December 15, 2022

Liane Randolph
Chair
Air Resources Board
1001 I Street
Sacramento, CA 95814

Comment submitted electronically

RE: 2022 Climate Change Scoping Plan for Achieving Carbon Neutrality

Dear Chair Randolph,

This comment letter is submitted by Bayer Crop Science ("Bayer"). Bayer is a global enterprise with core competencies in the life science fields of health care and crop science. Bayer's products and services are designed to help people and the planet thrive by supporting efforts to master the major challenges presented by a growing and aging global population. Bayer is pioneering farming solutions that accelerate the decarbonization of the food and ag supply chain and is supportive of policy development that recognizes the potential of climate-smart agriculture as an effective lever for doing so.

Bayer commends the California Air Resources Board ("CARB") for the tremendous work that went into the development of the 2022 Climate Change Scoping Plan for Achieving Carbon Neutrality ("2022 Scoping Plan"). In particular, we recognize and appreciate CARB's diligence in evaluating the potential of Natural and Working Lands ("NWL") to store carbon in soils and biomass on a long-term or permanent basis. As further described in this letter, climate-smart agriculture ("CSA") is a top priority for Bayer, and we are developing comprehensive tools and capabilities to speed the expansion of CSA nationally and internationally. We are actively engaged with CARB staff to identify opportunities to integrate CSA into the Low Carbon Fuel Standard ("LCFS"), one of California's most successful market-based greenhouse gas ("GHG") programs.

We note that the 2022 Scoping Plan's NWL Technical Support Document contains a remarkable table entitled, "Total Annual emissions/sequestration in annual croplands." This table addresses the Reference Scenario and four alternative scenarios and spans the years 2002- 2054. Within these years and for all scenarios, annual croplands are modeled to be net carbon emitters. We look forward to working with CARB on multiple fronts to develop effective policies that accelerate the deployment of CSA, and thereby transition annual croplands from a net source of carbon emissions to a net carbon sink.[1]

Based on our own experiences in the creation and development of new business models for CSA, we would like to offer the following perspectives and recommendations:

The acceptance of new practices should be informed by industry associations and their farmers who have the best on-the-ground understanding of ways to improve soil health within a given soil type, cropping system, or geography. This is particularly important as CARB engages on perennial croplands where climate-smart agriculture practices are less defined or understood than annual croplands.

Additionally, it is important to balance our goals of decarbonization with the needs of feeding a growing, global population and the intention of supplying healthy foods to consumers. We encourage CARB to consider prioritizing research, development and quantification that would turn working lands into carbon sinks over the increased attention to land easement policies.

There has been significant progress in understanding the science associated with climate-smart practices in annual croplands. In addition to practice changes such as no till or cover cropping, our company and others are continuing to develop novel seed and breeding technologies that can increase nitrogen uptake and efficiency in plants. As such, we recommend that CARB and others continue to engage with the food and agriculture industry to inform the most robust menu of on-farm practices and to consider the potential that these new technologies may not be applicable to organic agriculture.

We appreciate the attention to the various models that can be used to quantify soil sequestration in croplands. With the recent announcement of USDA's Climate-Smart Agriculture and Forestry Partnerships Program, we anticipate that additional models will soon be available and recommend that CARB continue to assess tools beyond Daycent and DNDC but also look to models such as SALUS, developed by Michigan State University.

[1] California Air Resources Board, 2022 Scoping Plan, Appendix I- Natural and Workings Lands Technical Support Document (November 2022), Table 45, at p. 132-133, available at https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-i-nwl-modeling.pdf

Lastly, we hope that CARB will consider publishing its important body of work on perennial cropland modeling for use by the industry and that together we can work to advance new, process-based models in other cropping systems. Furthermore, we see significant needs for collecting state-specific data in California and would appreciate public-private partnership opportunities in the area of soil sampling to create more robust datasets for model development and training.

The remainder of this comment letter briefly summarizes some of the leading scientific analysis that establishes that to achieve California's goal of carbon neutrality by 2045, the State must unleash the power of soil as a vast carbon sink.

The Importance of Natural Solutions Including Soil Carbon

To identify negative emissions pathways that physically remove CO_2 from the atmosphere and strategies that can enable California to meet its goal of achieving carbon neutrality by 2045, the Lawrence Livermore National Laboratory developed a report entitled, Getting to Neutral, Options for Negative Carbon Emissions in California ("Getting to Neutral Report" or "Report").[2] The Getting to Neutral Report analyzed California's carbon neutrality goal and determined that it is necessary for the State to remove 125 million metric tons ("MMT") of carbon from the atmosphere each year by 2045 in order to achieve carbon neutrality. The Getting to Neutral Report then determined the lowest cost and most productive pathways to create a negative emissions strategy and identified the three central pillars of the strategy:

Capture and store as much carbon as possible through better management of natural and working lands.

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[2] Sarah E. Baker, Joshuah K. Stolaroff, George Peridas, Simon H. Pang, Hannah M. Goldstein, Felicia R. Lucci, Wenqin Li, Eric W. Slessarev, Jennifer Pett-Ridge, Frederick J. Ryerson, Jeff L. Wagoner, Whitney Kirkendall, Roger D. Aines, Daniel L. Sanchez, Bodie Cabiyo, Joffre Baker, Sean McCoy, Sam Uden, Ron Runnebaum, Jennifer Wilcox, Peter C. Psarras, Hélène Pilorgé, Noah McQueen, Daniel Maynard, Colin McCormick, Getting to Neutral: Options for Negative Carbon Emissions in California, January, 2020, Lawrence Livermore National Laboratory, LLNL-TR-796100, at p. 29, available at https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf (hereafter "Getting to Neutral Report," footnotes omitted).

Convert waste biomass to fuels and store the CO_2.
Remove CO2 directly from the air using purpose-built machines and store the CO_2.[3]

The natural solutions encompassed by the Getting to Neutral Report include farming practices that increase the amount of carbon stored in soils. The Report found that, "These approaches are among the least expensive we examined, averaging $11 per ton of CO_2 removed from the atmosphere." The Report also recognized that these strategies have important co-benefits including improved soil health.[4] The Report went on to state:

Natural systems are always the first option for negative emissions, both due to their concomitant advantages (soil health, ecosystem services) and to their generally lower cost… Natural issues are perhaps the most simple, with the source of the CO_2 *being the atmosphere and the ultimate sink being the natural system itself.*[5]

The Getting to Neutral Report specifically referenced the following Soil Carbon strategies: cover cropping, mulching, no-till farming, reduced-till farming, and compost application. Regarding scale of the opportunity, the Report found that:

Soils have lost approximately 130 billion metric tons of organic carbon (477 billion metric tons of CO_2 *equivalent) to the atmosphere globally since the advent of modern agriculture. Reversing soil organic carbon losses by altering land management would sequester atmospheric* CO_2 *while also potentially delivering gains in soil fertility. Estimates of the near-term carbon storage potential of agricultural soils are in the range of approximately 0.08-1.85 metric tons of carbon per hectare per year, or 0.3-6.8 tons of* CO_2 *equivalent per hectare per year. In theory, increasing soil carbon stocks globally at these rates could sequester 1-4 billion tons of carbon (3.7-14.7 billion tons of* CO_2*) per year, with the potential to offset global temperature increase.*[6]

<u>The Value of Regenerative Agriculture as a Natural Solution</u>
Consistent with the Getting to Neutral Report, regenerative agriculture has tremendous momentum, is actionable today, and has great atmospheric carbon reduction potential. According to the IPCC 2018 report, the global technical GHG emission mitigation potential from all

[3] Getting to Neutral Report at p. 3.
[4] Id. at p. 4.
[5] Id. at p. 15.
[6] Id. at 22 (footnotes omitted).

agriculture exceeds 5 gigatons of CO2e per year. Per the Agriculture chapter's Executive Summary, "Soil carbon sequestration (enhanced sinks) is the mechanism responsible for most of the mitigation potential (*high agreement, much evidence*), with an estimated 89% contribution to the technical potential."[7]

<u>Conclusion</u>

Bayer appreciates all of the work that CARB has done in developing the 2022 Scoping Plan, including the in-depth analysis of NWL. Thank you for your consideration of our input. We look forward to engagement with CARB and other stakeholders on these vital issues.

Respectfully,

DocuSigned by:
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Allison Nepveux
Carbon Business Development Lead, Bayer Crop Science

[7] Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, B. Scholes, O. Sirotenko, 2007: Agriculture. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, at p. 499 (emphasis in original), available at https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg3-chapter8-1.pdf (last viewed December 13, 2022) (2018 IPCC Agriculture Chapter). at p. 499.