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LIFE CYCLE ASSESSMENT AND LIFE CYCLE COSTING IN MEASURING THE ECO-EFFICIENCY PERFORMANCE OF WINTER RAPE PRODUCTION

Abstract:

In the mitigation policy, agricultural activities are gaining growing importance. International and national regulations require the use of sustainable production methods. This means that the attention focused on the current recommendations shifts from a set of minimum requirements to recognize environmental effects throughout the life cycle of products. Farming and food production are also expected to comply with the second pillar of sustainability which is related to the economic aspects of production. Important operational dimension of sustainability assessment is a concept of eco-efficiency, which is defined as creating more value or generating less cost with less environmental impact. Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) are appropriate methodologies to investigate the eco-efficiency of production systems within the life cycle. The aim of the study was to perform the comparative analysis of cash crop production in different farming types by applying the LCA and LCC methods. Carbon Footprint (CF) was applied as a single most important measure of environmental impact of production. The study was conducted in 69 farms, located in the Wielkopolska and Lubelskie regions (Poland) during the period 2017-2018. The analysed farms represented key agricultural activities, according to the classification of the EU: a) milk production, b) pig production, c) field crops, d) mixed livestock production (pig and milk). The chosen types of production are represented by the largest number of farms in Poland. The selection of the study group, according to the set criteria, were based on the information of Wielkopolski and Lubelski Agricultural Advisory Centres. The LCA and LCC analysis were carried out in similar phases corresponding to LCA standard: goal and scope definition, environmental life cycle inventory, life cycle impact assessment and interpretation. In winter rape production average value of CF was equal to 1003 kg CO₂ eq per 1 tonne of grain (functional unit). The highest value of CF was observed in milk farming in Wielkopolska region of 1254 kg CO₂ eq. Average aggregated cost of production related to the functional unit was 1084 PLN, with the highest value of 1222 PLN found in the pig farming in Lubelski region. Preproduction phases linked with the direct inputs levels contributed mostly to a high overall cost of rape production in pig farming and to the CF value of winter rape in farms specialised in milk production.

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Keywords:

sustainability, eco-efficiency, environmental impact, carbon footprint, LCA, LCC, winter rape

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