

# LIFE CYCLE ASSESSMENT OF FRESH FRUIT BUNCH PRODUCTION

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**L**ife cycle assessment (LCA) is the most holistic and comprehensive method which can be used in assessing the environmental burden and impacts resulting from fresh fruit bunch (FFB) production. The system boundary was defined using a gate-to-gate approach, starting from land conversion, transplanting of seedlings into the plantation, right until FFB are delivered to the mills in a 25-year lifetime of the palm. An LCA study compiles an inventory of inflow (materials/resources and energy) and outflow (solid wastes, gaseous and liquid emissions), evaluates the potential environment impacts associated with these flows, and then interprets the results to make decisions for the improvement of environmental performance in the plantation. All impacts are related to one common unit (*i.e.* 1 t of FFB produced), and are summarised into environmental effects.

LCA was conducted following the ISO Standards 14040 and 14044. This study has been critically reviewed and approved by an external panel of international LCA experts.

## BENEFITS

Better utilisation of energy, material inputs, and ways and measures to reduce the environmental impacts in the plantation through the LCA approach.

## OBJECTIVES

- To identify the potential environmental impacts associated with the production of FFB, and to assess the greenhouse gas (GHG) emissions from specific operations in the oil palm plantation during the production of FFB as well as from the effect of land-use change (LUC) when oil palm plantations replace other land use.
- To contribute to the sustainable development of the oil palm industry by identifying and addressing environmentally sensitive issues.

## METHODOLOGY

- Collection of data for a life cycle inventory (LCI) through observations and from responses to questionnaires, telephone conversations and interviews.
- Compilation of data.
- On-site verification of data.
- Life cycle impact assessment (LCIA) carried out using the European-Indicator 99 method and the European databases-equipped LCA software, SimaPro 7.1.
- Estimation of GHG emissions from the plantation.

## TYPES OF SERVICES

- Collection of LCI data for site-specific plantations:
  - Energy use (diesel used in running the machinery and for transportation of FFB to the mill)
  - Agrochemical use (fertilisers, herbicides, insecticides, *etc.*)
- Estimation of emissions (output) to the environment.
  - Emissions to air ( $\text{NH}_3$ ,  $\text{N}_2\text{O}$ ,  $\text{NO}$ ,  $\text{N}_2$ ,  $\text{CO}_2$ ).
  - Emissions to water ( $\text{PO}_4^{3-}$ ,  $\text{NO}_3^-$ ).
  - Emissions to soil (heavy metals).
- Life Cycle Impact Assessment (LCIA) for a site-specific plantation (*Figure 1*).
- Estimation of the carbon footprint or GHG emissions for a site-specific plantation:
  - Changes in C stock (land use conversion).
  - Emissions at the plantation (from N fertiliser use, energy use and transportation).
- Interpretation of LCIA results and suggestions for mitigation measures.

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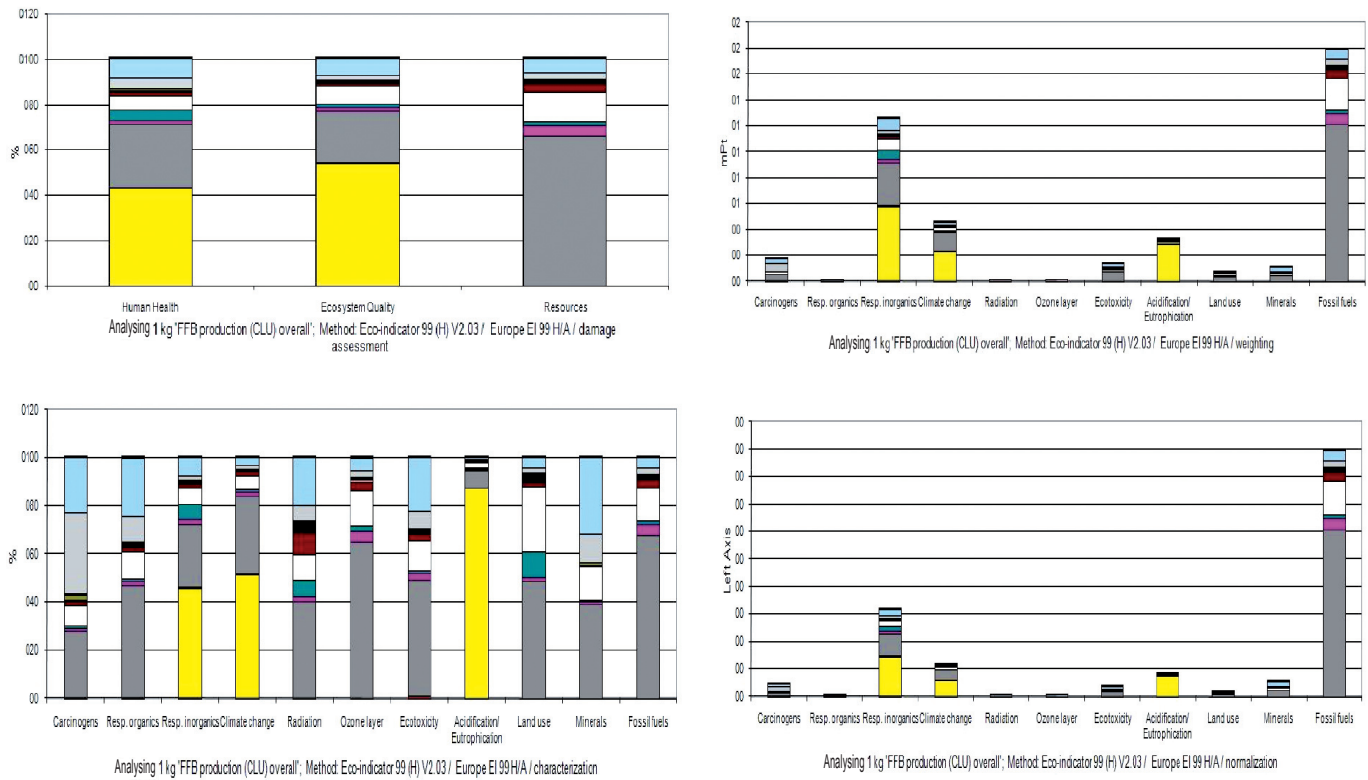


Figure 1. Example of LCIA.

- Building your LCA capacity – through a crash course on LCA consisting of a combination of lectures and case studies to get you started on LCA.

### WHERE SERVICES ARE OFFERED

In Peninsular Malaysia, Sabah and Sarawak.

### COST

Depends on the type of services required.

### CLIENTS

Stakeholders – oil palm plantations and R&D institutions.

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