
Dynamic weighting model of environmental impacts of food systems

SMETANA S. (1), FRANCIS A. (2), GHNIMI S. (3,4)

1 DIL German Institute of Food Technologies (DIL e.V.), Quakenbrück, Germany

2 Infarm - Indoor Urban Farming GmbH, Berlin, Germany

3 Université Claude Bernard Lyon 1, CNRS, Villeurbanne, France

4 ISARA Lyon, Lyon, France

THIS ABSTRACT IS PART OF THE ACCEPTED SPECIAL SESSION (Multi-Indicator Sustainability Assessment of Food Systems, Products, and Food Process Technologies)

Dynamic and accurate assessment of environmental impacts of products in relation to national and regional conditions is important for the development of efficient mitigation strategies and policies. Available weighting methods in life cycle assessment rate environmental burdens based on survey- and panel-based approaches. Moreover, the importance of weighted values in relation to current state or environment carrying capacity is not known. It is especially obvious when the weighting is performed for emerging protein products or different regions or performed for the novel protein products like insect or microalgae. Taking the approach of weighting the characterized environmental impacts against the total impacts or impact of specific production chains on a country or regional level allowed to determine their current state importance of environmental influence. Among compared countries, proposed weights based on total national impact, available arable land and country population were the highest for Saudi Arabia and Japan and lowest for China and India. Weights based on impact of protein production supply, arable land and population were more relevant to emerging protein products indicating higher potential impact for Saudi Arabia and Japan. For example, the global warming impact of *Acheta domesticus* (crickets) as a novel protein source weighted against the impact of total protein supply, available arable lands and population indicated more than 60 times higher eco-potential impacts for India than for Saudi Arabia and Japan, and only 2 times higher than potential impact in the USA, China and Russian Federation. The weights have a dynamic annual resolution and thus represents a sensitive approach for precise disclosure of environmental impact of a product in relation to the current state of environmental influence. They can be used as an-biased explainable weighting factors for the sustainability assessment of products, providing a valuable insight for the research, industry and policymaking.