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**The Study of Analyzing the Environmental Impact of Manufacturing Wheat Biscuits in Laboratory Scale Using Life Cycle Analysis (LCA)**

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**Abstract**

The Life Cycle Assessment (LCA) method is a tool that can be used for assessing the potential emissions generated by a product, process, or activity over its entire life cycle. The purpose of this study was to assess the potential environmental impact of laboratory-scale wheat-based soft dough and hard dough biscuit production processes, and to compare their environmental impact using LCA. Environmental impact was assessed using the method described by ISO 14040: 2006 for Life Cycle Assessment. The functional unit (FU) for the study was defined as one kilogram of biscuits. Accordingly, 1 kg each of soft dough and hard dough biscuits were prepared per trial, with three trials conducted for each biscuit type. The system boundary included all stages from raw material acquisition to biscuit packaging stage. Laboratory trials conducted in the Food Processing Laboratory at the University of Sri Jayewardenepura were used to collect primary data, and the secondary data was mainly obtained from the Ecoinvent, Agri-footprint, and USLCI databases. The associated environmental impact was assessed using SimaPro 9.5.0.2 faculty version and the ReCiPe 2016 Endpoint (H) method. According to the results, the environmental impacts of both biscuits were primarily influenced by the dough making stage, as raw material transportation during the dough making stage emits significant amounts of carbon dioxide (197.37 kg CO<sub>2</sub> eq / km) and dinitrogen monoxide (2.4 kg CO<sub>2</sub> eq / km). The second-largest impact was attributed to the biscuit baking phase, with the least impact occurring during biscuit packing for both biscuit types. The dough-making stage had the highest impact on land use (99.7%), as butter production, a key ingredient in the dough, requires a significant amount of land to feed dairy cows. The dough making stage had the second highest impact on water consumption affecting aquatic ecosystems (99.1%), owing to the significant amount of water required for wheat flour production, which reduces water availability for aquatic ecosystems. Among the ingredients used in the dough, butter had the highest impact across most categories. When comparing two biscuit types, soft dough biscuit manufacturing had the highest impact across most categories, except water consumption affecting aquatic ecosystems. This exception is due to the high-water requirement for cultivating wheat flour, which is more prevalent in hard dough biscuits than soft dough biscuits. In conclusion, the dough-making stage had the greatest environmental impact, while hard dough biscuit production had a lower impact compared to soft dough biscuit manufacturing.

**Keywords:** *Life Cycle Assessment, Wheat, Biscuits, Environmental impact, SimaPro software*