RSB GHG Calculator

CAAFI Environment Team GHG Modeling
Workshop, 27th January 2014

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RSB is a pioneer in the standardisation of biofuels and biomaterials

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Notes – Sustainable Biofuels Stakeholder Meeting
November 28th, Energy Center, EPFL

November 28th, 2006

A multi-stakeholder meeting was held at the EPFL in Lausanne on November 28th, 2006 to investigate the potential for developing internationally accepted and implementable standards for sustainable biofuels. This document summarizes the discussion points and information shared on the day.

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Main outcomes of first meeting

..a standard on sustainable biofuels should include a **lifecycle analysis** of greenhouse gas (GHG) emissions..

..and ensure that biofuels contribute to **GHG reduction**

RSB principles and criteria: Criterion 3 GHG emissions

Principle 3. : "Biofuels shall contribute to climate change mitigation by significantly reducing lifecycle GHG emissions as compared to fossil fuels."

Criterion 3a – Comply with GHG regulations. Biofuel operators must meet GHG regulations in the markets where they operate

- E.gU.S. RFS, California LCFS, EU RED
- Benchmarking of global biofuel regulations & GHG requirements

Criterion 3b – Calculate GHG Emissions Operators must use RSB GHG methodology to calculate lifecycle GHG emissions associated with their operations

- RSB/EMPA have developed a GHG methodology, in collaboration with an GHG expert group
- July 2011 Final Version RSB GHG Methodology
- There are no default energy & material use values – actual numbers must be used by operators

Main aspects of GHG calculation methodology

Life cycle approach: “from the field to the tank”

Attributional approach

Own data from operators / users

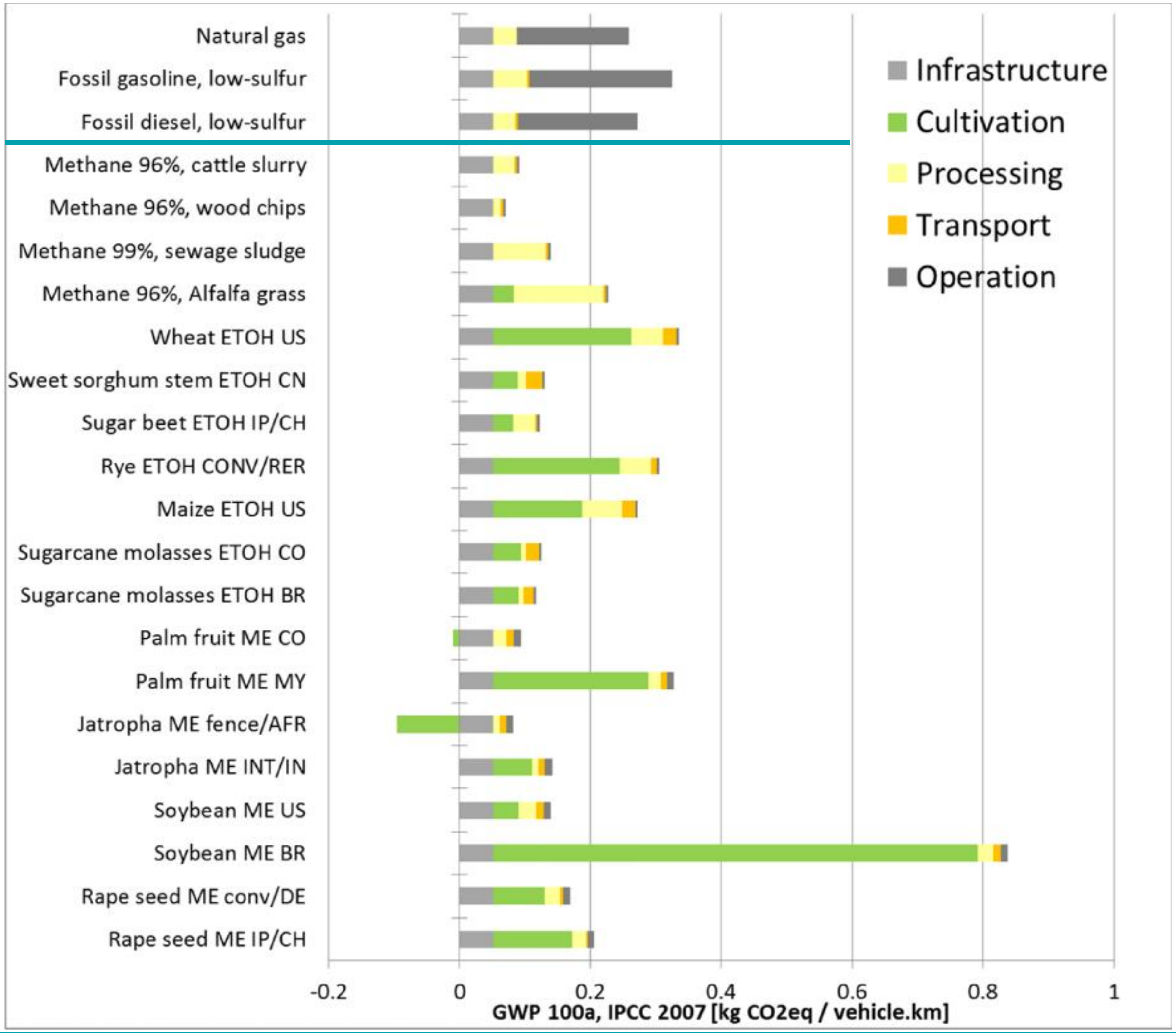
- Energy use (e.g. amount of natural gas, amount of electricity)
- Material use (e.g. amount of fertilizer, amount of chemical)
- Location (affects modelling of emissions in the cultivation module)
- (Direct) land use change data (cultivation)

Background data (e.g., GHG emission factors for fertilizer production) based on comprehensive database (ecoinvent)

Economic allocation

Own fossil fuel baseline based on world average

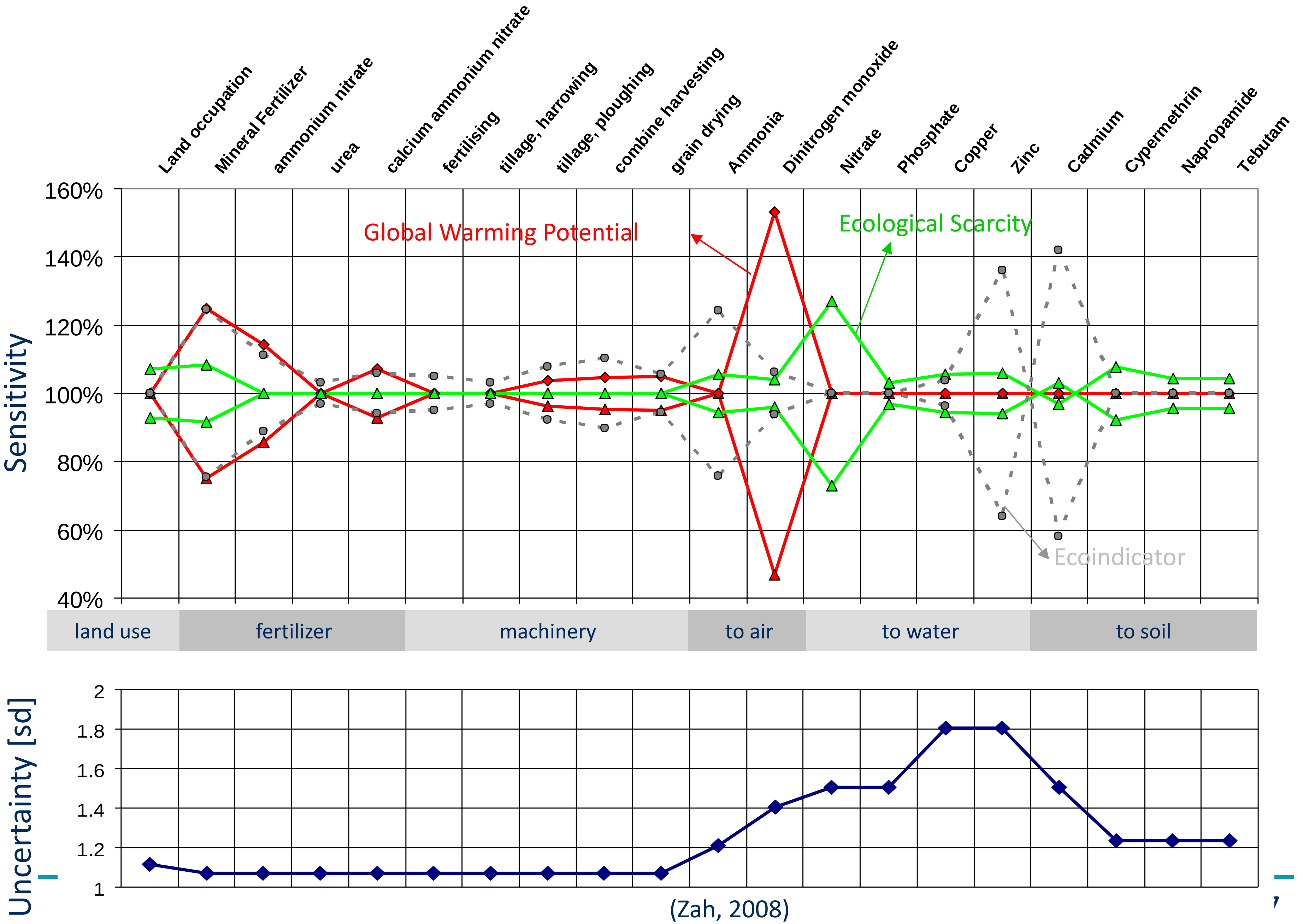
GHG emissions of fuel pathways



- High variability among the biofuels
- Agricultural step is very important
- Processing step influenced by use of energy and emissions

(Faist Emmenegger, Gmünder et al. , 2012)

Key factors: Rape Cultivation, Switzerland



(Zah, 2008)

Key factors

Key factors for the carbon balance of biofuels are agricultural processes

Most sensitive factors for carbon balance:

- N_2O, CO_2 from land transformation, production of mineral fertilizer, to a lesser part field work

Most key factors also show a high uncertainty, because direct measurements are strongly dependant on local / temporal conditions

Calculation procedure in RSB

Each operator along the value chain collects and enters data for the operation under his responsibility in the corresponding module

Data for the operation are inputs of energy and material, specific emissions of processing, land use change instances for cultivation, feedstock efficiency, yields of main and co-products

Integration of GHG impacts of the preceding step (after cultivation) in the value chain with the GHG intensity of the feedstock

Modelling of field emissions in cultivation is included in the tool based on the fertilizer input as well as climatic and geographic data

Modelling in the cultivation module

Modelling of field emissions (dinitrogen oxide, nitrate, ammonia): specific agricultural models, developed by a Swiss Agricultural Research Institute (ART)

Modelling of land use emissions: largely based on IPCC methodology with some modifications (incorporation of specific data provided by EU Renewable Energy Directive RED)

All documentation is available in the RSB GHG Methodology document

Features of RSB tool

Web-based tool, freely available under www.rsb.org

Five main module types: cultivation, feedstock processing, biofuel production, transport and blending, final blending

Tool provides emission modelling and allocation calculation

Results provided graphically and as a detailed table

Results and data can be exported in excel sheet and sent by mail to any address.

Data for one operation is saved as “module”

Possibility of calculating with both RSB and RED methodologies

Module can be created, saved, copied, modified.

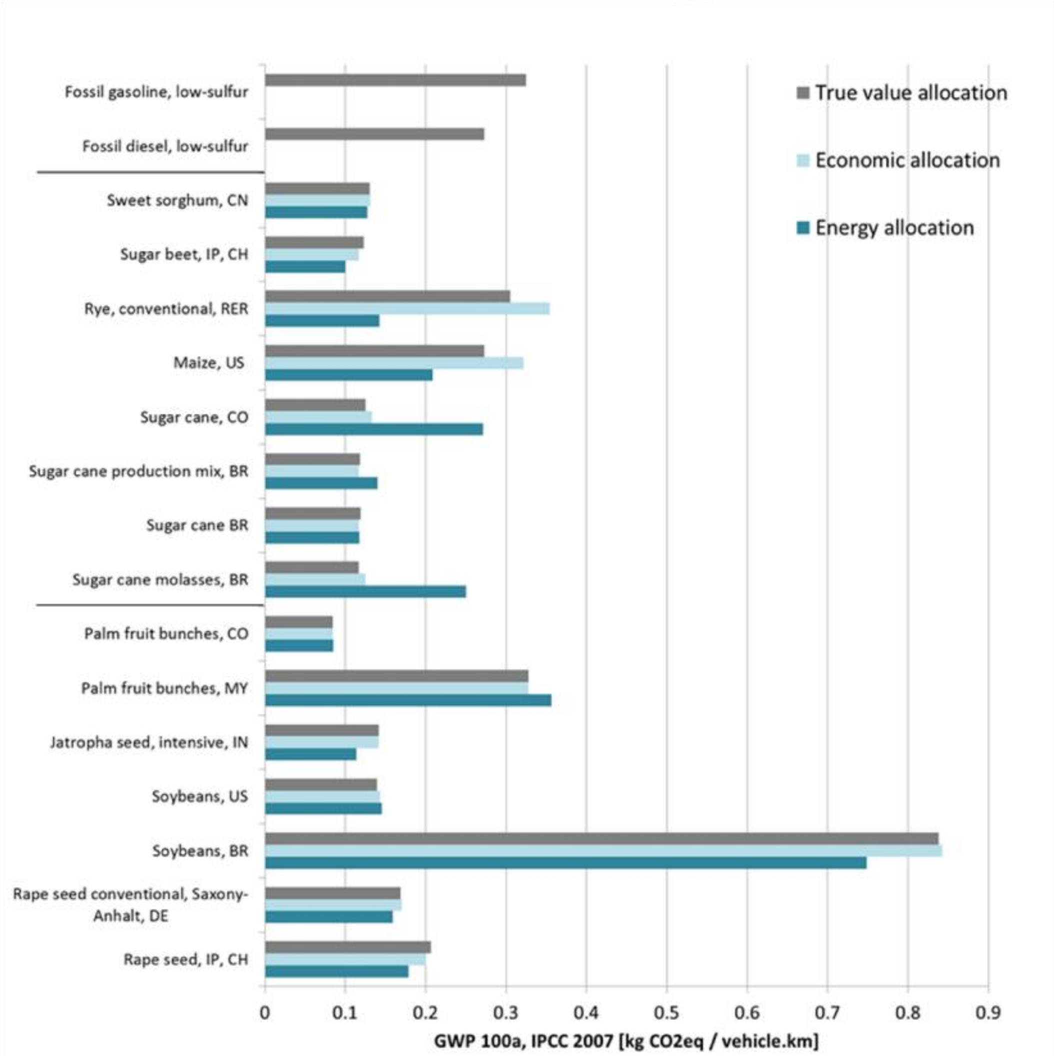
Main differences between RSB and RED methodologies

RED allows using default values, while RSB obliges to use actual values calculated for the operation with actual data

RED does not give any guideline on which kind of background data should be used: danger of “cherry picking”

Energy allocation: the attribution of the GHG emissions depends on the energy content of the co-products (except for some exceptions like excess electricity).

Influence of allocation type



(Faist Emmenegger, Gmünder et al. 2012)

«True value» = ecoinvent default allocation
Economic allocation ≅ RSB
Energy allocation ≅ RED

Results depend on the type of pathway!

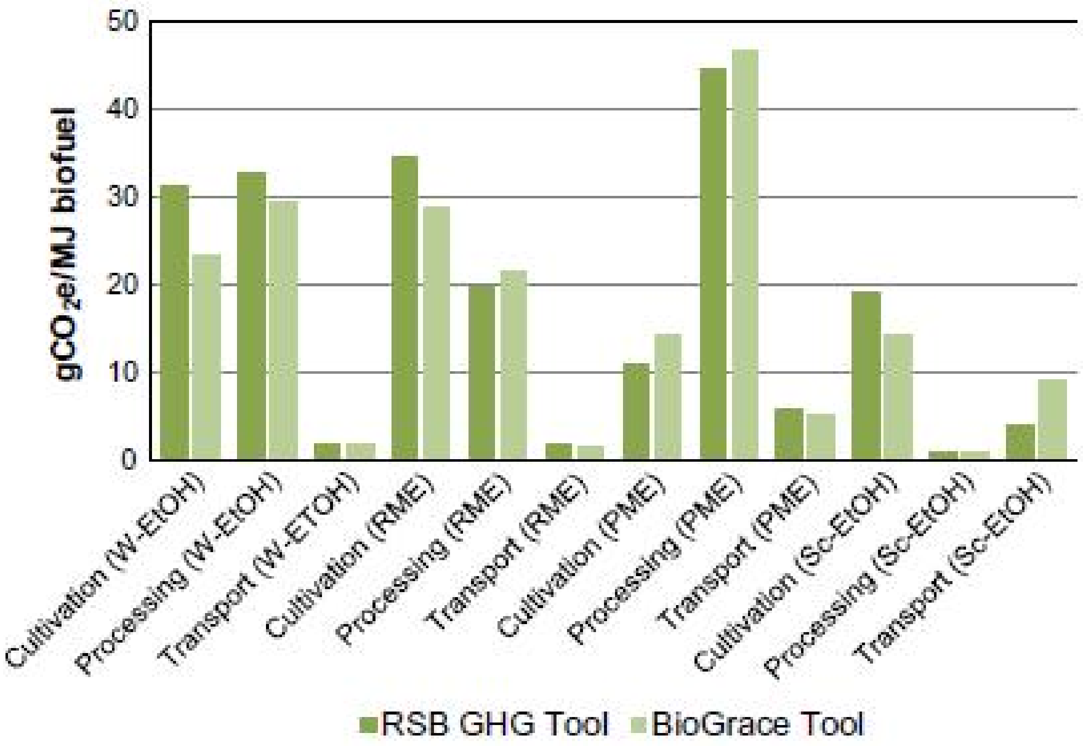
Emission factors and modelling N_2O in RED and RSB

RED leaves open which kind of database for emission factors shall be used and how to calculate N_2O

BioGrace Tool (recognized for RED) proposes emission factors (which were used to calculate the default values); this data is less complete and detailed than in the RSB tool

RSB tool also allows calculating RED values but with own background data and own N_2O calculation

Results of calculation with two different tools for RED: RSB EU-RED and BioGrace EU-RED

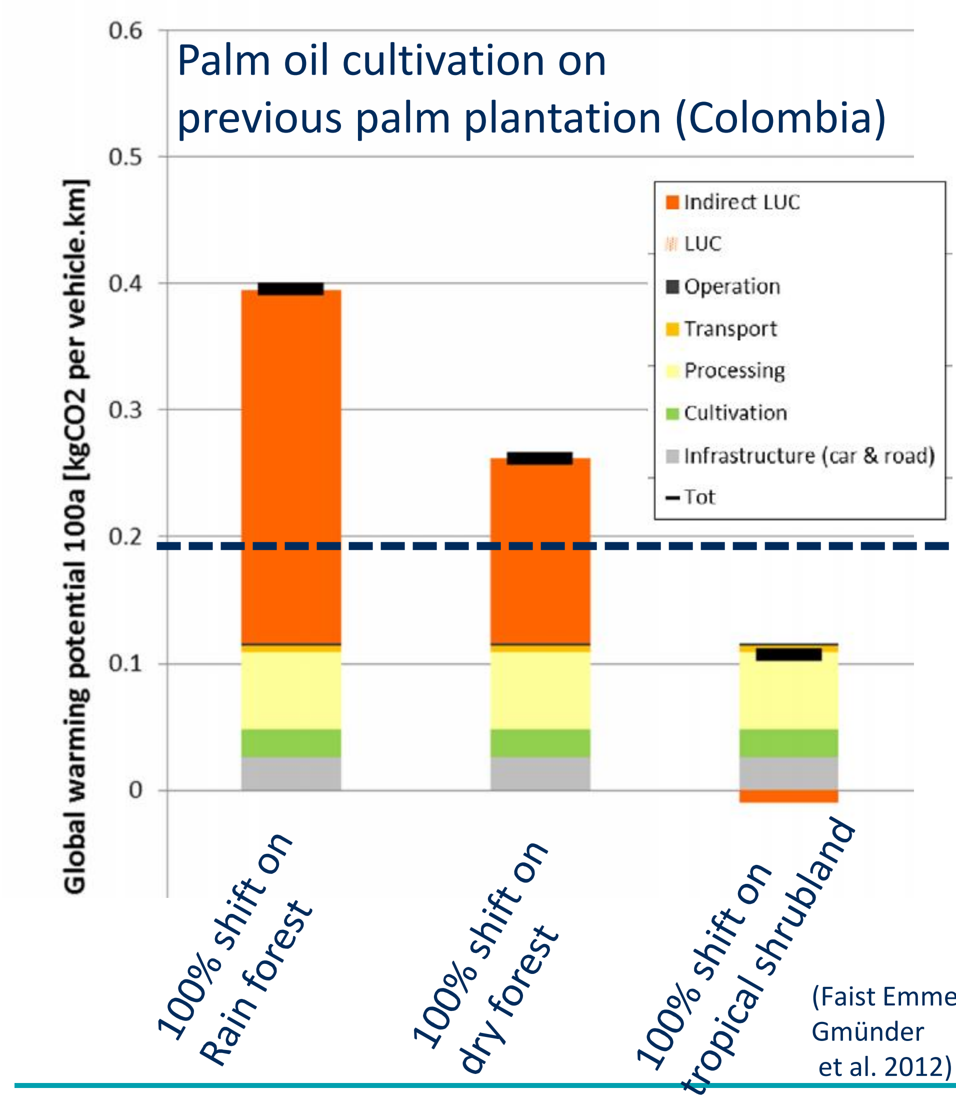


Hennecke, Faist Emmenegger et al. 2012

Main deviations:

- GHG intensity of fertilizers
- More detailed level of entering data in RSB tool
- N2O modelling: BioGrace: standard value, RSB according to IPCC

System boundaries: Indirect effects?



(Faist Emmenegger, Gmünder et al. 2012)

- Accounting of LUC might lead to growing of feedstocks on agricultural land while displacing food crops
- iLUC can obliterate GHG reduction
- Assessment indirect land use emissions still very controversial
- RSB GHG methodology addresses only direct impacts of biofuel production; indirect impacts are addressed qualitatively (principle «local food security»)

Conclusions

To reduce GHG emissions, you must first count them: RSB provides a complete GHG methodology with the corresponding tool.

The RSB calculator also offers the possibility of calculating GHG emissions following the rules of RED.

Modelling choices can result in great differences in the GHG calculations

Very precise guidelines for modelling / calculation are necessary to allow meaningful comparison between different types of fuel

Quantis

Thank you for your attention!

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