LCA of goat milk production: A case study from Cyprus

Marinos Stylianou[*1], Kyriaki G. Agkastiniotou[1], Iliana Papamichael[1], Irene Voukkali[1], Michalis Omirou[2], Ioannis M. Ioannides[*+2], Antonis A. Zorpas[1]

[1]Laboratory of Chemical Engineering and Engineering Sustainability, Faculty of Pure and Applied Sciences, Open University of Cyprus, Nicosia 2231, Cyprus

[2]Department of Agrobiotechnology, Agricultural Research Institute, Nicosia, Cyprus

Abstract

Goat milk production in Cyprus has gained significant attention in recent years, due to the production of traditional cheese (halloumi), prompting a growing interest in assessing its environmental impacts through life cycle assessment (LCA). LCA is a comprehensive methodology that evaluates the environmental burdens associated with a product or process throughout its entire life cycle, from raw material extraction to disposal. In the context of goat milk production, LCA can provide valuable insights into the environmental hotspots and potential areas for improvement. It examines various stages such as land use for grazing, feed production, water consumption, energy use, waste management, and transportation. Furthermore, the effect on nutrient cycling and soil microbial communities involved in greenhouse gas emissions which may be affected by manure, fertilizer antibiotics and pesticide use in fields is under investigation. The study investigates the cradle to gate approach. The functional unit (FU) used in the current LCA for the data collection and inventory formulation was 1 kg FPCM—fat and protein corrected milk. Tetracycline was found to significantly affect N2O emissions and functional microbial assemblies involved.

References

Carvalho LS, Willers CD, Soares BB, Nogueira AR, de Almeida Neto JA, Rodrigues LB. Environmental life cycle assessment of cow milk in a conventional semi-intensive Brazilian production system. Environ Sci Pollut Res 2022;29:21259–74. https://doi.org/10.1007/s11356-021-17317-5.

Omirou M, Stephanou C, Anastopoulos I, Philippot L, Ioannides IM. Differential response of N2O emissions, N2O-producing and N2O-reducing bacteria to varying tetracycline doses in fertilized soil. Environ Res 2022;214:114013. https://doi.org/10.1016/j.envres.2022.114013.

Robertson K, Symes W, Garnham M. Carbon footprint of dairy goat milk production in New Zealand. J Dairy Sci 2015;98:4279–93. https://doi.org/10.3168/jds.2014-9104.

Zanni S, Roccaro M, Bocedi F, Peli A, Bonoli A. LCA to Estimate the Environmental Impact of Dairy Farms: A Case Study. Sustain 2022;14:1–15. https://doi.org/10.3390/su14106028.