Pesticides and Climate Change: A Vicious Cycle

Executive Summary

Full report to be released early 2023

Climate change is one of the greatest challenges facing humanity today. Scientific evidence indicates that pesticides contribute significantly to greenhouse gas emissions while also making our agricultural systems more vulnerable to the effects of climate change. However, the reduction of synthetic pesticide use has been omitted from climate change solutions, and synthetic pesticide use is even presented as a climate change mitigation strategy by industrial agriculture interests.

Pesticides contribute to climate change throughout their lifecycle via manufacturing, packaging, transportation, application, and even through environmental degradation and disposal. Importantly, 99% of all synthetic chemicals—including pesticides—are derived from fossil fuels, and several oil and gas companies play major roles in developing pesticide ingredients.[1] Other chemical inputs in agriculture, such as nitrogen fertilizer, have rightly received significant attention due to their contributions to greenhouse gas emissions. Yet research has shown that the manufacture of one kilogram of pesticide requires, on average, about 10 times more energy than one kilogram of nitrogen fertilizer.[2,3] Like nitrogen fertilizers, pesticides can also release greenhouse gas emissions after their application, with fumigant pesticides shown to increase nitrous oxide* production in soils seven to eight-fold.[4,5] Many pesticides also lead to the production of ground-level ozone, a greenhouse gas harmful to both humans and plants.[6,7,8] Some pesticides, such as sulfuryl fluoride, are themselves powerful greenhouse gasses, having nearly 5,000 times the potency of carbon dioxide.[9]

Meanwhile, climate change impacts are expected to lead to increases in pesticide use, creating a vicious cycle between chemical dependency and intensifying climate change (see Figure 1). Research shows that declining efficacy of pesticides, coupled with increases in pest pressures associated with a changing climate, will likely increase synthetic pesticide use in conventional agriculture.[10] An increase in pesticide use will lead to greater resistance to herbicides and insecticides in weeds and insect pests, while also harming public health and the environment.

The effects of higher synthetic pesticide use will disproportionately impact populations already under stress from a wide range of climate change effects, such as extreme heat and wildfire smoke. The compounded effects of climate change and pesticide use primarily fall on the shoulders of people of color—a climate and racial injustice.[11, 12, 13, 14, 15]

Adoption of alternative agricultural systems such as agroecological farming minimizes or eliminates synthetic pesticide use while increasing the resilience of our agricultural

**Nitrous oxide is a greenhouse gas 300 times more potent than carbon dioxide*

systems to better withstand climate change impacts.[16, 17, 18] Agroecology is a way of farming rooted in social justice that focuses on working with nature rather than against it. It relies on ecological principles for pest management, minimizing the use of synthetic pesticides, while prioritizing the decision-making power of farmers and agricultural workers. Agroecology and diversified organic agriculture, when paired with social justice principles, have been shown to have significant climate benefits, while supporting the health and rights of agricultural workers, Indigenous Peoples and rural communities.

Decisive action is required to reduce agrochemicals' contribution to greenhouse gas emissions and improve the climate resilience of food and farming systems. To accomplish this, policymakers should:

- Establish measurable goals in climate policies to reduce synthetic pesticide use in agriculture;
- Promote the transition to biodiverse, agroecological food and farming systems, such as by establishing and funding programs that provide increased technical assistance and incentives to farmers to adopt or continue these farming practices; and
- In line with international law, adopt regulations that uphold and promote the rights of groups most impacted by synthetic pesticide use.

Transitioning our agricultural systems to those that uplift ecological and social justice principles will not only help mitigate climate change, but also reduce the negative health impacts of industrial agriculture. While the work toward future policy and practice change continues, we can collectively support the advocacy work of impacted communities and organizations fighting for more equitable and sustainable food and farming systems right now.

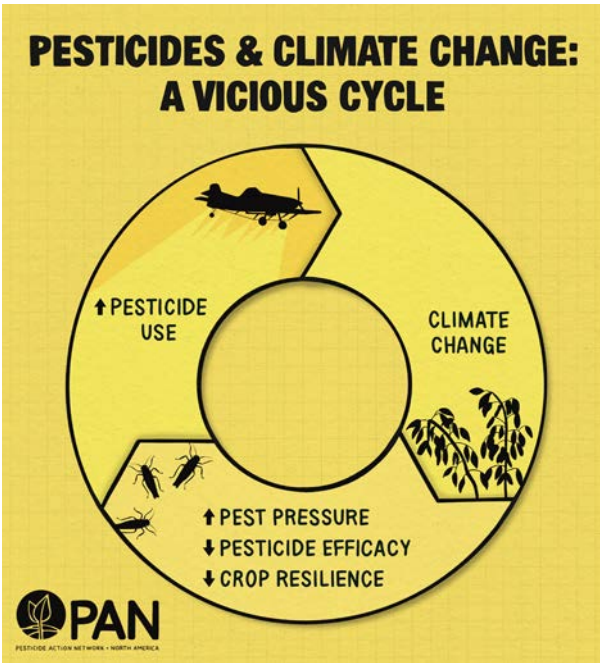

Figure 1

Notes

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Note: Calculation is based on comparing Audsley et al. 2009's calculation in Table 1 of 370 MJ/kg pesticide active ingredient to Ahlgren et al. 2008's 35.14 MJ/kg nitrogen for commonly used fertilizers produced conventionally using natural gas.

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