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Household Food Waste and Associated Greenhouse Gas Emissions in Five European Countries: Evidence from the Horizon Europe CARE Project

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Abstract

Reducing household food waste is a priority in European and international climate strategies due to its contribution to greenhouse gas (GHG) emissions. While animal-based foods often have higher product-level global warming potentials, household-level waste composition is rarely quantified with sufficient granularity to inform targeted interventions. Within the Horizon Europe CARE project, more than 70 households across Finland, Norway, Sweden, Germany, and Estonia participated in a 14-day observation. Participants recorded quantities and types of edible food disposed in structured food waste diaries. Diaries were mapped to food products and specific food dishes, and GHG emissions were estimated using attributional life cycle assessment emission factors from Agribalyse database. Carbon footprints were calculated as the mass of wasted food item multiplied by the cradle-to-gate emission factor (kg CO2e kg-1) and then complemented with the cooking and storing efforts at home (if the product was cooked and stored before disposal) as well as the disposal habits per household (residual waste bin, separate waste bin for organics, home composting, etc.) and country level (waste incineration, biogas plant, composting, etc.). Results were normalized per household and per capita per day, with uncertainty addressed via sensitivity analyses to alternative emission factors and categorization assumptions. The study characterizes household food waste quantities and associated CO2e across five countries and identifies household-level carbon “hotspots.” Preliminary patterns suggest that when animal-based products are present in the waste stream, they commonly dominate carbon footprints due to higher emission factors, whereas fruits, vegetables, and bakery products often dominate by mass but contribute less to CO2e per unit. High-resolution household diaries combined with product-specific emission factors can reveal actionable hotspots for waste prevention. Results inform tailored advice for participating families and provide a scalable approach for policy and consumer interventions targeting the most carbon-intensive waste fractions. The CARE project is funded by the European Union under Grant Agreement No. 101135141. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Keywords: food waste dairy, household behaviour, carbon footprint, life cycle assessment