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Organic versus conventional food emissions under different carbon footprint metrics

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One of the most well-known and appreciated characteristics of organic food is the lower pesticide residual which reduces the risks for human health. Moreover, the main benefit clearly recognized to the organic farming is the environmental sustainability compared to conventional ones, with a minor pressure of chemicals, reduced negative impacts on biodiversity and water quality and improved agricultural soil and vitality. However, the effect of organic farming on global warming and climate change mitigation is instead a still open debate in the scientific community. Depending on the boundary of the study, the adopted methodology, the soil and climatic characteristic of the agrosystem, the analyzed crops and the availability of primary data, different studies in literature provide diverse and even opposite results: organic farming is considered to perform better in some cases and worse in other cases in terms of contribution to climate change, compared to conventional farming.

The carbon footprint (CF) is one of the most used indicators to measure the contribution to climate change in terms of GHG emissions with different metrics (e.g. GHG per unit of product or per unit of land). With the aim to contribute to a more informed debate on the actual contribution to climate change in terms of GHG emissions of organic and conventional agriculture, we carried out a systematic analysis of the existing peer-reviewed studies allowing an unbiased comparison of product-based vs land-based CF.

The results of the review show that organic food has on average lower impact on climate than conventional ones both when the CF is assessed per area unit (-43% GHG emissions, average) and per product unit (-12% GHG emissions, average), solving the existing scientific debate in favor of the organic food production, being more sustainable both in terms of total climate altering gases released in atmosphere and in terms of GHG emission intensity per product.

According to these results and in view of the global climate policies' targets which foster organic food production and the transition to sustainable diets, a potential full conversion of the actual global croplands into organic lands would nearly halve the emissions from the land sector, from the current 11 GtCO₂eq yr⁻¹ to 6 GtCO₂eq yr⁻¹.