

Hanif Risma Verdiana. NIM 220331100051. Analisis Jejak Karbon Roti Isi Pisang Keju Menggunakan Metode *Life Cycle Assessment*. Dibawah Bimbingan **Dr. Millatul Ulya, S.TP., M.T** dan **Dr. Moh. Fuad Fauzul Mu'tamar, S.TP., M.Si**

ABSTRAK

Industri bakery merupakan salah satu sektor pangan yang terus berkembang seiring meningkatnya konsumsi roti di Indonesia. Namun, proses produksi roti memerlukan penggunaan bahan baku, energi listrik, dan bahan bakar yang berpotensi menghasilkan emisi gas rumah kaca sehingga berkontribusi terhadap perubahan iklim. Penelitian ini bertujuan untuk menganalisis besarnya jejak karbon pada produksi roti isi pisang keju serta mengidentifikasi tahapan proses yang menjadi penyumbang emisi karbon terbesar menggunakan metode *Life Cycle Assessment* (LCA). Penelitian dilakukan di O'ndut Bakery, Kabupaten Tegal, Jawa Tengah, dengan batasan sistem *cradle-to-gate*. Analisis mengikuti tahapan LCA berdasarkan ISO 14040 yang meliputi *goal and scope definition*, *life cycle inventory* (LCI), *life cycle impact assessment* (LCIA), dan *life cycle interpretation*. Pengolahan data dilakukan menggunakan perangkat lunak SimaPro versi 10.2.0 dengan metode penilaian dampak CML Baseline. Data yang digunakan berupa data primer hasil observasi dan wawancara mengenai penggunaan bahan baku, energi, serta proses produksi, serta data sekunder dari database Ecoinvent. Hasil penelitian menunjukkan bahwa total jejak karbon yang dihasilkan dari satu kali proses produksi roti isi pisang keju adalah sebesar 0,89 kg CO₂ eq, sedangkan jejak karbon per produk sebesar 0,00103488 kg CO₂ eq/pcs atau setara dengan 1,03488 g CO₂ eq/pcs. Berdasarkan hasil analisis *Life Cycle Impact Assessment*, tahapan pengovenan merupakan titik kritis (*hotspot*) dengan kontribusi terbesar terhadap kategori *global warming*, yaitu sebesar 18,7%, yang dipengaruhi oleh tingginya penggunaan energi dari bahan bakar LPG selama proses pemanggangan. Hasil penelitian ini diharapkan dapat menjadi dasar bagi industri bakery dalam menerapkan strategi efisiensi energi dan pengurangan emisi guna mendukung produksi pangan yang lebih berkelanjutan.

Kata kunci: Jejak Karbon, *Life Cycle Assessment*, Roti Isi Pisang Keju

Hanif Risma Verdiana. NIM 220331100051. *Carbon Footprint Analysis of Banana and Cheese Filled Bread Production Using the Life Cycle Assessment (LCA) Method.* Under the guidance **Dr. Millatul Ulya, S.TP., M.T** and **Dr. Moh. Fuad Fauzul Mu'tamar, S.TP., M.Si**

ABSTRACT

The bakery industry is one of the fastest-growing sectors in the food industry due to the increasing consumption of bread in Indonesia. However, bread production requires raw materials, electrical energy, and fuel, which potentially generate greenhouse gas (GHG) emissions and contribute to climate change. This study aimed to analyze the carbon footprint of banana cheese-filled bread production and identify the production stage that contributes the highest carbon emissions using the Life Cycle Assessment (LCA) method. The research was conducted at O'ndut Bakery, Tegal Regency, Central Java, using a cradle-to-gate system boundary. The LCA was carried out following the ISO 14040 framework, which includes goal and scope definition, life cycle inventory (LCI), life cycle impact assessment (LCIA), and life cycle interpretation. The data were processed using SimaPro version 10.2.0 with the CML Baseline impact assessment method. Primary data were collected through direct observation and interviews regarding raw material consumption, energy use, and production processes, while secondary data were obtained from the Ecoinvent database. The results showed that the total carbon footprint generated from one production cycle of banana cheese-filled bread was 0.89 kg CO₂ eq, while the carbon footprint per product was 0.00103488 kg CO₂ eq per piece (equivalent to 1.03488 g CO₂ eq per piece). Based on the Life Cycle Impact Assessment results, the baking process was identified as the environmental hotspot, contributing 18.7% to the Global Warming Potential (GWP) category due to its high LPG energy consumption during baking. These findings provide valuable information for the bakery industry in developing energy efficiency strategies and reducing greenhouse gas emissions to support more sustainable food production.

Keywords: Carbon Footprint, Life Cycle Assessment, Banana Cheese-Filled Bread.