeds Investment Plan. While the current draft of the investment plan emphasizes investments in existing programs, such as the Healthy Soils Program, to curb emissions from agriculture, these programs currently leave out organic transition and the reduction of pesticides as mitigation strategies.

The investment plan should include an explicit mention of investing in farming systems that reduce applications of pesticides in order to create a more climate-friendly and equitable agricultural sector. Reducing the use of synthetic pesticides and supporting organic farming not only mitigates climate change, but also addresses serious environmental justice concerns affecting predominantly Latinx rural and farm-working communities throughout California. There is precedent for these interventions, with the 2021 Budget Act including significant funding for sustainable pest management research and technical assistance as well as historic funding to support organic transitions.

We remain extremely concerned that the scientific research and our many letters pointing to the contribution to greenhouse gas emissions from some of California's most heavily used pesticides continue to be disregarded by CARB. Communities around the state and more than 60 other environmental justice, labor, environmental, sustainable ag and public health organizations share our concerns¹. We face a climate and biodiversity crisis that cannot wait.

¹ July 9, 2021 letter signed by 54 organizations to CARB calls for inclusion of pesticides and organic farming in 2022 Scoping Plan:

<https://www.pesticidereform.org/wp-content/uploads/2021/07/Sign-on-comment-letter-to-CARB-re-pesticides-in-scoping-plan-July-2021.pdf>

January 5, 2021 letter signed by 59 organizations to Governor Newsom calling for inclusion of pesticides in 2022 Scoping Plan and Climate Lands Strategy:

<https://www.pesticidereform.org/wp-content/uploads/2021/07/Sign-on-comment-letter-to-CARB-re-pesticides-in-scoping-plan-July-2021.pdf>

Pesticide use inhibits soil's ability to sequester carbon and, at the same time, puts the health of nearby agricultural communities at risk, including children and species that are critically important to our food supply.

We urge CARB not to let another opportunity go by to set benchmarks for transitioning away from reliance on hazardous, drift-prone and highly polluting pesticides that contribute significantly to GHG emissions and inhibit the ability of soil to sequester carbon. We've compiled different ways that pesticides contribute to climate change, directly and indirectly, below.

Commonly-used fumigants contribute to GHG 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 cause increased emissions of nitrous oxide (N₂O). 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 N₂O 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 MITC-producing 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 the MITC-producing fumigant metam potassium, another commonly-applied fumigant of which approximately 8.5 million pounds are applied in California each year, and which we expect would produce the same impact.
- Compared to fertilizer-induced N₂O emissions, which generally return to background rates within 2 weeks after application, the effect of fumigant-induced N₂O emissions were found to last more than 48 days.⁵

At a minimum, we call on CARB to measure and address the GHG contributions of the fumigant pesticides chloropicrin, metam sodium, metam potassium and dazomet and set benchmarks for their reduction or elimination.

Pesticides contribute to formation of GHG tropospheric ozone (O₃)

Eighty to ninety percent of pesticides may volatilize within a few days of application.^{6,7} Volatile organic compounds (VOCs), including pesticide VOCs, react with sunlight and NO_x to form

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](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 Spokas, K., Wang, D., Venterea, R. & Sadowsky, M. (2006) Mechanisms of N₂O production following chloropicrin fumigation. *Applied Soil Ecology* 31, 101-109.

⁶ Majewski, M. S. & Capel, P. D. (1996) Pesticides in the atmosphere: distribution, trends, and governing factors. Vol. 1 (Ann Arbor Press, Inc.; CRC Press).

⁷ Aktar, M. W., Sengupta, D. & Chowdhury, A. (2009) Impact of pesticides use in agriculture: their benefits and hazards. *Interdisciplinary toxicology* 2, 1-12, doi:10.2478/v10102-009-0001-7.

tropospheric ozone (O₃),⁸ a GHG that is harmful to plants and animals. Tropospheric O₃ is **the third most important greenhouse gas** after carbon dioxide (CO₂) and methane (CH₄).⁹ Its abundance is controlled primarily by emissions of CH₄, carbon monoxide (CO), nitrogen oxides (NO_x), and VOCs. VOC pesticides include the fumigants methyl bromide, 1,3-dichloropropene, chloropicrin, metam sodium, metam potassium and dazomet. In California's San Joaquin Valley VOC nonattainment areas, 65% of VOC emissions are from high VOC formulations of non-fumigant pesticides including abamectin, chlorpyrifos, gibberellins and oxyfluorfen.¹⁰ The contribution of these pesticides must also be measured.

Sulfuryl fluoride contributes to GHG emissions

Sulfuryl fluoride is 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 commonly used fumigants in the state, with almost 3 million pounds applied in California in 2018, mainly for structural fumigation but with 0.5 million pounds used for post-harvest fumigation of nuts and other commodities.¹¹ Between 50 to 60% of the entire global usage of sulfuryl fluoride takes place in California.¹² It is also an extremely toxic pesticide and a neurotoxin, which causes illness, disabilities and death. Although CARB has recognized sulfuryl fluoride as a short-lived climate pollutant of concern, to our knowledge CARB has taken no action to curb its use. We call on CARB to incorporate strategies to reduce use of this fumigant.

Synthetic pesticides inhibit the ability of soil to sequester carbon and can lead to increased use of synthetic fertilizers

Synthetic pesticides, through their deleterious effect on microorganisms, decrease the soil's capacity to sequester carbon, build soil organic matter (SOM) and provide the many associated benefits including cycling and provision of nutrients, suppression of phytopathogens, and building resistance to both biotic and abiotic stressors. Pesticide impacts include inhibition of N-fixing bacteria, decreased populations of mycorrhizal fungi, detrimental shifts in nematode populations, and decimation of earthworm populations.¹³ Applications of the common fungicide captan, for example, is associated with decreased populations of N-fixing bacteria and increased populations of denitrifiers (and potential generation of NO₂).¹⁴ Reduced N-fixation requires more synthetic N fertilizers, also leading to greater N₂O emissions.

⁸ Marty, M., Spurlock, F. & Barry, T. (2010) in Hayes' Handbook of Pesticide Toxicology (Third Edition) (ed Robert Krieger) 571-585 (Academic Press).

⁹ Atmospheric Chemistry and Greenhouse Gases - IPCC
<https://www.ipcc.ch/site/assets/uploads/2018/03/TAR-04.pdf>

¹⁰ <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=11273>

¹¹ Department of Pesticide Regulation annual Pesticide Use Reports. <https://www.cdpr.ca.gov/docs/pur/purmain.htm>.

¹² 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.

¹³ Pesticide Action Network (2020) Pesticides and Soil Health: State of the Science and Viable Alternatives
<http://www.panna.org/resources/pesticides-and-soil-health-state-science-and-viable-alternatives>

¹⁴ Martinez-Toledo MV, Salmeron V, Rodelas B, Pozo C, Gonzalez-Lopez J. 1998. Effects of the fungicide Captan on some functional groups of soil microflora. *Applied Soil Ecology* 7: 245-255; doi: [https://doi.org/10.1016/S0929-1393\(97\)00026-7](https://doi.org/10.1016/S0929-1393(97)00026-7).

- A recent review of almost 400 studies showed pesticide use was associated with damage to soil invertebrates in more than 70% of the studies.¹⁵ 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.¹⁶
- Research shows that soil microbial activity decreases proportionally to the amount of pesticides applied to the soil.¹⁷ 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, which protect SOM from decomposition.¹⁸ This process is essential for carbon sequestration in soils.

Organic farming as a critical nature-based climate solution

Previous investment plans have not incorporated the latest science that outlines the climate benefits of organic farming. Achieving carbon neutrality requires building on proven tools for sequestering carbon and reducing emissions. UC California research points to organic farming as an effective method to sequester carbon and reduce GHG emissions.

- A UC Davis Long-Term Research on Agricultural Systems (LTRAS) study found that after 10 years, organic systems resulted in 14 times the rate of carbon sequestration as the conventional system¹⁹. After 20 years, organically managed soils sequestered significantly more soil organic carbon than conventionally managed soils²⁰.
- 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.²¹
- Organic crop and livestock production practices build long-term soil fertility, creating healthy soils that can store increased levels of nutrients, including carbon²².
- The Rodale Farming Systems Trial, which is the longest running organic comparison study in the United States, documented that after 22 years, soil organic carbon

¹⁵ 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>.

¹⁶ 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.

¹⁷ 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.

¹⁸ Gougoulas, 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.

¹⁹ Kong, A. Y., Six, J., Bryant, D. C., Denison, R. F., & Van Kessel, C. (2005). The relationship between carbon input, aggregation, and soil organic carbon stabilization in sustainable cropping systems. *Soil Sci Soc Am J.*, 69, 1078-1085.

²⁰ Wolf, K., Herrera, I., Tomich, T. P., & Scow, K. (2017). Long-term agricultural experiments inform the development of climate-smart agricultural practices. *California Agriculture*, 71, 120-124.

²¹ Horwath, W. R., Devenire, 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.

²² Gaudick, E. C., Scow, K. M., Horwath, W. R., Jackson, L. E., Smart, D. R., Mitchell, J., . . . Six, J. (2010). The potential for California agricultural crop soils to reduce greenhouse gas emissions: a holistic evaluation. *Advances in Agronomy*, 107, 123-162.

increased by 15-28% in organically managed soils compared to 9% in the conventionally managed soils²³.

- An extensive 2017 study comparing soils from 659 certified organic farms and 728 conventional farms found that organic farms across 48 states sequester significantly more carbon than conventional farms²⁴.
- Globally, evidence shows that organically managed soils hold more carbon and have higher rates of carbon sequestration than soil from non-organic systems²⁵.
- One meta-analysis of 59 studies found total soil organic carbon to be on average 19% higher in organic than conventional systems.²⁶
- 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.²⁷

Omitting whole-farm solutions like organic certification ignores the latest science and misses the opportunity to adopt multiple climate-mitigating practices through one strategy. Furthermore, agricultural practices currently emphasized in the draft investment 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 in conventional till fields.²⁸

Pesticides contribute to climate change at all stages of the pesticide life cycle and merit action along with additional study

Pesticides' role in contributing to climate change has been insufficiently studied. The studies that do exist indicate that pesticides increase GHG emissions, but there is much research still to be conducted, and this research must be holistic and include all direct and indirect aspects of the pesticide life cycle: from production to transportation, storage, energy costs of application, emissions arising from applications, and pesticide-derived modifications of environmental processes involved in the GHGs flux exchanges²⁹.

²³ Pimentel, D., Hepperly, P., Hanson, J., Douds, D., & Seidel, R. (2005). Environmental, energetic and economic comparisons of organic and conventional farming systems. *Bioscience*, 55(7), 573-583.

²⁴ Ghabbour, E. A., Davies, G., Misiewicz, T., Alami, R. A., Askounis, E.M., Cuzzo, N.P., . . . Shade, J. (2017). Chapter one - national comparison of the total and sequestered organic matter contents of conventional and organic farm soil. *Advances in Agronomy*, 146, 1-35.

²⁵ Gattinger, A., Muller, A., Haeni, M., Skinner, C., Fliessbach, A., Buchmann, N., . . . Niggli, U. (2012). Enhanced top soil carbon stocks under organic farming. *Proc. Natl. Acad. Sci. U.S.A.*, 109, 18226–18231.

²⁶ Lori M., Symnaczyk 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.

²⁷ 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>

²⁸ 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.

²⁹ One nearly holistic study of pesticides' contribution to GHG emissions looked at a typical drip irrigated tomato system in South Florida. It showed agrochemicals as the largest contributor of GHG emissions. Pesticides (12.8% of agrochemicals applied) accounted for 61% of agrochemical-GHG emissions. Of those emissions, soil fumigants, fungicides and herbicides accounted for 34%, 17% and 10% respectively. Only energy used for production,

Pesticides are an environmental justice issue that can't be ignored

In addition to the climate benefits of reducing agricultural pesticide use, such reductions would also benefit rural communities that are currently 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.³⁰
- 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.”³¹ 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.³² Farmworkers and their families experience high rates of exposure to pesticides because of weak enforcement of pesticide protections, their homes' proximity to pesticide application, crowded and low quality housing which can limit access to bathing facilities, and lack of adequate access to laundry facilities needed to clean work clothes.³³
- 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.³⁴
- 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.³⁵
- Pesticides also put Latinx children in particular at higher risk.

transportation and storage were included; energy costs of application were not. 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, doi:<https://doi.org/10.1016/j.agsy.2012.07.007>. Other studies have documented how organic farming uses consistently less energy per acre than conventional farming. 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. 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.

³⁰ Department of Pesticide Regulation annual Pesticide Use Reports. <https://www.cdpr.ca.gov/docs/pur/purmain.htm>.

³¹ 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.

³² <https://www.alrb.ca.gov/wp-content/uploads/sites/196/2018/05/CalifFarmLaborForceNAWS.pdf>

³³ 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.

³⁴ US Census Bureau.

<https://www.census.gov/quickfacts/fact/table/tularecountycalifornia,kerncountycalifornia,fresnocountycalifornia/PST045219>.

³⁵ Donnalay, N. (2015). Lost in the Mist. *The Center for Biological Diversity*.

https://www.biologicaldiversity.org/campaigns/pesticides_reduction/pdfs/LostInTheMist.pdf.

- Pesticide exposure in children has been linked to severe illnesses including cancer, neurodevelopmental harms and learning disabilities.³⁶
- 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.³⁷
- Research shows pesticide exposure to be a contributing factor to childhood asthma in the San Joaquin Valley.³⁸ The population of the San Joaquin Valley is 52% Latinx.³⁹
- 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.⁴⁰

Dairy digesters are a false climate solution and should be removed from the investment plan

Another critical environmental justice issue in California is the continued subsidizing of dairy digesters. Dairy digesters represent a false climate solution, and result in miniscule greenhouse gas savings, while allowing continued pollution of air and water in primarily Latinx communities⁴¹. We urge that dairy digesters as a climate mitigation strategy be removed from the investment plan.

VII. Recommendations

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

- Add pesticide use reduction and organic farming to the practices that the administration will use to meet its goals and include pesticide use reduction targets
- 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)
- Adopt a holistic approach towards climate change mitigation in agricultural systems that incorporates outcomes to community health rather than just to agriculture and climate change alone
- Commit to review and evaluate programs such as the Healthy Soils Program, to ensure that funding is resulting in greenhouse gas reductions, and is inclusive of pesticide reduction strategies to mitigate climate change

³⁶ Pesticide Action Network. (2016). Kids on the Frontline: How pesticides are undermining the health of rural children. *Pesticide Action Network North America*.

³⁷ 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/>.

³⁸ 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.

³⁹ https://cviic.org/wp-content/uploads/2019/01/SJVCRP_Survey_Findings_Report_011819-small.pdf


⁴⁰ Pesticide Action Network. (2016). Kids on the Frontline: How pesticides are undermining the health of rural children. *Pesticide Action Network North America*.

⁴¹ Leadership Counsel. <https://leadershipcounsel.org/dairy-digesters-not-a-solution/>

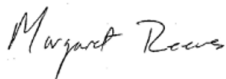
- Remove dairy digesters from the investment plan
- Align incentives to favor the reduction of pesticide use in agriculture:
 - Identify a sustainable funding source to support agroecological and regenerative organic farming. All public funding, research and implementation support should be shifted away 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 by 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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California Organizing Director, Pesticide Action Network



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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 200+ 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.