Technical Report:
Attribution of impacts to bioenergy production and use for the implementation of the GBEP Sustainability Indicators for Bioenergy (GSI)

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Content of the report

- Introduction and purpose
- The attribution issue
  - The general question
  - Attribution issues raised by implementation reports
  - The way forward for guidance
- General guidance for the attribution issue
  - Overarching considerations
  - Identification of attribution types and related guidance
- Guidance for environmental / social / economic indicators
- Highlights concerning the attribution issue
Purpose of the report:

• input into the **implementation guide** on the GSI initiated by TFS, but also stand-alone document.

• To **identify** the relevant attribution issues;

• To **structure** the underlying attribution issues and identify general solutions to the attribution problems;

• To provide **specific guidance** for the different indicators according to the data situation in the GBEP member countries; and

• To **report** the analysis and guidance in a document as a knowledge base which can be amended in the future as experience will grow.
The general question

The character of the attribution issue:

- The GSI are focused on impacts of the bioenergy,
- But sectors are connected!
- Attribution (in this sense) means: to allocate the share of impacts to the involved sectors or produced products.
- There are three main components to this issue:
  - Separating bioenergy from other activities
  - Coupled processes provide bioenergy
  - Assignment of measured effects to bioenergy
Attribution types
the TFS sub-groups reveal different types of questions and problems. They could roughly be classified into the following groups:

- Attribution of statistical data to the bioenergy sector
- Allocation of indicator results related to coupled activities
- Attribution of general effects to bioenergy
- Overlap of several of these types of attribution
- No attribution issue at all – but a general lack of data
Separating bioenergy from other activities

• Biomass could be harvested and used as food, animal feed or as material.

• So the harvest activities of a certain biomass has to be split according to its later use.

Problem: often the final uses of biomass are not defined in advance and its final assignment depends on many factors.
Attribution of statistical data to the bioenergy sector

**Reality:**
Actual locations of the production sites for bioenergy are unknown
(i.e. inquiry would be excessively laborious)

**Top-Down - Approximation:**
Averaging the share of production attributed to bioenergy,
according to some parameter, which are
Coupled processes provide bioenergy

- The „co-product“ issue!
  - e.g.: wheat → ethanol (biofuel) and co-product animal feed = classical LCA issue (allocation!)
  - e.g. nitrogen → protein: no N in ethanol but in animal feed
    problem: is the use of N-fertilizer not only needed for the production protein-rich animal feed?
Allocation of indicator results related to coupled activities

An extended discussion of allocation of environmental impacts to coupled products exists in the LCA community. Principles see ISO 14040, ISO 14044 and many academic publications.

For the GSI plausible allocation conventions shall be applied. Recommendation (open to further discussion):

• Allocation by energy content shall be the default method
  • when different energy products originate from a coupled production.
  • when energy products and products for other purposes (e.g. food, animal feed, material use) share the same production processes and have to be allocated.
  
A sensitivity analysis shall be performed using the economic values of the co-products to detect any implausible conclusion for the GSI.

• Provide full transparency and traceability of underlying assumptions and results if co-product allocation has been used in the context of the GSI measurement.
For practicality → the “TIER approach”

A tier represents a level of methodological complexity (with reference to the IPCC Inventory Guidelines)

Tier 1: the basic method
Tier 2: intermediate
Tier 3: most demanding in terms of complexity and data requirements.

Tiers 2 and 3 are generally considered to be more accurate.
Guidance for environmental indicators

Attribution issues will be addressed for the following indicators:

• Indicator 1: Lifecycle GHG emissions
• Indicator 2: Soil quality
• Indicator 6: Water quality
• Indicator 8: Land use and land-use change related to bioenergy feedstock production

Indicators where attribution issues are yet to be raised by the implementation reports have not be addressed in detail. However, practitioners may still encounter attribution problems in the future.
Guidance for environmental indicators

**Indicator 1: Lifecycle GHG emissions**

Attribution issues mainly refer to **co-product allocation** using LCA methodology, i.e. multi-output processes.

Proposed approach:

**TIER 1:** Use pre-set default methods and values from a specific data source.

**TIER 2:** Use economic value of products with original data and consider individual solutions where appropriate.

**TIER 3:** Use energy content (lower heating value) of material flows as allocation factor with original data and consider individual solutions where appropriate.
Guidance for environmental indicators  
**Indicator 1: Lifecycle GHG emissions**

How to separate the aggregated GHG impact of bioenergy at a national level from the overall GHG impact of the country?

Proposed approach:

**TIER 1: Estimate the share of energy products from bioenergy against the overall consumption of energy products in a country and combine them with default values for the respective products life cycle.**

**TIER 2: Use statistical national consumption data for bioenergy products and combine them with default values for the respective products life cycle.**

**TIER 3: Combine all energy products on a one-by-one basis from original national data with statistical national bioenergy consumption data to achieve the national GHG bioenergy level.**
Guidance for social indicators

Attribution issues will be addressed for the following indicators:

• Indicator 9: Allocation and tenure of land for new bioenergy production
• Indicator 11: Change in income
• Indicator 12: Jobs in the bioenergy sector
• Indicator 14: Bioenergy used to expand access to modern energy services
• Indicator 15: Change in mortality and burden of disease attributable to indoor smoke
• Indicator 16: Incidence of occupational injury, illness and fatalities
Guidance for social indicators

Indicator 12: Jobs in the bioenergy sector

Proposed approach:

**TIER 1:** Estimations can be made by observing the number of total jobs in the agricultural sector compared to the production figures of conventional products and bioenergy products.

**TIER 2:** Surveys about the job creation in bioenergy can be made on an individual basis for research purposes.

**TIER 3:** Established statistical data about jobs in the bioenergy sector is available and collected on a regular basis.
Guidance for economic indicators

Attribution issues will be addressed for the following indicators:

- Indicator 17 Productivity
- Indicator 19: Gross value added
- Indicator 20 Change in the consumption of fossil fuels and traditional use of biomass
Summing up highlights concerning the attribution issue

Understand the **character of the attribution issue**. The following types of attribution can be found:

- Insufficient statistical data for the bioenergy sector
- Allocation of a pressure indicator to bioenergy sector
- Assignment of an impact to the bioenergy sector

→ Identify if an overlap of different attribution issues exist.
→ Check if the attribution issue is just a lack of sufficient data.