



INSTITUT FÜR ENERGIE-  
UND UMWELTFORSCHUNG  
HEIDELBERG



on behalf of



Sponsored by



in close exchange with  
**BMEL, FNR, GIZ**

## Technical Paper for the GBEP Task Force on Sustainability

---

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

**International Workshop of the GBEP Task Force on Sustainability**

---



November 28, 2017 in Rome, Italy

Jürgen Giegrich, Horst Fehrenbach, ifeu

# Background

---

The Working Group on Capacity Building (WGCB) - more precisely the Activity Group 2 of the WGCB – has started to analyse the need for action and to set up a first scope of work for the TFS, elaborating a list of specific working items. This list includes a number of cross-cutting issues, which shall be handled with priority.

One of these issues, which was raised by almost all of the GSI implementation projects executed, is: how impacts measured by the GSI should be attributed to bioenergy production and use.

During the 13th Meeting of the TFS it was agreed that a technical paper on attribution should be prepared to provide **basic information about this complex matter** in order to shed light on the implications of this topic and **to give recommendations on how to develop guidance for practical application.**

# Purpose of the paper

---

... is to give the best guidance for the users of the GSI.

The general idea is:

- to address the relevant attribution problems
- to describe general solutions to the attribution problems
- to provide specific solutions for the different indicators and according to the data situation in the GBEP member countries
- to establish a discussion to exchange views on the attribution issue and their solutions
- to sum up the guidance in a document which can be amended in the future as knowledge and experience will further develop

# Attribution is a common issue

---

The GBEP sustainability indicators are about the role of bioenergy in respective countries. And like other sectors in a society the generation and use of **bioenergy is part of the entire economy. Focusing on one sector always means to separate it from the whole economy** and specify its role within the economic system of a country.

Cutting out a sector is connected with rules and conventions about how to draw the line between the sector of interest and the remaining rest. This is also true for bioenergy which starts by defining the system of bioenergy and ends up with solving all the single questions which arise from parting this system from all other systems.

# Three types of attribution issue

---

Analysing the attribution issue for bioenergy three general types can be identified:

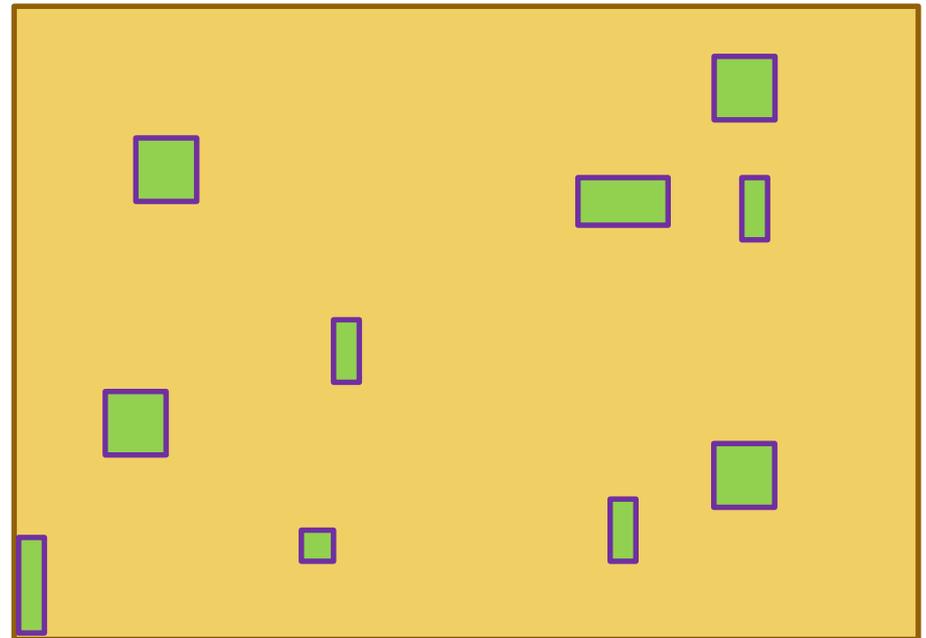
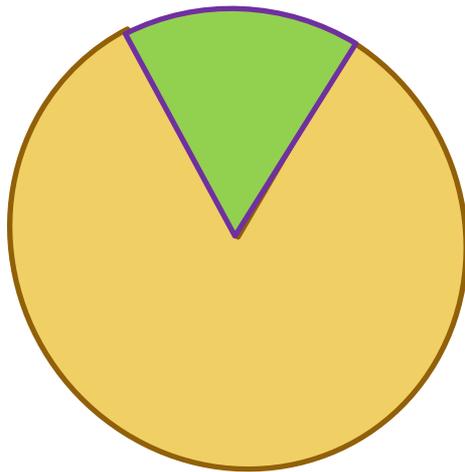
- Interpreting or generating statistical data
- Co-production of bioenergy and other products
- A combination of both

Check if still other types of attribution issues exist

# Two general solutions to the statistical attribution issue

## Top-down approach

e.g. production figures and land use

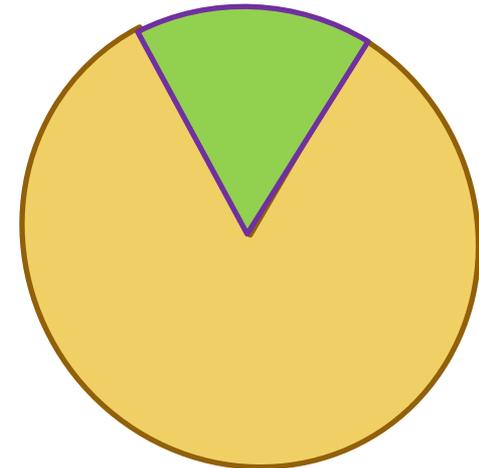
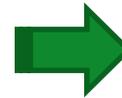


-  Biomass production for energy use
-  non-energetic production of biomass (food, feed, fiber etc.)

# Two general solutions to the statistical attribution issue

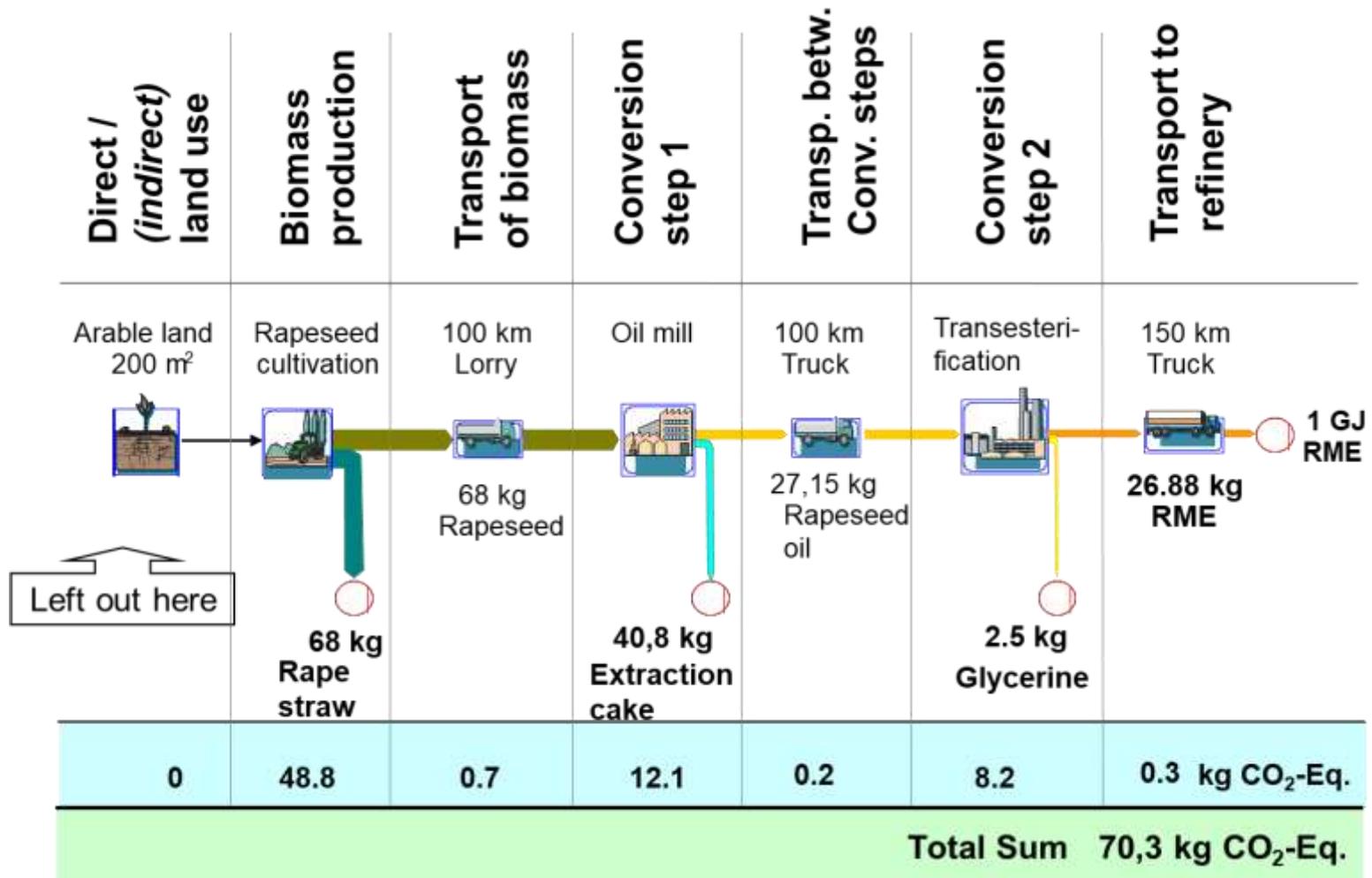
## Bottom-up approach

e.g. GHG emission for a certain technology



-  Biomass production for energy use
-  non-energetic production of biomass (food, feed, fiber etc.)

# The attribution issue of co-production - also known as allocation



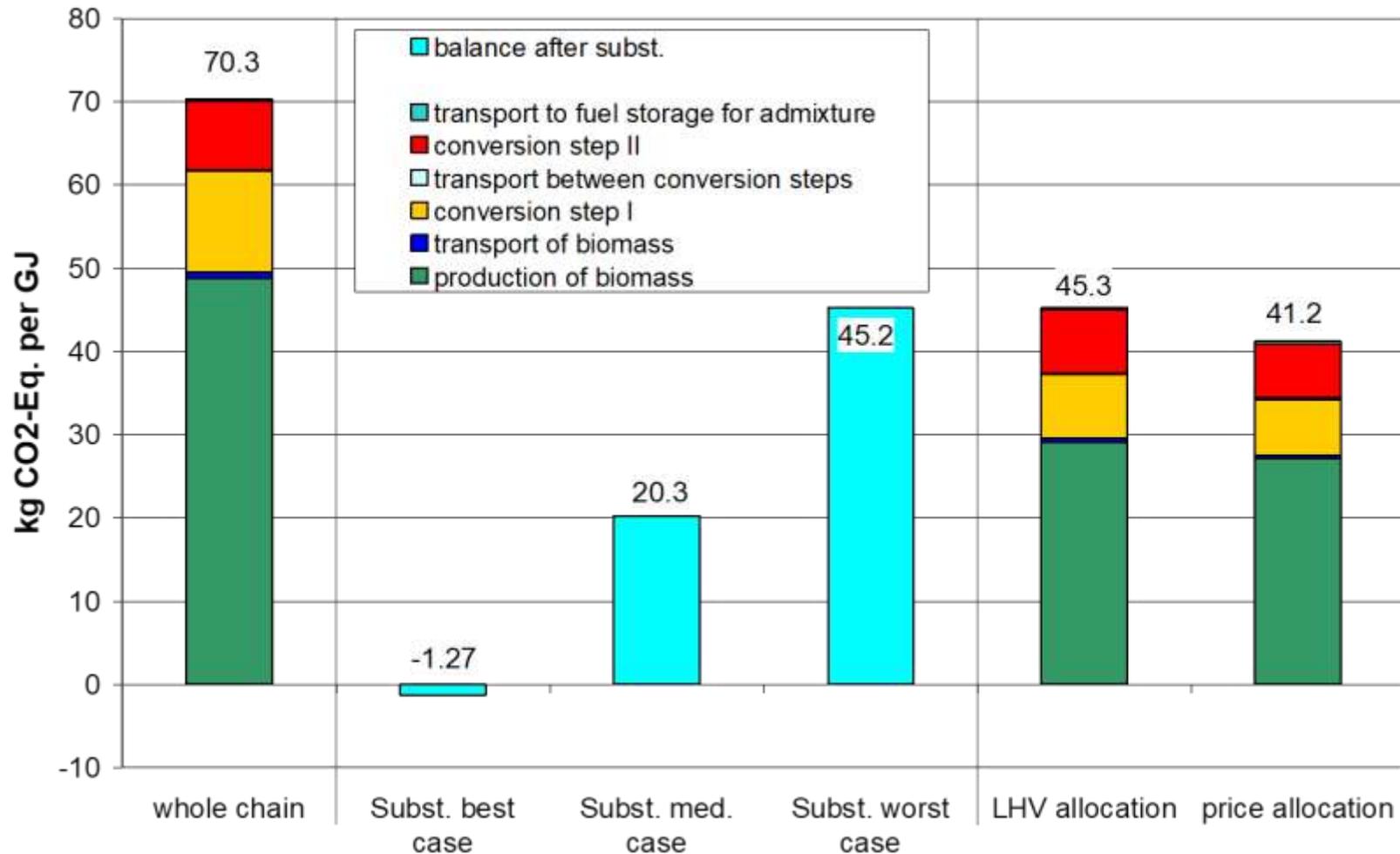
# The attribution issue of co-production

---

To assign an impact e.g. the GHG emissions to the different products (energy, animal feed, chemical use) several methods are proposed. The most important ones are:

- allocation by energy content expressed by the lower heat value (LHV)
- allocation by market value
- substitution

# The attribution issue of co-production



# Lessons learnt from implementation projects of GSI in several countries

COUNTRIES	COMPLETED	IN PROGRESS	PLANNED
Argentina	N		
Brazil	L		
China			L
Colombia	N		
Egypt	L		
Ethiopia		N	
Germany	N1	N2	
Ghana	N		
India			N
Indonesia	N		
Italy		L	
Jamaica	N		
Japan	L		
Kenya		N	
Netherlands	N		
Paraguay		N	
USA		N	
Sudan			L
Uruguay		N	
Vietnam		N	

# Lessons learnt from implementation projects of GSI in several countries

## Example from Indonesia

### ENVIRONMENTAL PILLAR

Indicator	Indicator description	Attribution issue	Approach
1 -GHG emissions	Lifecycle greenhouse gas emissions from bioenergy production and use	None mentioned	Bottom-up calculation of selected / representative production sites
2- Soil quality	Percentage of land for which soil quality, in particular in terms of soil organic carbon, is maintained or improved out of total land on which bioenergy feedstock is cultivated or harvested	None mentioned	Assessment of oil palm plantations in general (state of soil at national level); case study approach for SOC (assessment of different oil palm plantations)
7-Biological diversity in the landscape	(7.1) Area and percentage of nationally recognised areas of high biodiversity value or critical ecosystems converted to bioenergy production;	Overlap of oil palm plantations with regions of high biodiversity value or critical ecosystems	Linear attribution of CPO used for national bioenergy production (8%)

# Lessons learnt from implementation projects of GSI in several countries

## SOCIAL PILLAR

Indicator	Indicator description	Attribution issue	Approach
11 - Change in income	Contribution of the following to change in income due to bioenergy production:	Attribution of oil palm sector to bioenergy production	Assessment of whole palm oil sector combined with case studies (field surveys in areas with bioenergy production and comparison with national average wages)
12 - Jobs in the bioenergy sector	Net job creation as a result of bioenergy production and use  Total number of jobs in the bioenergy sector; and percentage adhering to nationally recognized labour standards consistent with the	Attribution of the total number of jobs in the production of the crops/feedstocks for bioenergy	For direct jobs assessment of whole palm oil sector and attribution to bioenergy based on share of palm oil used for biodiesel production; partly information from case studies (field surveys
	principles enumerated in the ILO Declaration		one palm oil plantation dedicated to bioenergy production)

# Lessons learnt from implementation projects of GSI in several countries

## Example from Germany

### ENVIRONMENTAL PILLAR

Indicator	Indicator description	Attribution issue	Approach
1 -GHG emissions	Lifecycle greenhouse gas emissions from bioenergy production and use	Imported vs. domestically produced feedstocks;	Bottom-up calculations of different bioenergy pathways
2- Soil quality	Percentage of land for which soil quality, in particular in terms of soil organic carbon, is maintained or improved out of total land on which bioenergy feedstock is cultivated or harvested	Location of bioenergy feedstock cultivation is not known	risk based approach; qualitative description of soil improvement measures
6 - Water quality	(6.1) Annual nitrogen (N) and phosphorus (P) loadings from fertilizer and pesticide active ingredient loadings attributable to bioenergy feedstock production (per watershed area):	Location of bioenergy feedstock cultivation is not known	Linear attribution based on share of agricultural land used for bioenergy (assumes that all crops have similar water requirements) Risk-based approach: focus on regions with high pollution levels

# General considerations to solve the attribution issue

---

Overarching aspects shall be followed if an attribution issue arises. Criteria for solving an attribution task are

- plausibility
- transparency
- practicability

The first and second criterion are needed to understand and reproduce a solution of an attribution issue while the third one ensures the feasibility of the solution under given circumstances.

# General considerations to solve the attribution issue

## How to ensure practicability for solving attribution

Practicability is connected to the availability of data and therefore directly linked to the economic effort to produce data for a sector-specific attribution. An idea to bridge the gap is to work with different solutions for the attribution issue resulting in different efforts to achieve data and figures. The TIER approach supports the needs and possibilities for each user of indicators.

The definition of the TIER approach from the IPCC Inventory Guideline: A tier represents a level of methodological complexity. Usually three tiers are provided. Tier 1 is the basic method, Tier 2 intermediate and Tier 3 most demanding in terms of complexity and data requirements. Tiers 2 and 3 are sometimes referred to as higher tier methods and are generally considered to be more accurate.

# Examples how to treat attribution issues as further guidance to GSI practitioners

## Example Indicator 1: Lifecycle GHG emissions

(Environmental pillar)

*(1) Multi-output processes with different (energy) products occur while comparing the GHG emissions from different energy sources at the national level. How should this allocation issue be addressed?*

- TIER 1: Use pre-set default values from one data source
- TIER 2: Use economic value of products with original data.
- TIER 3: Use energy content (lower heating value) of material flows as allocation factor with original data.

## Example Indicator 9: Allocation and tenure of land for new (social pillar) **bioenergy production**

*(1) How can land use titles of a certain type of land be attributed to the production of biomass for new bioenergy?*

- TIER 1: The produced amount of biomass for new bioenergy and biomass for other purposes is known on a national level and the land tenure structure of the country and type of land is known. Then the percentage of land tenure titles may be calculated according to the relation of the different produced biomasses.
- TIER 2: The produced amount of biomass for new bioenergy and biomass for other purposes is known but not the related land area of a specific given land tenure information. Then attribution may be calculated using share of biomass for bioenergy to assign respective land area.
- TIER 3: Due to national systems of monitoring or subsidizing specific land occupation for bioenergy production must be reported to administrative institutions of a country (private or public). So land tenure and bioenergy production are available in combination.

## Example Indicator 17: Productivity

(Economic pillar)

*(1) Multi-output processes with different amounts of (bioenergy) products or co-products have an influence on the productivity. The productivity indicators (17.1) and (17.3) refer to a productivity per area (feedstock productivity). How can the hectare-productivity be assigned to a given bioenergy feedstock at farm level?*

- TIER 1: Use allocation factors determined for a specific case e.g. nutrition content, carbon content, etc. as specifically determined for a country and a type of plant production.
- TIER 2: Use economic value of products with original data from a farm (value of products at the point of sale from the farm)
- TIER 3: Use energy content (lower heating value) of material flows as allocation factor with original data from a farm.

### Description:

(17.1) Productivity of bioenergy feedstocks by feedstock or by farm/plantation

(17.2) Processing efficiencies by technology and feedstock

(17.3) Amount of bioenergy end product by mass, volume or energy content per hectare per year

(17.4) Production cost per unit of bioenergy

# Further steps of the attribution issue

It is suggested to proceed as follows:

1. Presentation of first ideas on how to deal with the topic in a paper
2. Workshop at the GBEP meeting 2017 to discuss the general approach for preparing an attribution guidance paper or an input into the overall guidance document
3. **Collect real attribution problems from the participants of the workshop, from the existing indicator reports and from other forms of communication like e.g. webinar meeting in the next year**
4. **Collect solutions which are proposed by experts and structure the solutions for a guidance document as a follow up of this paper**
5. **Identify difficult attribution matters which lack an appropriate solution and develop ideas which can be tested by GBEP indicator practitioners**
6. **At the end a final guidance paper or an input into the overall guidance document shall be drafted which includes general solutions as well as indicator specific assistance**



INSTITUT FÜR ENERGIE-  
UND UMWELTFORSCHUNG  
HEIDELBERG



---

Thank you for your attention and looking forward to a fruitful discussion

---



# Title

---

