

EGU22-2406

<https://doi.org/10.5194/egusphere-egu22-2406>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Periodic and total carbon footprint values of large-scale agricultural cultivation

András Polgár¹, Karolina Horváth¹, **Tamara Temesi¹**, Pál Balázs¹, Sándor Faragó², and Veronika Elekne Fodor¹

¹Institute of Environmental Protection and Nature Conservation, Faculty of Forestry, University of Sopron, Sopron, Hungary (polgar.andras@uni-sopron.hu)

²Institute of Wildlife Management and Wildlife Biology, Faculty of Forestry, University of Sopron, Sopron, Sopron, Hungary

Maintaining environmental balance and reducing the damages caused by climate change anomalies are the basic pillars of sustainable agricultural competitiveness. Applying agricultural sector life cycle assessment (LCA) to achieve both internal (comparative) and external (efficiency enhancing) benefits is a priority.

The investigated area (Lajta-Project) is located in Kisalföld plain, specifically in the southern part of Mosoni-sík (plain).

The main cultivated plant species in this agricultural land (2678-2768 ha) are cereals, maize, hemp and canola. There are, on average, 10-15 crops present during a single cultivation cycle. The area is divided into 56 parcels measuring between 20 and 105 ha. The investigation covers the two decade period between 1991 and 2011. We analysed the cultivation data of 5 crops: canola, winter barley, winter wheat, green maize and maize.

We applied the following methods and models in our life cycle impact assessment: CML2001 (January 2016) method, carbon footprint analysis according to the standard ISO 14067, GaBi impact assessment model for land use and GaBi model for water. In order to represent the overall environmental impact, we used the method of CML2001, Experts IKP (Central Europe).

Significant impact categories resulted from the average cultivated plant values calculated on 1 ha (territorial approach) were: abiotic depletion pot. (ADP fossil), global warming (GWP 100 years) and marine aquatic ecotoxicity pot. (MAETP inf).

We compared the yearly time series values on 1 ha and the average yearly values of cultivated plants. According to the resulted ratio, we could define the year of above-average level emission and the year of lower level environmental impact. This provides opportunity to draw further conclusions in the time series assessments of the resulting changes in the local flora and fauna.

We also summarized the indicator results of appropriate impact categories according to CML2001 method in the studied area by crops which resulted in the territorial environmental footprints of crops for the total time period, namely the 'super footprint' values. The calculated carbon footprint

value specific to the area was 307,000 kg CO₂-equiv. according to 'super footprint' approach. The calculated values are clear to interpret by comparison with the similar data or average values of other areas or time periods.

The obtained results help to better assess environmental impacts, climate risks, and climate change as they pertain to arable crop production technologies, which advances the selection of appropriate technologies that have been adjusted to environmental sensitivities.

Acknowledgement: Our research was supported by the „Lajta-Project“.