

**ANALISIS JEJAK KARBON PADA BUDIDAYA CABAI RAWIT
(*Capsicum frutescens* L.) DI KABUPATEN SLEMAN DENGAN
PENDEKATAN *LIFE CYCLE ASSESSMENT***

INTISARI

Penelitian ini bertujuan untuk menganalisis dan mengkuantifikasi jejak karbon (JK) pada sistem budidaya cabai rawit (*Capsicum frutescens* L.) di Kecamatan Pakem, Kabupaten Sleman, menggunakan pendekatan *Life Cycle Assessment* (LCA) berbasis standar ISO 14067 dan perangkat lunak OpenLCA. Batasan sistem yang digunakan adalah dari tahap budidaya (*cradle*) hingga distribusi ke pasar lelang (*gate*).

Hasil perhitungan menunjukkan rata-rata jejak karbon budidaya cabai rawit sebesar 1,136 kg CO₂eq per kg produk, dengan variasi signifikan antar lima lahan petani sampel, berkisar antara 0,731 kg CO₂eq/kg (terendah) hingga 1,614 kg CO₂eq/kg (tertinggi). Analisis kontribusi (*hotspot*) emisi menegaskan bahwa tahap pengolahan lahan dan perawatan merupakan penyumbang emisi terbesar, didominasi oleh input material berjejak karbon tinggi. Secara spesifik, hotspot utama meliputi penggunaan *quicklime*/kapur tohor (amendan tanah), pupuk kandang, mulsa plastik (PE), pupuk mineral, dan bensin.

Berdasarkan temuan ini, dirumuskan strategi mitigasi emisi yang berfokus pada optimalisasi input: substitusi kapur tohor (CaO) dengan biochar, pengomposan pupuk kandang dengan jerami untuk menekan emisi CH₄ hingga 82–91%, penggunaan pupuk kombinasi organik dan sintetis untuk menurunkan emisi GRK hingga 28,4–34,9%, serta implementasi Pengendalian Hama Terpadu (PHT) dengan pestisida nabati. Penelitian ini memberikan dasar ilmiah dan data primer lokal untuk pengembangan praktik pertanian cabai rawit yang lebih ramah lingkungan dan berkelanjutan.

Kata kunci: Jejak karbon, *Life Cycle Assessment*, cabai rawit, budidaya, pertanian, emisi GRK.

CARBON FOOTPRINT ANALYSIS OF CAYENNE PEPPER (*Capsicum frutescens* L.) CULTIVATION IN SLEMAN REGENCY USING A LIFE CYCLE ASSESSMENT APPROACH

ABSTRACT

This study set out to analyse and quantify the carbon footprint (CF) of cayenne pepper (*Capsicum frutescens* L.) cultivation systems in Pakem District, Sleman Regency, employing the Life Cycle Assessment (LCA) methodology in line with the ISO 14067 standard and utilising OpenLCA software. The defined system boundary spanned from the cultivation stage (cradle) through to distribution to the auction market (gate).

The calculations revealed an average carbon footprint of 1.136 kg CO₂eq per kg of cayenne pepper produced. A significant variation was observed among the five sampled farms, ranging from a low of 0.731 kg CO₂eq/kg to a high of 1.614 kg CO₂eq/kg. A hotspot analysis of emissions confirmed that the land preparation and maintenance stages were the largest contributors to emissions, primarily driven by high-carbon footprint input materials. Specifically, the key hotspots included the use of quicklime (soil amendment), manure, plastic mulch (PE), mineral fertilisers, and bensin.

Based on these findings, mitigation strategies were formulated to optimise these critical inputs. The recommendations focus on replacing quicklime (CaO) with biochar, introducing the practice of manure composting with straw to suppress CH₄ emissions by 82–91% , utilising a combination of organic and synthetic fertilisers to reduce overall GHG emissions by 28.4–34.9% , and implementing Integrated Pest Management (IPM) with bio-pesticides. This research furnishes local primary data and a scientific basis for the development of more environmentally friendly and sustainable cayenne pepper farming practices

Keywords: Carbon footprint, Life Cycle Assessment, cayenne pepper, cultivation, agriculture, GHG emissions.