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Policy Comment

Europe needs better pesticide policies to reduce impacts on biodiversity

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Current levels of pesticide use have profound impacts on the environment and potential repercussions to human health. Policy assessments tend to focus on pollution of ecosystems and economic implications of pesticide use. Critically, there is increasing evidence that the use of harmful pesticides in European agriculture has significant impacts on non-target organisms and biodiversity: articles that recently contributed critical evidence to the growing body of literature on pesticides' externalities include Nicholson et al. (2023), who show that bumblebee populations across Europe are exposed to harmful levels of pesticides and Rigal et al. (2023), who show that agricultural intensification and the use of pesticides contribute to bird population declines in Europe. Further, Beaumelle et al. (2023) show that pesticides overall contribute to decreased abundance and diversity of soil fauna communities. The multifaceted stressors on food systems result in a cascading effect with potentially severe consequences to food security (Tscharntke et al., 2012). Pesticides' adverse effects on functional biodiversity, which is critical for various production-relevant ecosystem services (e.g. pollination, pest control, nutrient cycling). This effect is not limited to lethal doses but also emerges from a continuous exposure at sub-lethal concentrations (Tosi et al., 2022). For example, as many soil functions are biologically mediated (Chagnon et al., 2015), adverse effects on soil organisms may result in a lower potential for e.g. the uptake of nutrients (e.g., Edlinger et al., 2022), which in turn fuels anthropogenic interventions with potential externalities in the form of higher fertilizer applications.

These recent findings contribute further evidence that current European regulatory systems currently fail to safeguard non-target organisms and ecosystems (Schneider et al., 2023). However, a recent proposal for the Sustainable Use of Pesticides in the European Union has faced considerable political pushbacks (Candel et al., 2023), especially due to concerns about food production and economic implications (Schneider et al., 2023). Consequently, the proposal was rejected by the European Parliament in December 2023 and withdrawn by the European Commission in February 2024. There seems to be a mismatch between the increasing amount of scientific evidence on pesticides' externalities and their consideration in the political decisions taken. The better integration of the existing and recently emerging evidence in the political process requires the quantification of potential negative feedbacks of pesticide use (e.g. through biodiversity) on mid- to long-term food production and agricultures economic viability. To this end, new tools and approaches are needed, for example quantifying risk and external costs. However, methods and data for such estimations are currently still lacking (Candel, 2022, Mesnage et al., 2021). New analytical approaches are urgently needed to underline the importance of biodiversity related impacts also beyond nature conservation. Importantly, that would also highlight that there are significant potential costs of *not* acting on biodiversity loss for food production and its economic viability in the long run (Schneider et al., 2023).

To meet the goals outlined in the European Green Deal and the Kunming–Montreal Post-2020 Global Biodiversity Framework (Schneider et al., 2023), a holistic approach to pesticide policies is needed that combines different societal goals and reduces their trade-offs with food security and farms' economic viability. A truly effective approach to reducing pesticides' impacts on non-target organisms and ecosystems would have to go beyond banning single active ingredients. Instead, a holistic transformation of agricultural systems and practices is needed, including large-scale substitution of potentially harmful pesticides with more sustainable pest management practices. This requires a fundamental redesign of farming systems: i) to reduce pest and disease pressure, e.g. by diversifying agricultural landscapes and ii) to create economic conditions that support farmers in the large-scale uptake of alternatives to pesticide use. To realize these developments, a mix of public and private policy measures is needed: An increased investment into R&D of effective and efficient alternatives to pesticides needs to be combined with legislative approaches that may include pesticide taxation and targeted support for farmers adopting low-or no-pesticide practices (Möhring et al., 2020). The results of Nicholson et al. (2023), Rigal et al. (2023) and others underline the urgency of implementing

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tangible and powerful policy measures now.

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