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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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1	Variability in the Carbon Footprint of Open-Field Tomato Production in
2	Iran - A Case Study of Alborz and East-Azerbaijan Provinces
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11	Abstract
12	This study aimed to quantify the variability in life cycle greenhouse gas emissions, also called carbon footprint
13	(CF), of open-field tomato production in Iran. Three main emission sources, i.e. material and energy use,
14	biogenic sources, and fertilizer application were evaluated. To this end, data on tomato cultivation from 204
15	open-field tomato farms in two provinces of Alborz and East Azerbaijan in Iran were obtained using face-to-
16	face questionnaires with tomato farmers. The average CF was 0.2 kg CO _{2-eq} per kg tomatoes produced, ranging
17	from 0.1 to 0.4 kg CO _{2-eq} (kg tomato) ⁻¹ (5-95 percentile range). Material and energy use contributed most to the
18	total emissions (on average 60%), mainly as a result of fertilizer production and energy required for irrigation.
19	The variability in the tomato yield exerted the largest influence on the variation of CF (47%), followed by
20	variability in fertilizer application (22%) and differences in biogenic emissions between the two provinces
21	(21%). Farms in the Alborz region showed systematically smaller CFs than farms in the East-Azerbaijan region
22	due to the use of modern irrigation systems, less fertilizer use and higher yields. The application of modern
23	irrigation systems and provision of training programs on chemical fertilizer use (soil analysis for farmland N
24	content, crop rotation, and crop rotation with legumes) for open-field tomato farms can help to reduce the CF of
25	tomato production in Iran.
26	
27	Keywords: Carbon footprint, Greenhouse gas emissions, Material and energy use, Biogenic sources, Fertilizer

28 application, Open-field tomato, Iran.

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