

Inclusion of biogenic carbon emissions and removals in environmental LCA of agricultural products

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Introduction

Life cycle assessment (LCA) is a widely used method for the environmental assessments. Currently, there is no widely accepted and used methodology to include the biogenic carbon (C) emissions and removals in the carbon footprints of agricultural products. In Luke's projects **LCA Foodprint, ModiLCA and Bio-LCA**, we are currently working on a LCA method for agriculture-related biogenic C within the pre-existing LCA frameworks. The developed method will include Finnish average emission factors, and possibility to calculate more specific estimates based on especially soil type, land use changes, and management methods.

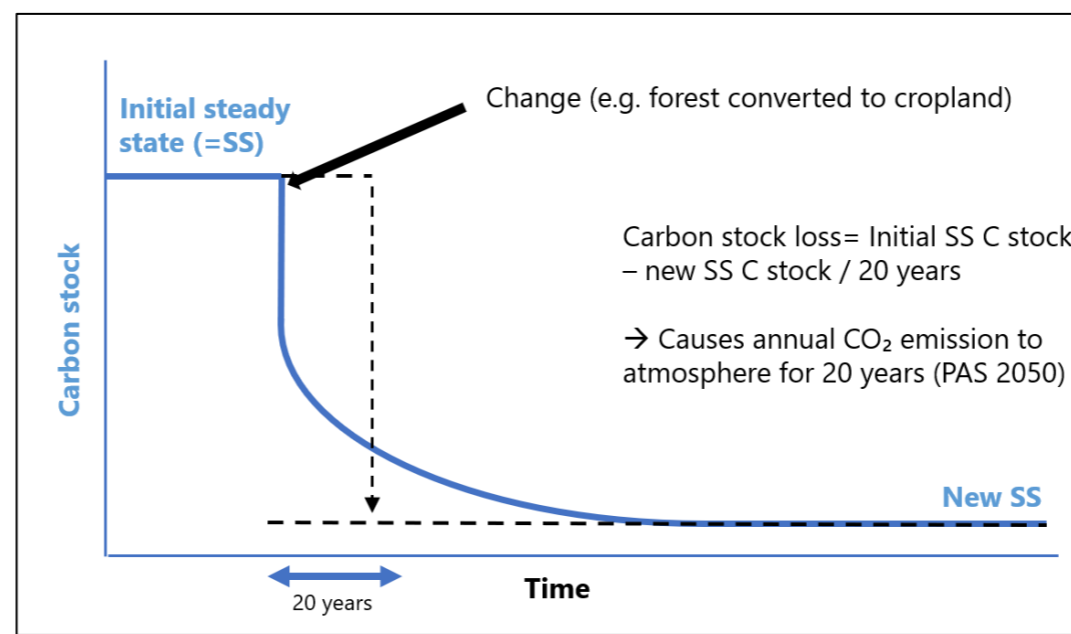


Figure 1. Steady state method to include carbon stock *loss* (= C emission) in LCA.

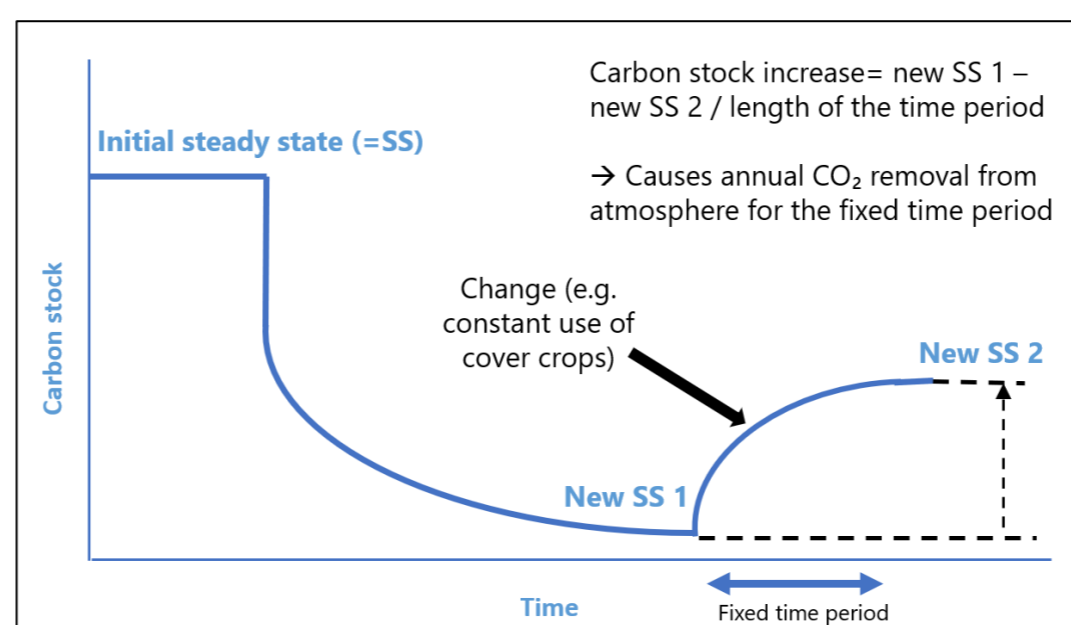


Figure 2. Steady state method to include carbon stock *increase* (=reduction of C emissions) in LCA.

Steady state method

Considers increase or decrease in C stock following a change in land use or management methods. The emission or removal of C is allocated for products produced within a fixed period (often 20 years).

Biogenic C in LCA

C in short term storages

For example, cereal or grass yield

Not included in LCA ❌

Shall be included in LCA, if biogenic C converts to biogenic CH₄ ✅

C related to land use and land use change (LULUC)

C in soil, living biomass and dead organic matter

Shall be included in LCA ✅

Biogenic C in LULUC sector

In LULUC sector, biogenic C emissions and removals are related to C stock changes due to:

- Land use changes (LUC)
- Management method changes

In agriculture, LUC refers to land conversion to cropland mainly from forest, grassland or wetland (following IPCC land use categorisation). LUC causes *C emissions*.

Management method change can be for example a shift from annual crop monoculture to crop rotation with perennial crops. The result of management method change may be either *C emission or removal*.

Land use change occurred within **20 years before** the assessment shall be considered in LCA (PAS2050:2011). The same 20-year time period could be applied also for management method changes.

Currently, there is no widely accepted and used methodology to include the biogenic carbon (C) emissions and removals in the carbon footprints of agricultural products

Read more about our projects:

ModiLCA



LCA Foodprint



Bio-LCA

