



## Impact of field crop production technologies on climate in Hungary

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The spread of agricultural land, overgrazing and exploitation of fuel wood on arid and semi-arid areas can modify the surface energy balance and the hydrological cycle, thus have an effect on the climate on local to regional scale. Only 11-13% of the Earth surface is cultivated, and on the major part of these areas the cultivation is not intensive. In contrast to this, in Hungary, 50% of the area is cultivated intensively, and 20% of the country is covered by forest treated by a nearly intensive way. About 75% of Hungary's surface is occupied by primarily climate dependent, which is non-irrigated area: arable land, meadow, forest. For each land use type, in addition to the growing conditions changed by the cultivation techniques and the effects of land cover, the specific environmental aspects of each technology have to be considered.

Our research aims to assess the environmental impacts of arable crop production technologies and especially their impacts on climate.

In the case of arable crop production, according to expert proposal, we examined the production technological process steps in the cultivation of cereals, maize, sunflower, alfalfa and rapeseed.

As the next step, we performed the life cycle assessment (LCA) of the selected technologies, in order to rank them based on their carbon footprint. As a functional unit, we considered 1 ha cultivation area. The environmental parameters of machines and tools necessary in the technologies have not been included in the analysis.

The machines used in arable crop production were mostly the same for the different cultivation plants, differences could be observed in the intensity of their use.

In the case of arable crop production technologies, the greatest impact occurred in the category of Abiotic Depletion (ADP fossil) and next in Marine Aquatic Ecotoxicity Pot. (MAETP inf.). Technologies had impact on global warming (GWP 100 years) after the previous ones. The life cycle contribution of the technologies can be considered to be almost equal. That is about 15% in case of maize, 19% in case of sunflower, 20% in case of alfalfa, 21 % in case of cereals and 25% in case of rapeseed. Even if with a small difference, the ranking of technologies gave the increasing order of 'maize – sunflower – alfalfa – cereals – rapeseed' in each impact category case.

On the basis of carbon footprint the ranking is the following for the whole technological life cycle: maize (15%) – sunflower (19%) – alfalfa (20%) – cereals (21%) – rapeseed (25%) (between the values of GWP 100 years: 399 – 633 [kg CO<sub>2</sub>-Equiv.]).

The results of the study highlight the carbon footprint of field plant production processes. These information help the more accurate identification of climate risks of the studied processes and their possible contribution to global warming.

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