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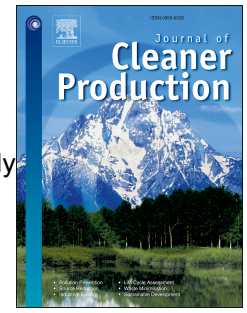

Variability in the carbon footprint of open-field tomato production in Iran - A case study of Alborz and East-Azerbaijan provinces

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Variability in the Carbon Footprint of Open-Field Tomato Production in Iran - A Case Study of Alborz and East-Azerbaijan Provinces

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Abstract

This study aimed to quantify the variability in life cycle greenhouse gas emissions, also called carbon footprint (CF), of open-field tomato production in Iran. Three main emission sources, i.e. material and energy use, biogenic sources, and fertilizer application were evaluated. To this end, data on tomato cultivation from 204 open-field tomato farms in two provinces of Alborz and East Azerbaijan in Iran were obtained using face-to-face questionnaires with tomato farmers. The average CF was 0.2 kg $CO_{2\text{-eq}}$ per kg tomatoes produced, ranging from 0.1 to 0.4 kg $CO_{2\text{-eq}}$ (kg tomato)$^{-1}$ (5-95 percentile range). Material and energy use contributed most to the total emissions (on average 60%), mainly as a result of fertilizer production and energy required for irrigation. The variability in the tomato yield exerted the largest influence on the variation of CF (47%), followed by variability in fertilizer application (22%) and differences in biogenic emissions between the two provinces (21%). Farms in the Alborz region showed systematically smaller CFs than farms in the East-Azerbaijan region due to the use of modern irrigation systems, less fertilizer use and higher yields. The application of modern irrigation systems and provision of training programs on chemical fertilizer use (soil analysis for farmland N content, crop rotation, and crop rotation with legumes) for open-field tomato farms can help to reduce the CF of tomato production in Iran.

Keywords: Carbon footprint, Greenhouse gas emissions, Material and energy use, Biogenic sources, Fertilizer application, Open-field tomato, Iran.

Nomenclature: