Indirect effects of biofuel production

Unraveling the numbers

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Key message I – Do biofuels save GHG-emissions if we include ILUC?

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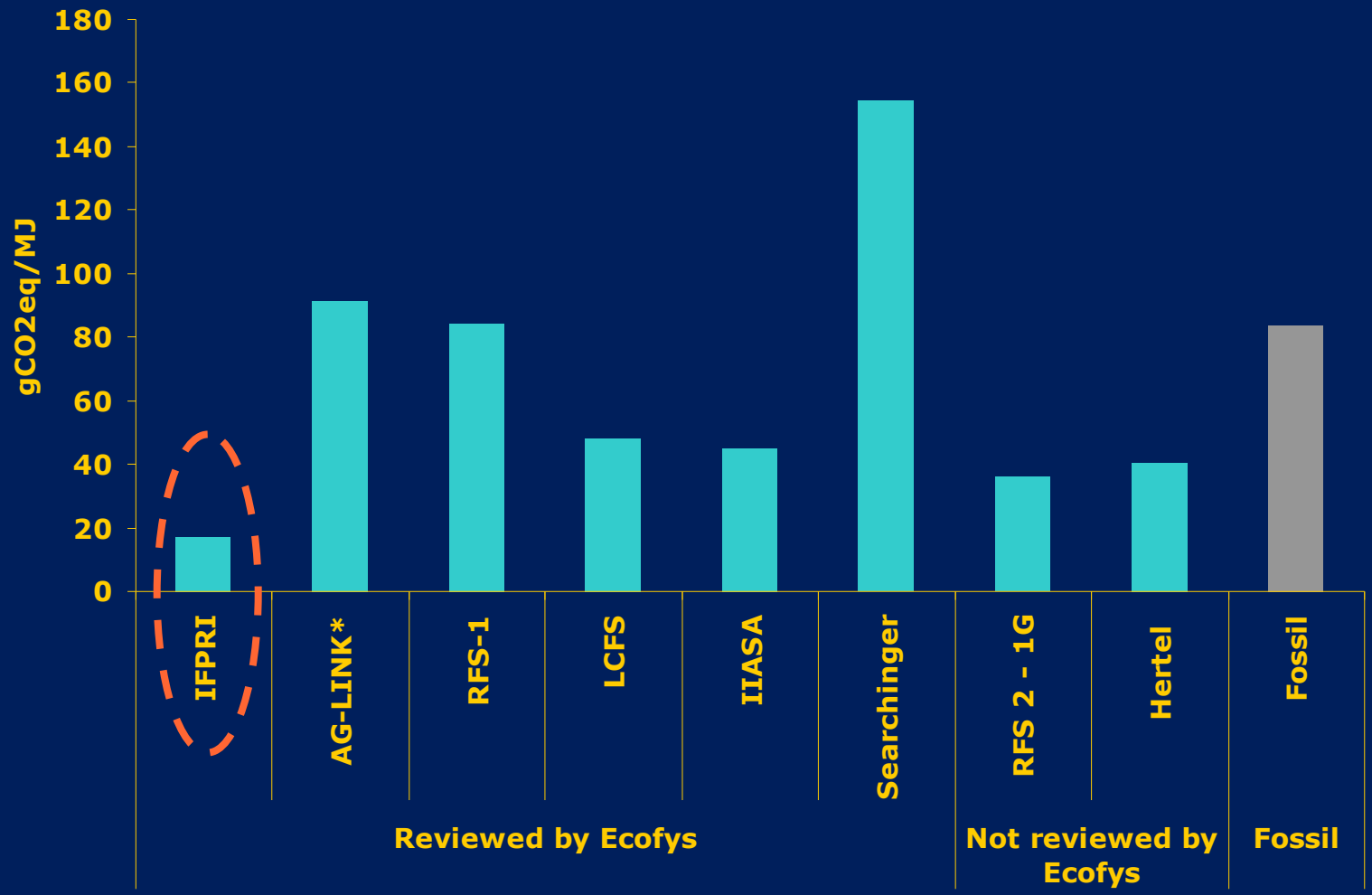
ILUC GHG-emissions – how big are they?



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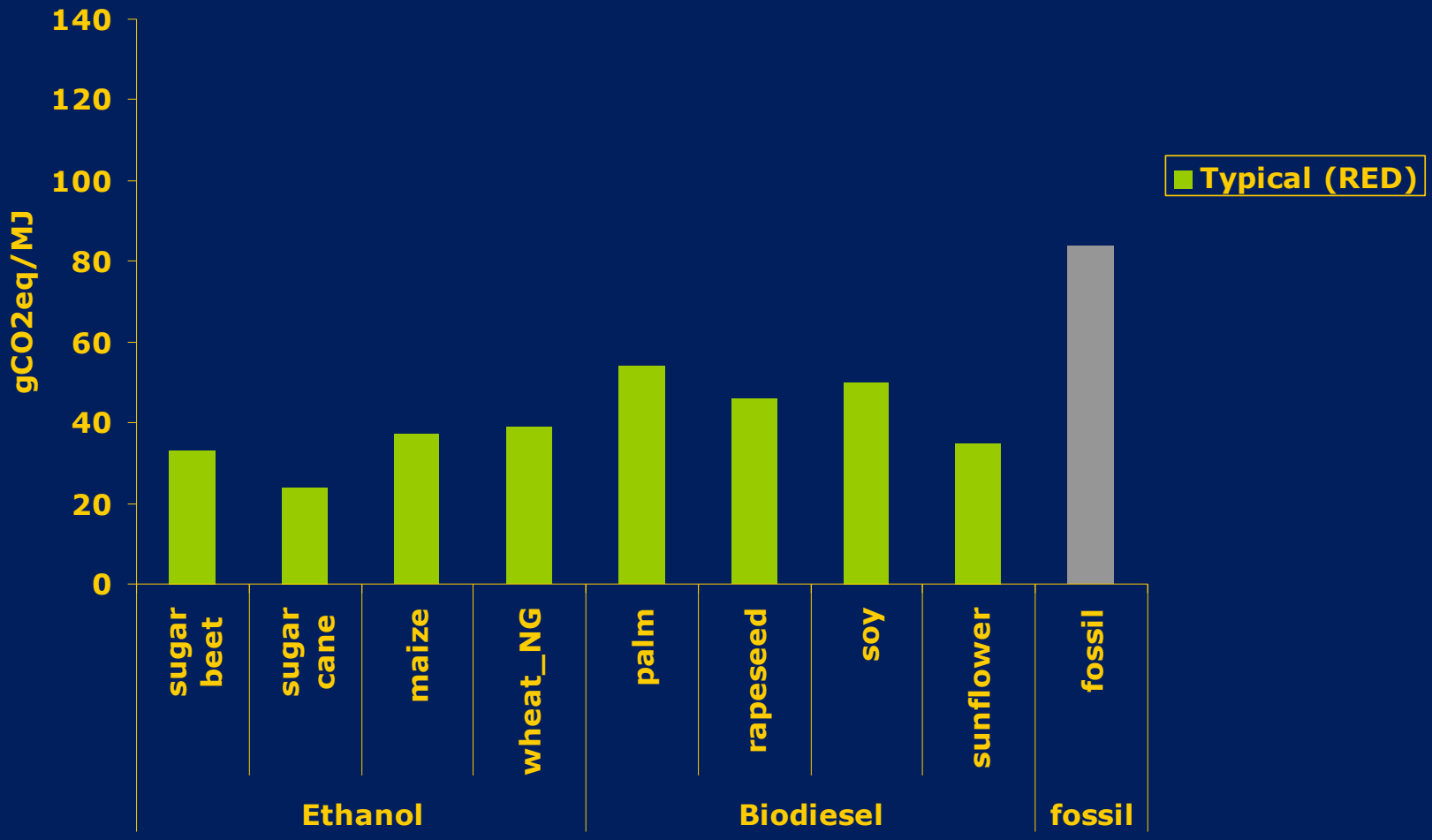
Do biofuels save GHG-emissions if we include ILUC?



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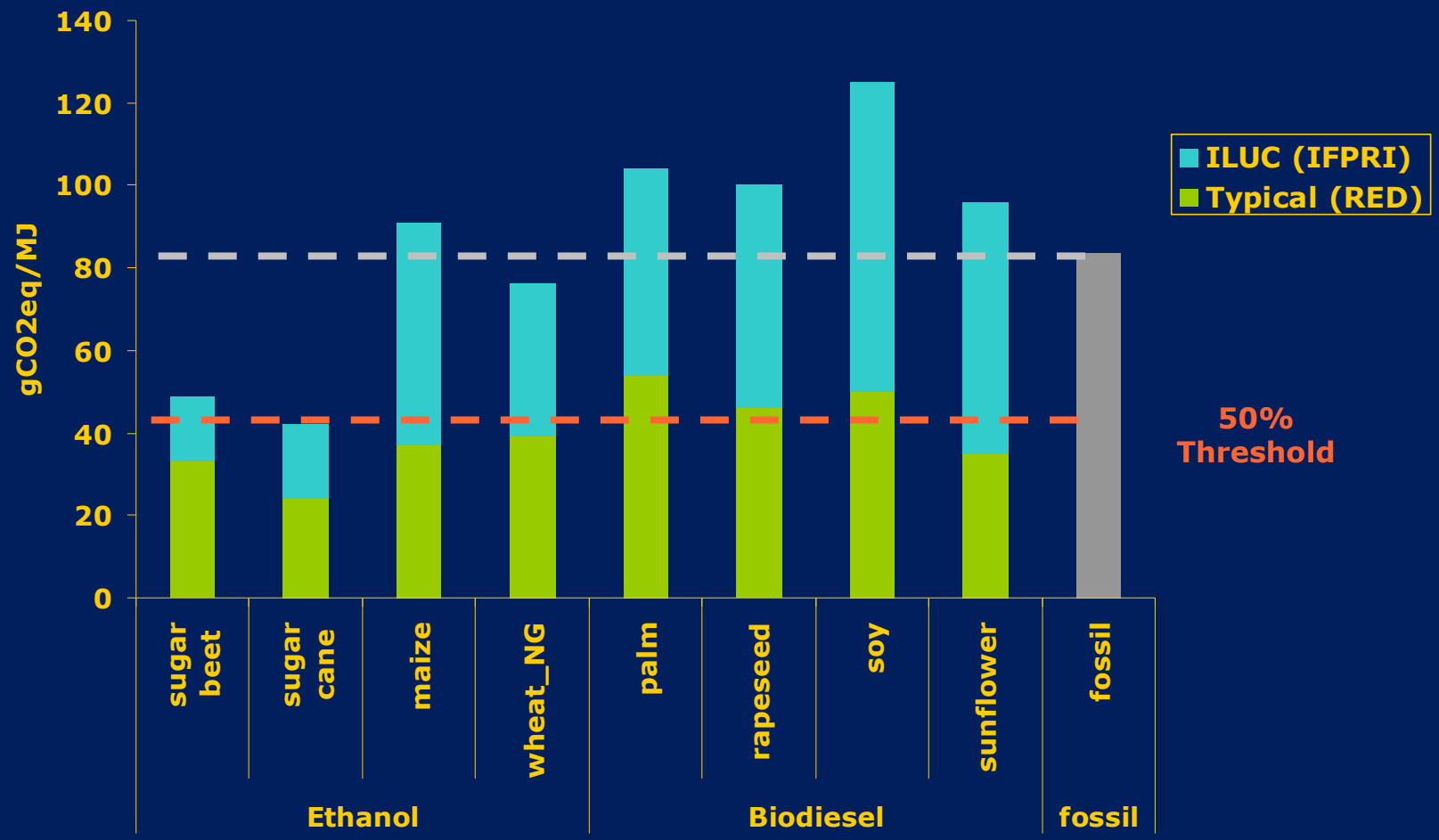
Do biofuels save GHG-emissions if we include ILUC?



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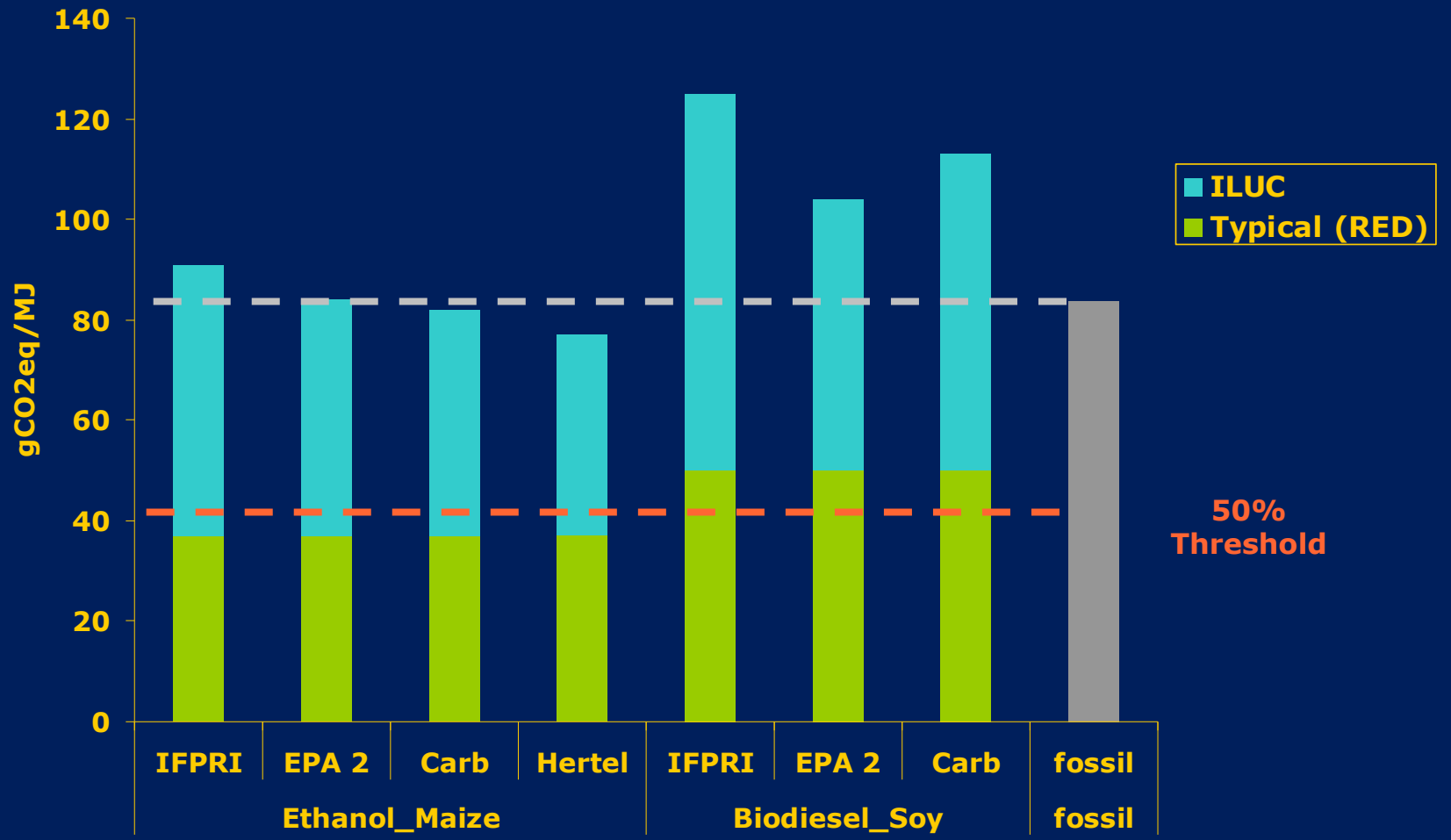
Do biofuels save GHG-emissions if we include ILUC?

Comparing $IFPRI_{marginal}$ with other studies

(excluding EPA-1 & Searchinger, which both find much larger numbers)



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Key message II – Haven't we forgotten anything?

- Debate focuses on GHG emissions
- What about loss of biodiverse areas due to ILUC?
  - 8.7% EU biofuels ~ 27 Mtoe * 0.24 ha/toe = 6.5 Mha LUC
- What about competition with food?
  - IFPRI: 25% of biofuel comes from reduction in food consumption

	EC-consultation		Other		
	IFPRI	AG-link	IIASA	RFS-1	Search-inger
% of biofuel supplied from reduction in other sectors	**24%**	**~50%***	**34%**	**4%**	**20%**

* Estimation based on own calculations – for biodiesel only

Crash course unraveling ILUC models

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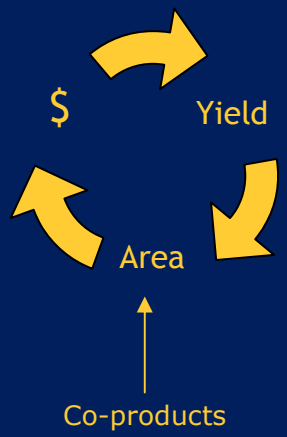
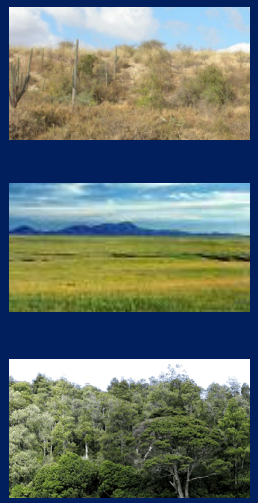
Quantifying indirect effects boils down to 4 questions

Biofuel Mandates	1. Market response?	2. Types of LUC?	3. Carbon stocks?	4. Time / allocation?
			C-stocks	g CO_2/MJ
			III. GHG impacts	
	I. Food prices and consumption	II. Biodiversity impacts		

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Key results of quantification review in 4 steps

		EC-consultation		Other			
		IFPRI	AG-link	IIASA	RFS-1	LCFS	Searchinger
1. Cropland expansion (from energy crops)	ha/toe	**0.11**	**~0.35**	**0.17**	**0.29**	**0.17**	**0.38**
2/3. Emissions from crop expansion	tCO2eq/ha	**133**		**219**	**288**	**235**	**351**
4. Time allocation	Years	**20**	**20**	**20**	**20**	**20**	**20**
-> (I)LUC Emissions	gCO2eq/MJ	**18**	**91***	**45**	**84**	**48**	**155**

Key assumptions determining quantification results of GHG impact

Additional biofuel demand	Area expansion	Types of LUC	Carbon stocks	Time allocation
MJ/y (D)	ha/MJ (A)	type (L)	CO2eq/ha (per type) (C)	y (T)
•Choice of feedstock •Treatment of co-products •Agricultural intensification <-> demand •Food consumption <-> food price	Types of LUC caused by cropland expansion	Carbon stocks of land used for cropland expansion	Time allocation of GHG emissions from LUC	

$$\text{GHG impact} = \frac{A \times L \times C}{D \times T}$$

Common misconceptions (1/2)

"the total world area planted with cereals, oilseeds and sugar crops increases by only 0.7%...."

- This amounts to more than 5 Mha (for 17 Mtoe 1st generation biofuels)
- This amounts to ~ 0.35 ha/toe*
- This amounts to ~ 90 gCO_{2eq}/MJ biofuels
- This is more than fossil fuel

-> always look at the numbers per unit biofuel

*) number includes area expansion for oil palm, which is not included in the 5 Mha

Common misconceptions (2/2)

"The numbers keep coming down"

- You can't compare studies that looked at different feedstocks
  - E.g. IFPRI contains mainly sugarcane. You can't compare this with studies for Maize-ethanol (Hertel, Searchinger)
- If you compare studies per feedstock, the numbers have not come down consistently over time
  - IFPRI marginal numbers are higher than CARB, EPA-2, Hertel
- Also, AG-Link numbers (ha/toe for mix of feedstocks) are higher than CARB, EPA-2, Hertel, IIASA and are comparable to Searchinger

-> Yes, some of the first studies were probably too high

-> But No, the numbers do not keep coming down

Conclusions

- Do biofuels save GHG-emissions if we include ILUC?
  - Based on IFPRI$_{_marginal}$ most do NOT (5 out of 8)
  - Confirmed by other feedstock-specific studies
  - Zero out of 8 studied biofuel pathways meets the RED threshold in 2020 (based on typical RED values)

- Haven't we forgotten something?
  - Debate focussed on GHG-emissions from ILUC
  - ILUC also forms a risk for biodiversity
  - Competition with food

We seem to talk a lot about *quantifying* unwanted indirect effects from biofuel production.

What about *preventing* them?