



Greenhouse Gas Balances for the German Biofuels Quota Legislation

Methodological guidance and default values

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- In Germany: law of a **mandatory biofuel quota** (Biofuel quota act) effective since January 2007.
(following the EU Directive 2003/30/EG)

- An R+D project on behalf of Federal Environment Agency (UBA) is started to work out a set of criteria for sustainable biomass production and use.
GOAL: to deliver input to the GBEP process (originally);
now also: to deliver input according to the requirements of the Biofuel quota act.

- Intensive discussion and exchange with similar activities in the Netherlands, UK other European states and the EU.

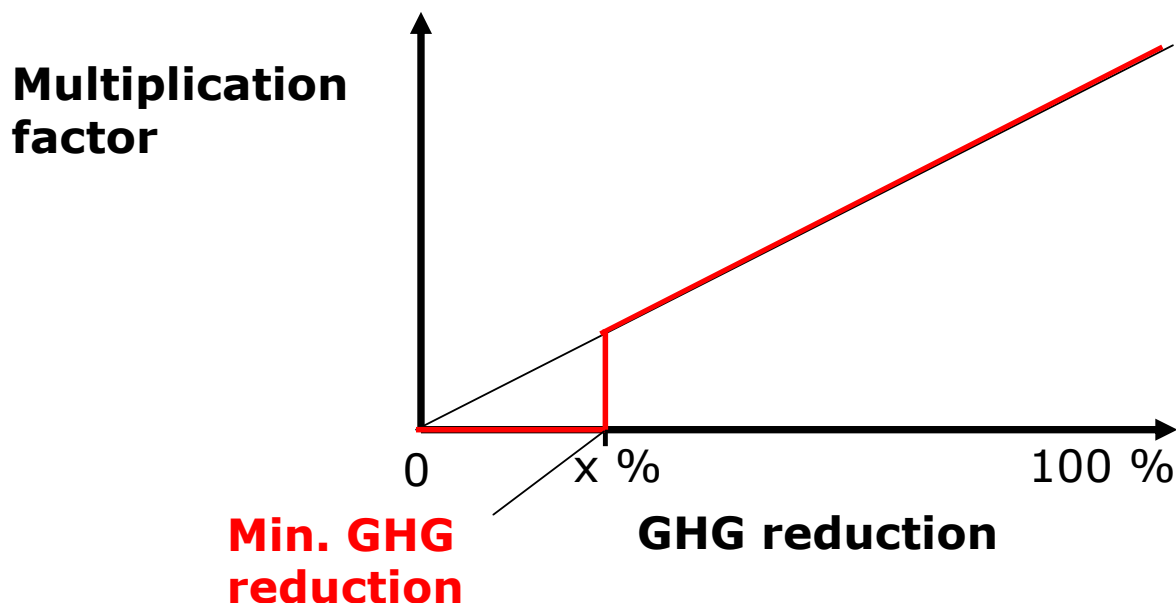
→ Requirements Biofuel Quota Act:

- the federal government is authorised to modify the actually acknowledged quota by regarding the real GHG savings. multiplication of the annually sold amount of a specific biofuel with a correction factor.
 - a minimal level of CO₂ savings for the biofuels is required,
 - sustainable cultivation of agricultural land.
 - protection of natural habitats.
- Authorization to concretize these requirements by an ordinance (first draft): Biofuel sustainability ordinance.

General principles of the “ GHG tool“



- Biofuel quota act authorises the government to introduce a **multiplication factor** for different biofuels **based on their GHG savings**.



The current state of proposed themes and principles to be addressed by a certification system for sustainable biomass.

- 1 There has to be a significant contribution to **greenhouse gas mitigation!**
- 2 **Land use** practices and land use changes driven by biomass production shall not lead to significant **ecological impacts!**
- 3 Increased biomass production shall not lead to worse **social-economic** situations!

R+D Project: Principles



The current state of proposed principles:

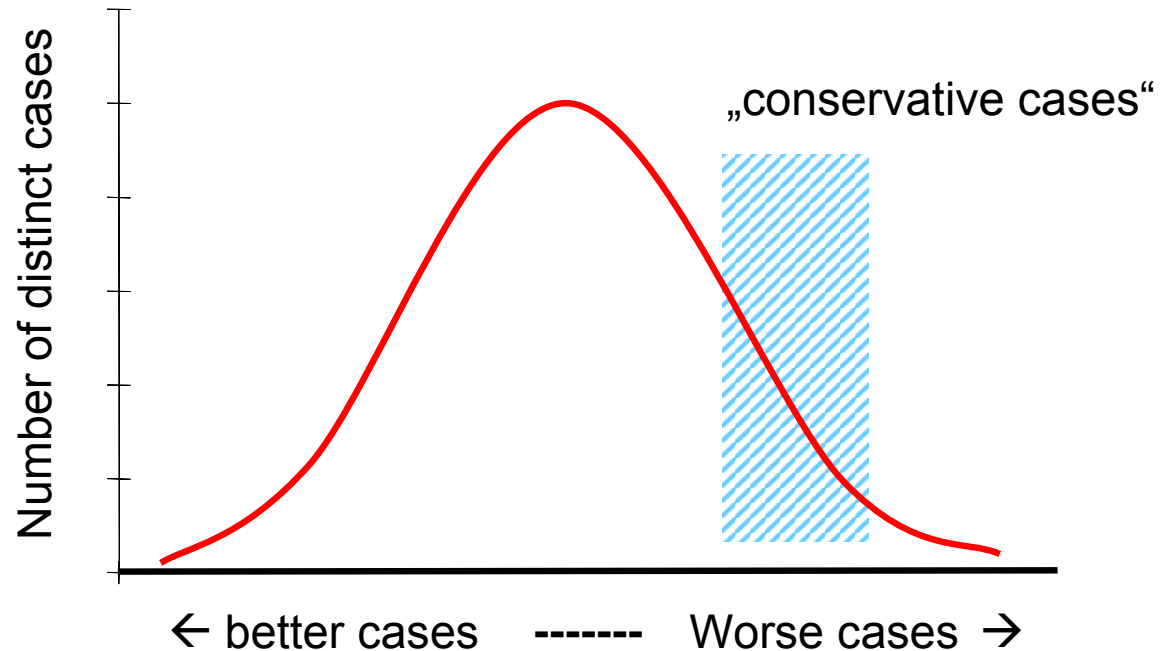
- 1 Significant contribution to greenhouse gas mitigation!
- 2 Effects from indirect land use changes (competition) have to be considered.
- 3 Loss of habitats of high conservation value shall be prevented
- 4 Loss of biodiversity shall be prevented
(incl. criteria considering farmland biodiv. and GMO)
- 5 Negative impacts on soil, water and air shall be minimized
- 6 Local population shall not drawbacks but participate in opportunities
- 7 Ownership has to be respected
- 8 Respect internationally required social standards

- **Considering all steps of the life cycle chain**
- **Setting default values**
- **Transparent calculation model with transparent co-product consideration**

Default values:

- The emission of GHG shall be calculated in the unit “kg CO₂ equivalent / GJ of fuel”.
- A differentiation has to be made for using default values and using singular case values.
- The default values are based on conservative but realistic cases for Germany. They have to be applied if no certified singular case values are available.
- The default values are configured in a modular way according to the different steps of the biofuel production system.

Default values: definition of “conservative”



General principles of the “ GHG tool“



Biofuel production steps	Considered in calculation
1. direct land use change (LUC)	carbon balance: (C storage in crop system minus C storage in previous system). time span 20 years ; avoided N ₂ O, CH ₄ emissions from previous system; caused N ₂ O, CH ₄ in case of burnings.
2. production of biomass	GHG emissions from fuel use. fertilizers and pesticide production; in case: energy for irrigation; N ₂ O, CH ₄ emissions from crop system
3. transport of biomass	Depending on the system
4. conversion step I	GHG emissions from energy supply. fuel use. auxiliary materials.
5. transport between steps	Depending on the system (might be missing)
6. conversion step II	GHG emissions from energy supply. fuel use. auxiliary materials.
7. transport to fuel storage for admixture (refinery)	Depending on the system
8. <i>Indirect land use change</i>	<i>“risk adder” (currently in further elaboration)</i>

Considering co-products:

There are various options to consider co-products.

From all these the most appropriate are judged to be...

- Allocation based on **energy** figures (i.e. lower heat value)
- Allocation based on **market** values (prices)
- Delivering **credits** for substitution of other products

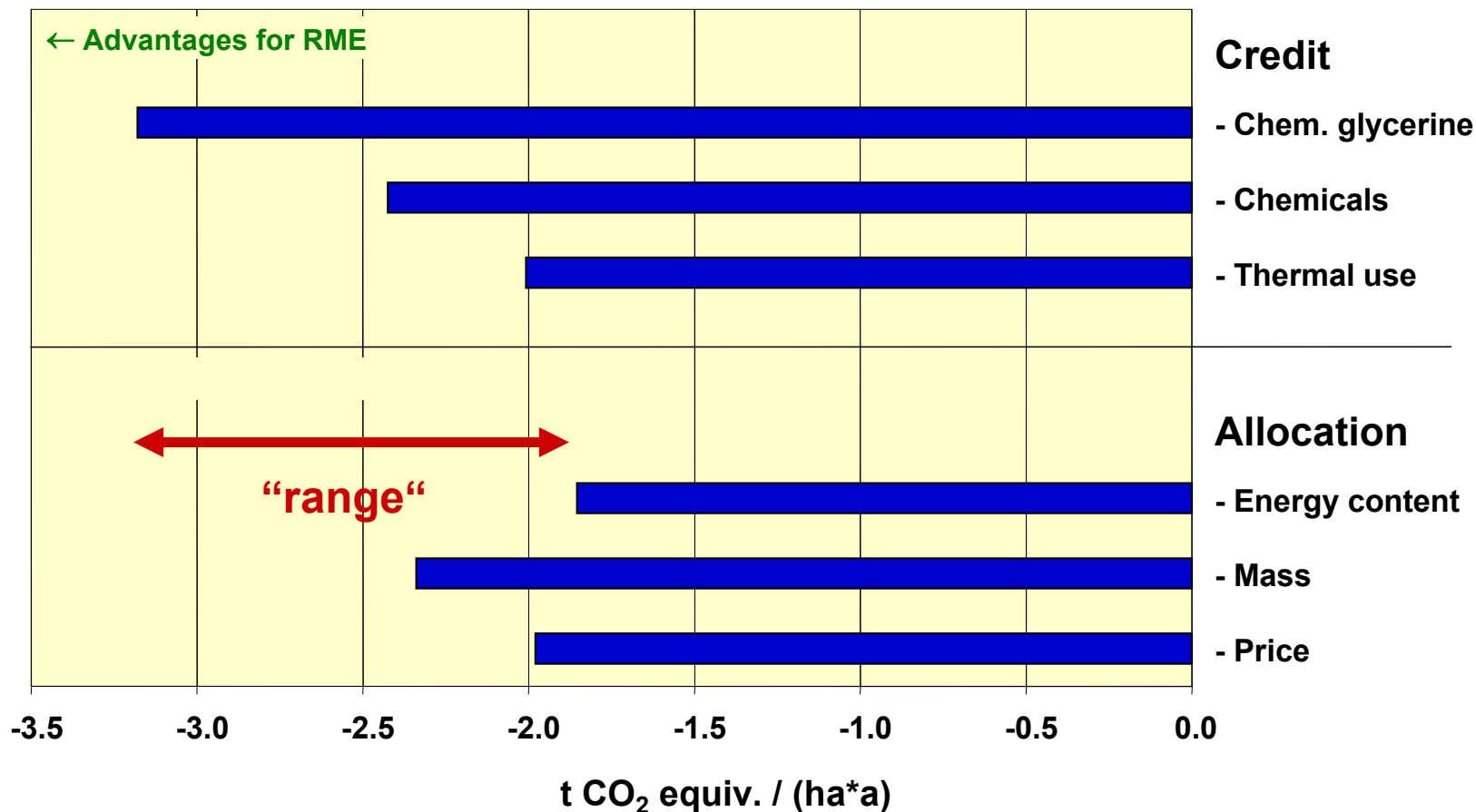
Each option shows specific advantages and disadvantages.

One important requirement is: minimize arbitrariness!

General principles of the “ GHG tool“



Considering co-products: e.g. RME vs. Diesel



Allocation of co-products:

- All inputs and outputs shall be attributed to the co-products by their share of the lower heat value.
- This is to minimize the arbitrariness for the objective of the Biofuel Quota Law because it provides a clear and measurable figure to be used as a rule for allocation.
- An energy figure is appropriate for allocation in this context because the Biofuel Quota Law is about the substitution of fossil energy.
- Biomass which stays on the land or is returned to it (directly or indirectly) is not treated as co-product but modelled in a closed loop. (→ Cross compliance)

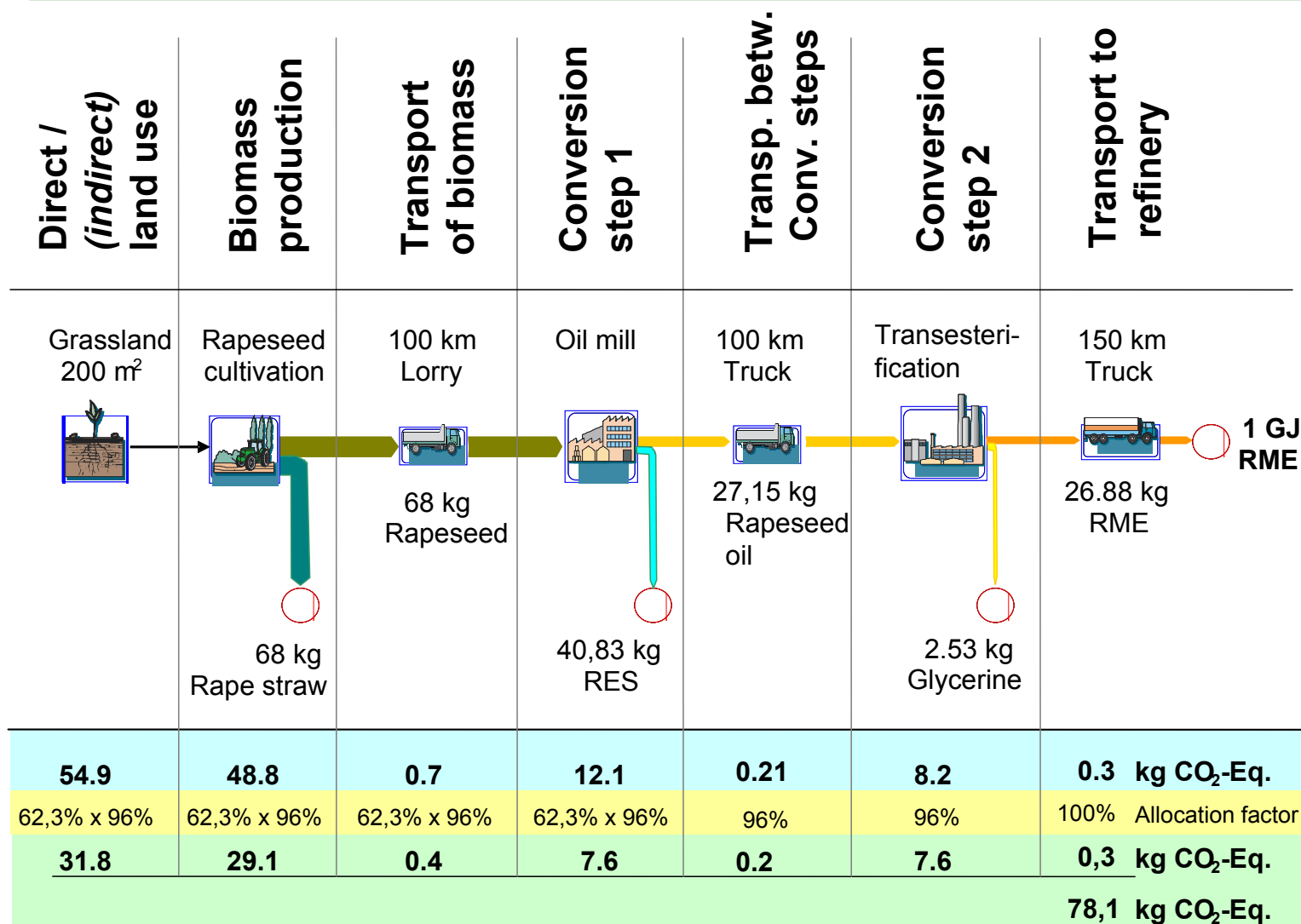
Basics of the “ GHG tool“



List of lower heat values (LHV):

agricultural products		lower heating value		intermediate products		lower heating value	
		MJ/kg d.m.	MJ/kg o.s.			MJ/kg d.m.	MJ/kg o.s.
Wheat	whole plant	17,1	13,5	Dried Distiller's Grains w. Solubles (DDGS)	21,8	16,0	
	grains	17,0	13,7		Sugar juice (45% saccharose)	19,0	7,0
	straw	17,2	13,3		Bagasse (50% dm)	16,6	9,4
Maize (Corn)	whole plant	16,5	14,3	Melasse	16,0	16,0	
	grains	21,4	17,4	rape seed oil	37,2	-	
	straw	17,7	13,7	soy bean oil	36,6	-	
Sugar cane	whole plant	17,0	11,0	palm oil	36,5	-	
	cane	17,0	11,0	extraction cake from rape seed	19,0	15,0	
Rape	whole plant	21,8	17,0	extraction cake from soy bean	19,0	15,0	
	grains	26,5	21,8	fibrous cake from oil fruits	17,5	14,0	
	herbaceous residuals	17,0	14,7	palm kernels	28,0	28,0	
Soy bean	whole plant	18,0	14,5	final products			
	grains	20,0	17,0	Ethanol	26,7	-	
	herbaceous residuals	17,0	13,0	RME	37,2	-	
oil palm	full fruit bunch	24,6	22,3	SME	37,0	-	
	fruits	31,7	31,5	PME	36,6	-	
	empty fruit bench	17,5	14,0	Glycerine (20% w after transesterif.)	17,0	13,4	

Calculation example RME



Exemplary calculations

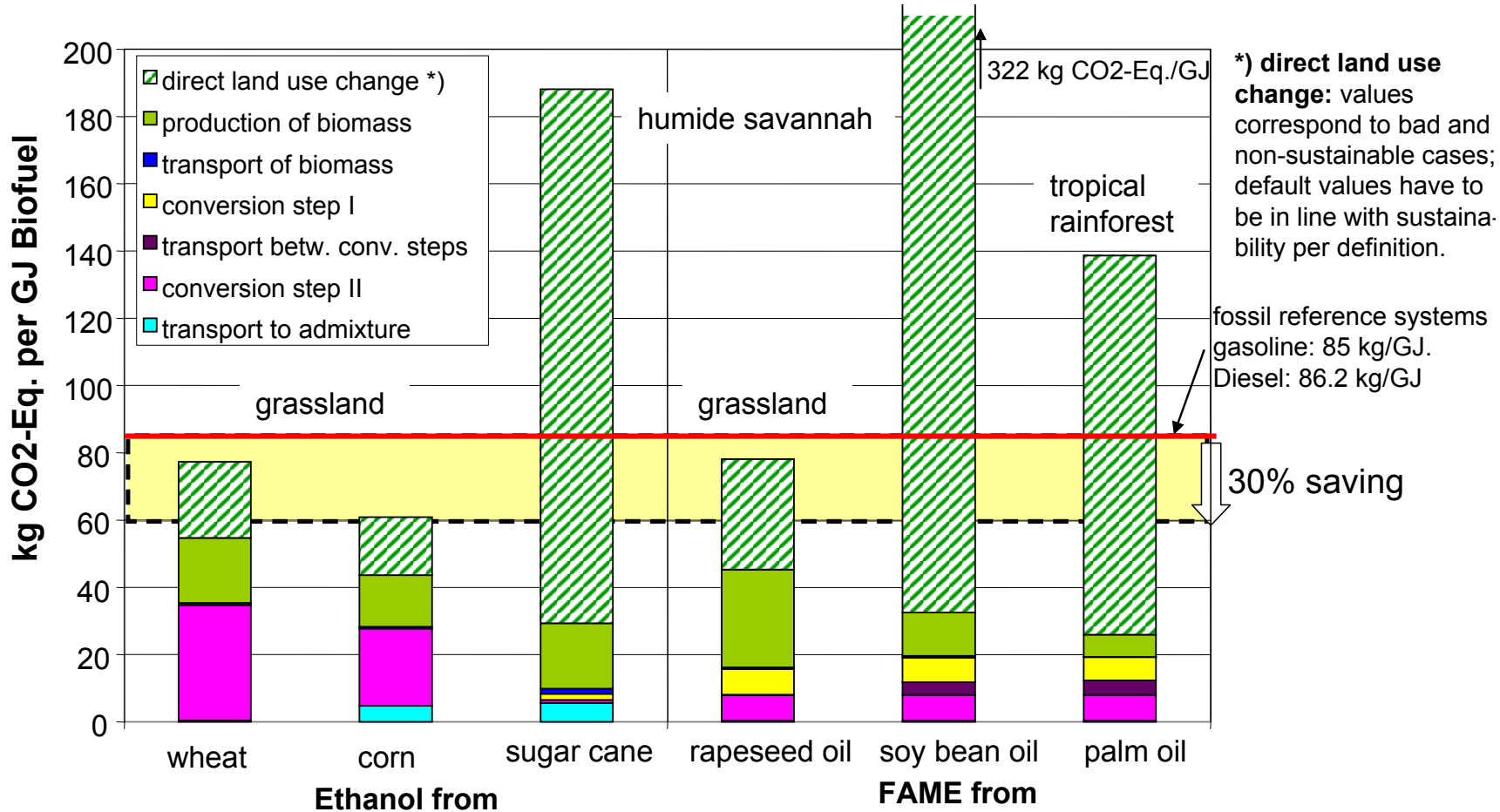


exemplary values based on an allocation (LHV) :

in kg CO ₂ -eq./GJ	Ethanol from			Methylester from		
	wheat (EU)	corn (NAM)	sugar cane (SAM)	rapeseed oil (EU)	soy bean oil (SAM)	palm oil (SEAs)
Land use change	22.7	17.2	158.8	32.8	289.5	112.8
Production of biomass	19.3	15.3	19.5	29.1	12.9	6.6
Transport of biomass	0.6	0.6	1.5	0.4	0.5	0.1
Conversion step I	-	-	1.7	7.6	7.3	6.9
Transport betw. steps	-	-	-	0.2	3.8	4.3
Conversion step II	34.3	23.0	1.0	7.6	7.7	7.7
Transport to refinery	0.4	4.8	5.5	0.3	0.3	0.3
<i>indirect land use change</i>			<i>Not yet implemented</i>			
Total	77.3	60.8	188.1	78.1	321.9	138.7
Total w/o LUC	54.6	43.6	29.3	45.3	32.4	25.9

Calculation examples

exemplary values based on an allocation (LHV) :



- **Germany will establish a GHG methodology according to the Biofuel sustainability ordinance.**
- **The whole life chain – including direct and indirect land use change – is considered.**
- **Default values are set in case of missing specific data of producer.**
- **A harmonization within the EU is strongly supported.**