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COMPARATIVE LIFE CYCLE ASSESSMENT STUDY OF THREE WINTER WHEAT PRODUCTION SYSTEMS IN THE EUROPEAN UNION

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Abstract

Three different winter wheat production systems for three European countries (United Kingdom, France and Italy), all with different climatic conditions, soil management and input levels (e.g. tillage, fertilizers, herbicides and pesticides) were analysed from an environmental perspective. The intended applications were the analysis and comparison from a Life Cycle Assessment (LCA) perspective and the identification of the key parameters which have the greatest influence on final results. The analysis considered the entire production system, including the extraction of raw materials, production of farming inputs and all agricultural operations. The adoption of LCA was considered the most appropriate methodology to define the environmental impact. The functional unit considered was 1 hectare of winter wheat production. The results showed that the impact due to machinery use was mostly dependent on the number of interventions related to the application of fertilizers, herbicides and plant protection. Emissions due to on-field fertilizer application and their production also showed a significant contribution for each impact category showing percentages reaching 90% of the total, whereas the impact due to fungicides and herbicides were negligible, since their contribution never exceeded 4% of the total emissions. Emissions to soil, air and water were affected by factors such as local weather conditions and soil characteristics, which can vary on a local scale, the time of farming activities, N, P and K uptake by the plants, amount and typology of fertilizers adopted. Nitrate losses from arable cropping may be reduced by limiting N-based fertilizer inputs.

Key words: France, Italy, LCA, United Kingdom, winter wheat

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