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Copernicus Institute of Sustainable Development

Energy & Resources

ILUC mitigation & its environmental effects

– A case study on Lublin province

Birka Wicke

Bioeconomy in Agriculture, 22 June 2016, Pulawy

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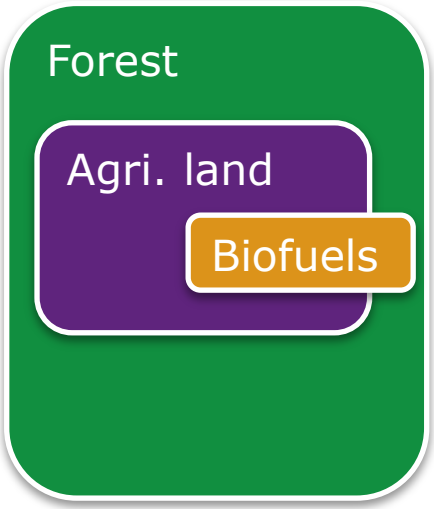
Overview of presentation

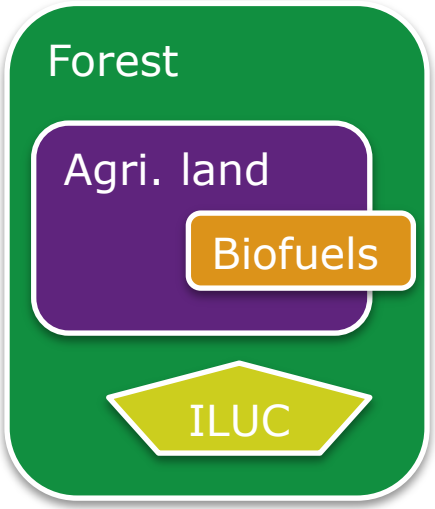
1. What is ILUC and why is it a concern?
2. How can we mitigate ILUC and its effects?
3. What are the environmental impacts of ILUC mitigation?

What is ILUC?

No bioenergy production



Direct land use change



Indirect land use change

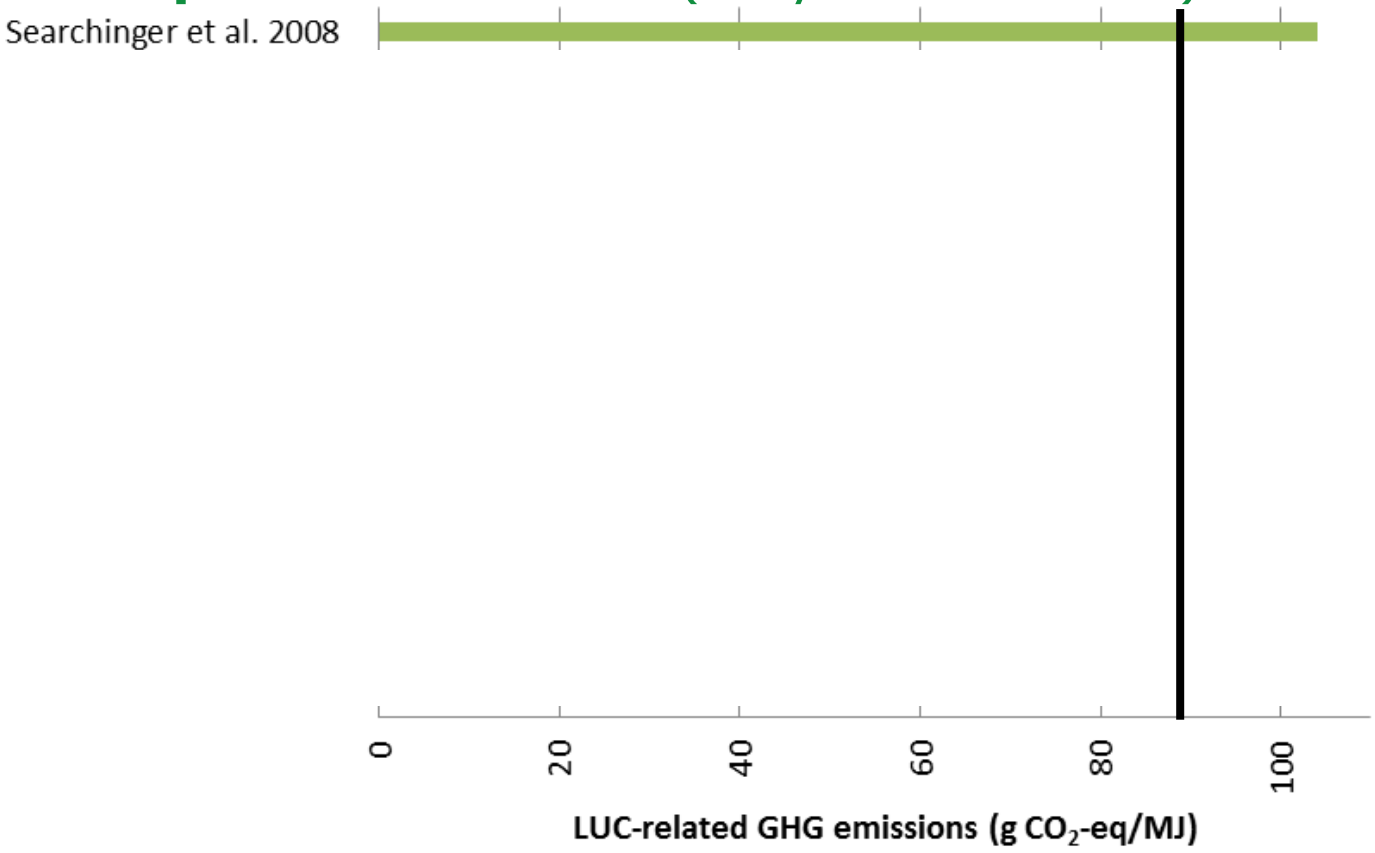
Searchinger et al. 2008 on ILUC

"… we found that corn-based ethanol, instead of producing a 20% savings, nearly doubles greenhouse emissions over 30 years and increases greenhouse gases for 167 years."

Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change
Timothy Searchinger *et al.*
Science **319**, 1238 (2008);
DOI: 10.1126/science.1151861

Why does ILUC remain a concern?

Example corn ethanol (30 year allocation)



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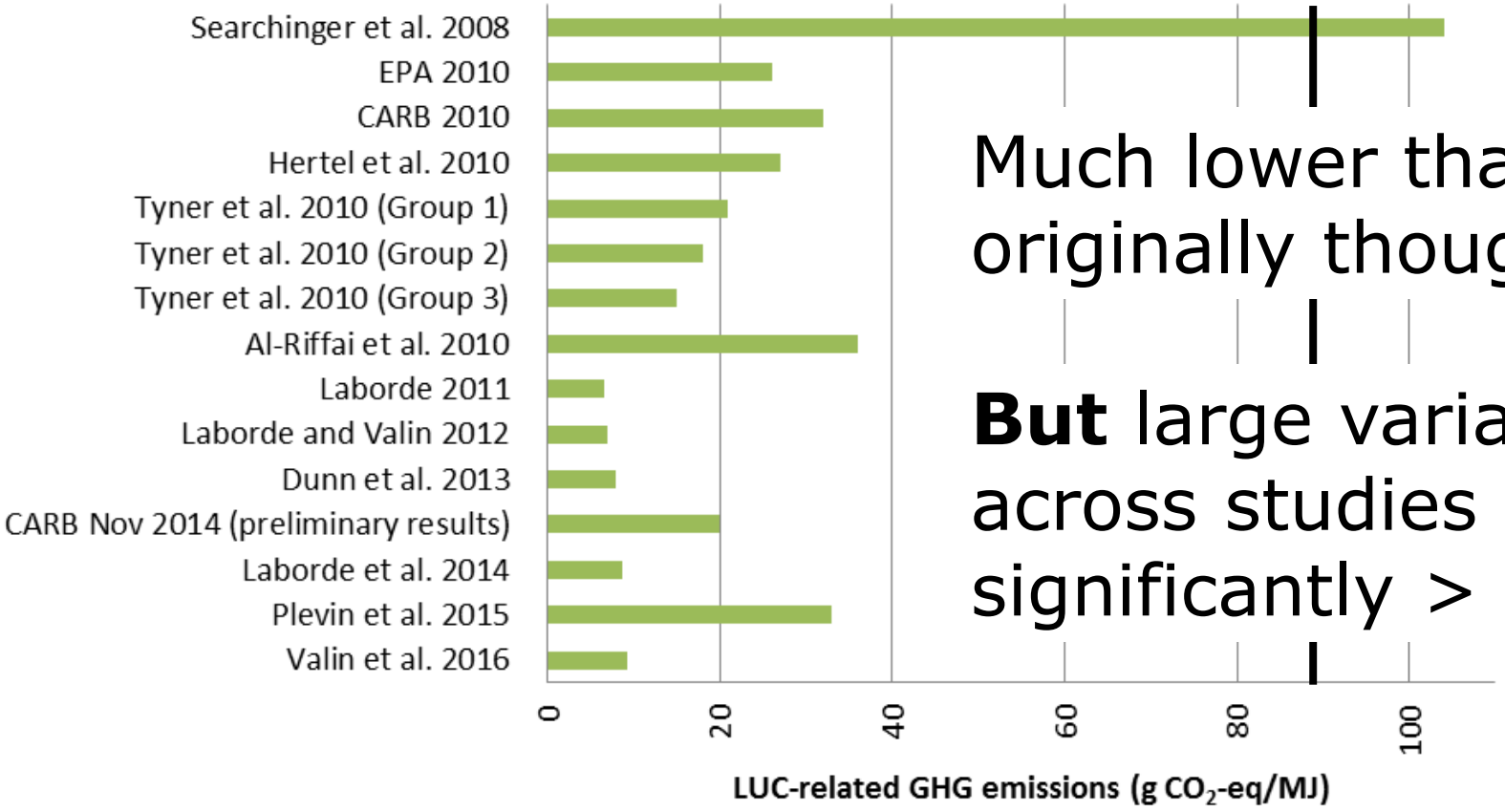
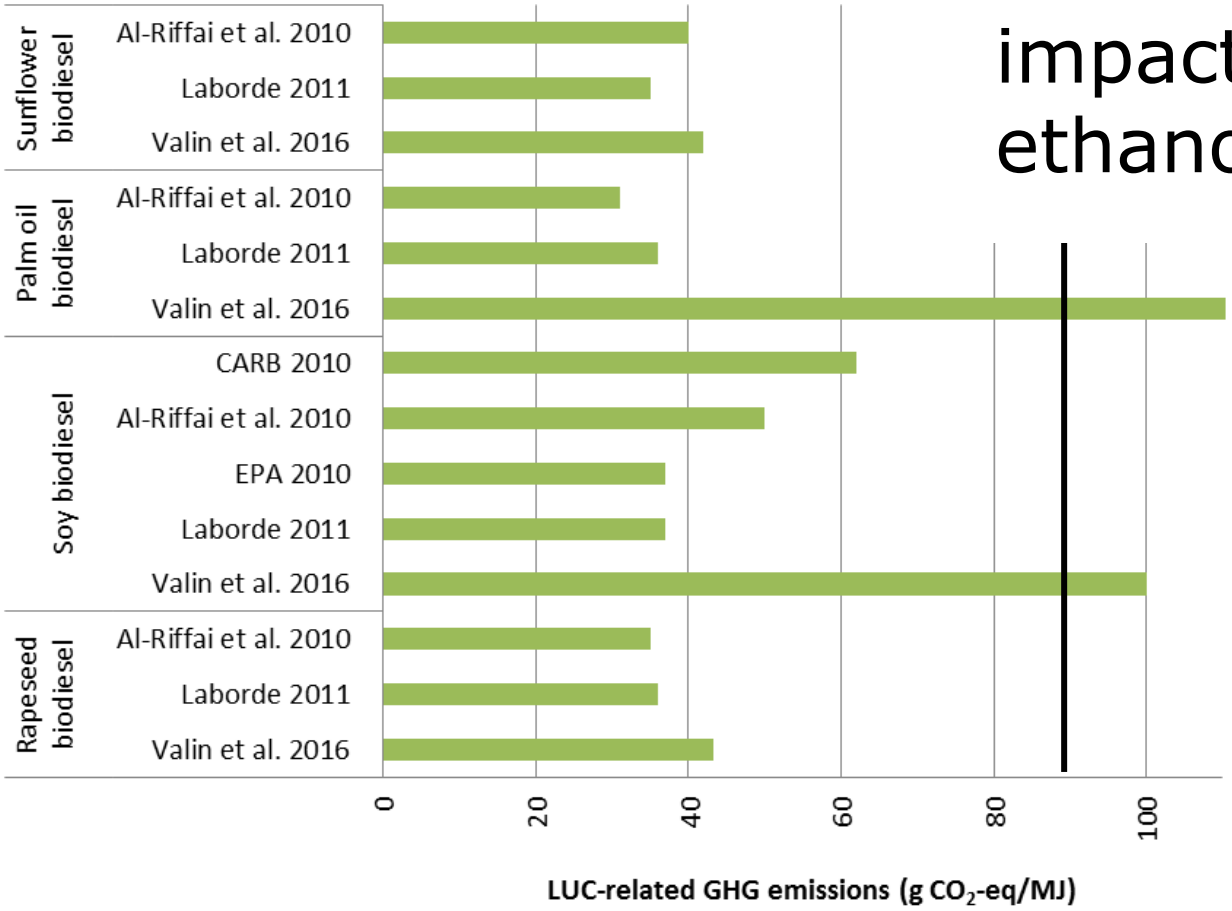


Much lower than originally thought

But large variation across studies & significantly > 0

And biodiesel?

… biodiesel routes show higher impacts than ethanol routes



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- **We cannot ignore ILUC!**
- **Underlying concept:** *Indirect LUC of bioenergy is the direct LUC of another activity*

ILUC mitigation = Address all agricultural production - whether for food or non-food purposes

Options are about

- resource efficiency,
- modernization and sustainable intensification of the agricultural sector, and
- using under-utilized land

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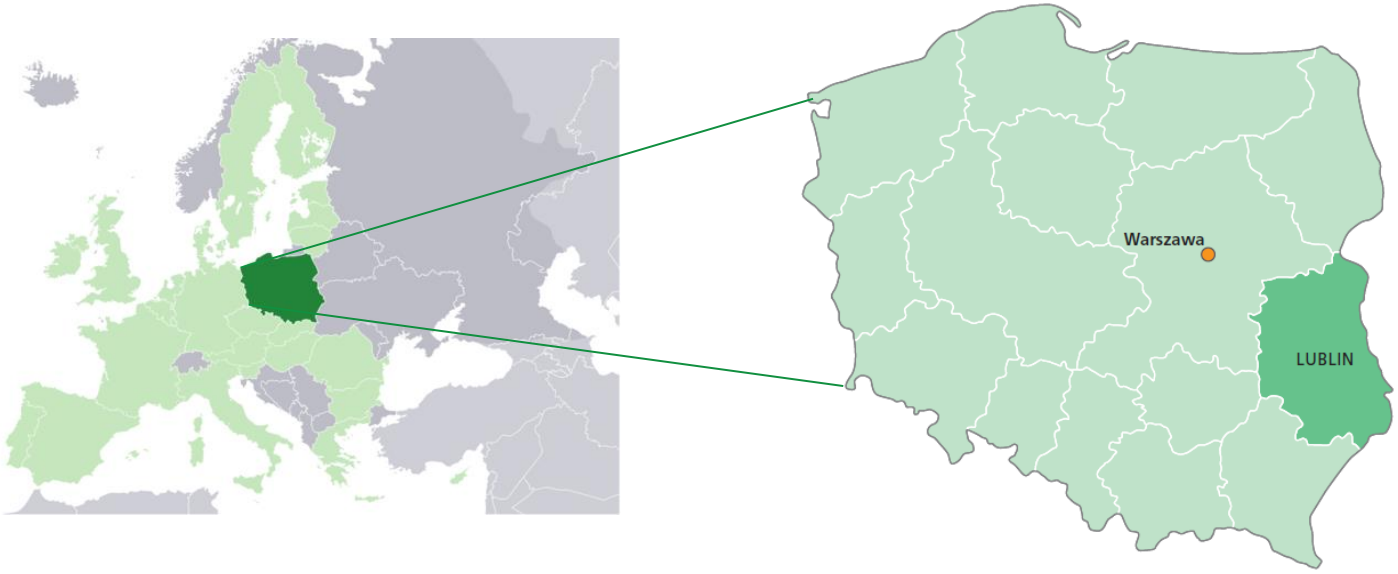
Case study on Lublin province in Poland: low-ILUC-risk production of Miscanthus grass for bioethanol



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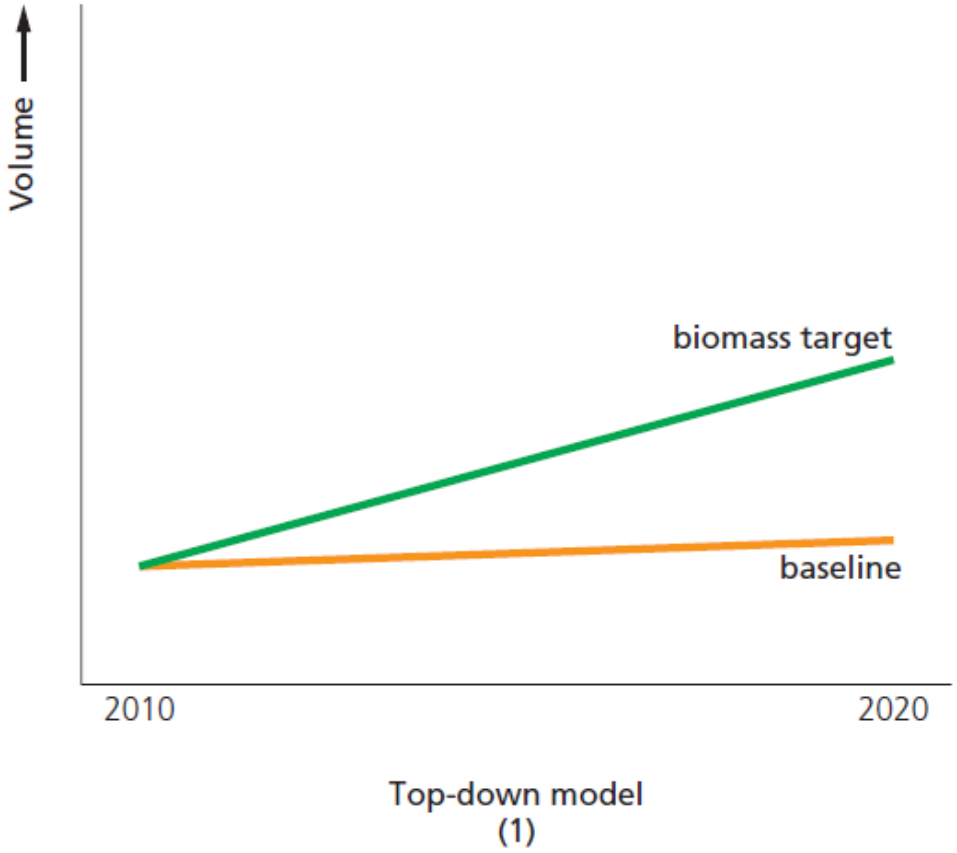
How much better can we do than the baseline?



Top-down model
(1)

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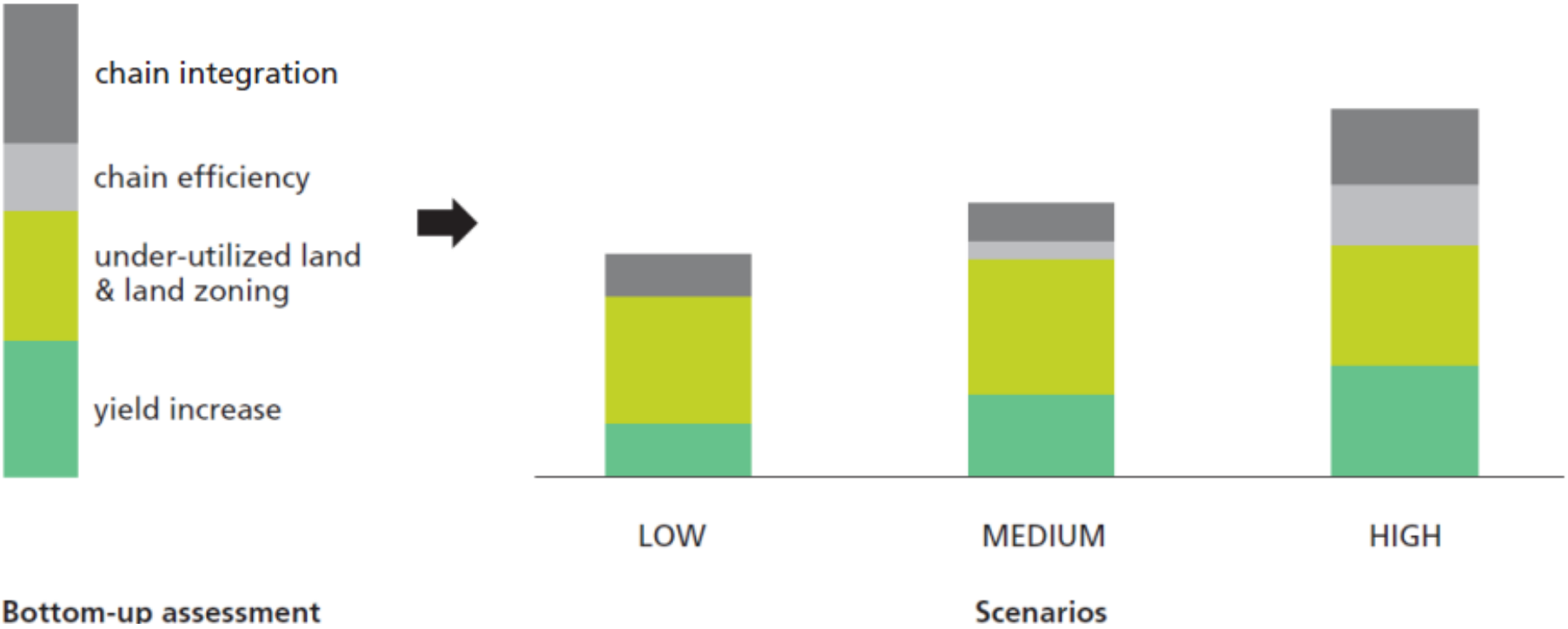
3 scenarios of above-baseline developments in agriculture



Bottom-up assessment

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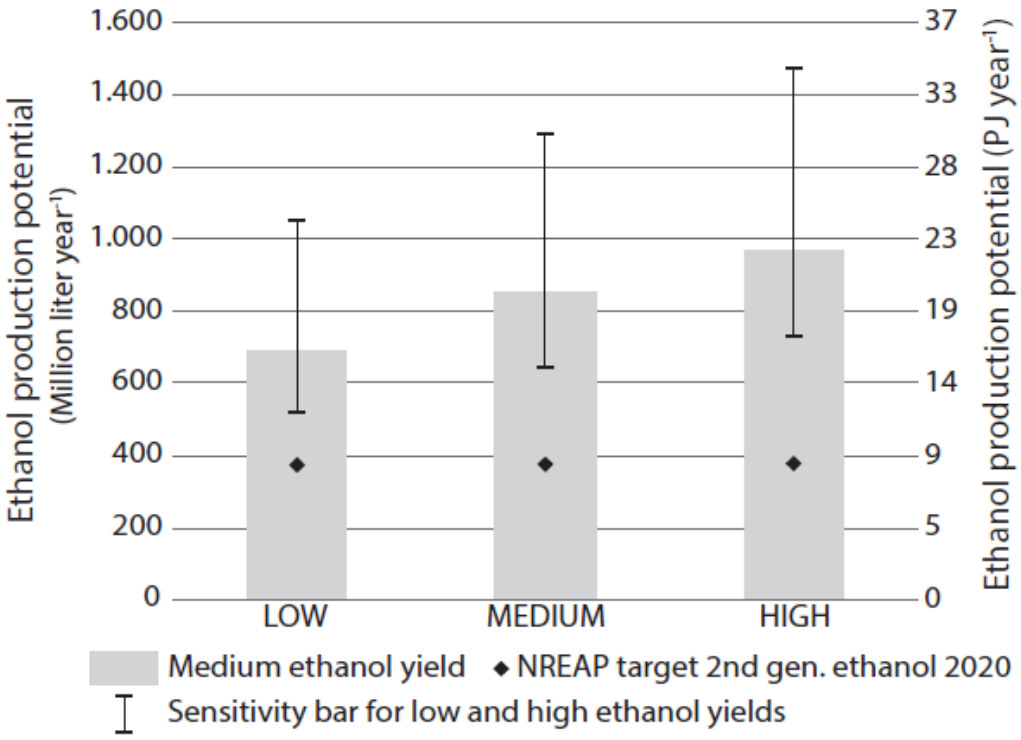
Low-ILUC-risk potential study

A lot of room for **improvement in yields**

Substantial area under-utilized land



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Environmental impacts of ILUC mitigation?

What is the GHG emission balance of miscanthus/total agriculture if we account for effects of intensification?

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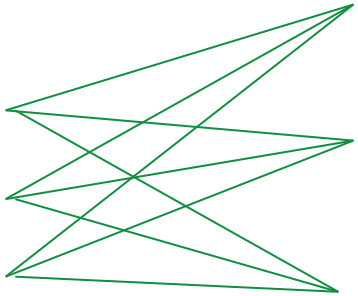
Scenarios

Scenarios for how much agricultural production could increase above the baseline:

- Low (L)
- Medium (M)
- High (H)



Pathways for intensification:

- Conventional intensification (CI)
- Intermediate sustainable intensification (II)
- Sustainable intensification (SI)

GHG emission sources

Agricultural crops	Cattle	Miscanthus & ethanol production	Land use change
•For 2010 and all scenarios in 2020: •Fertilizer use •Pesticide use •Fuel consumption	•For 2010 and all scenarios in 2020: •Enteric fermentation •Manure management •Feed production •Energy consumption	•For ILUC mitigation scenarios in 2020: •Rhizomes •Fertilizer use •Pesticide use and weeding •Fuel consumption •Transport of miscanthus to ethanol plant •Ethanol conversion •Transport of ethanol to refuel stations	•For all scenarios in 2020: •Changes in above and below ground biomass •Changes in soil organic carbon

Not a complete inventory of all emissions, only those sources that change with implementation of ILUC mitigation measures

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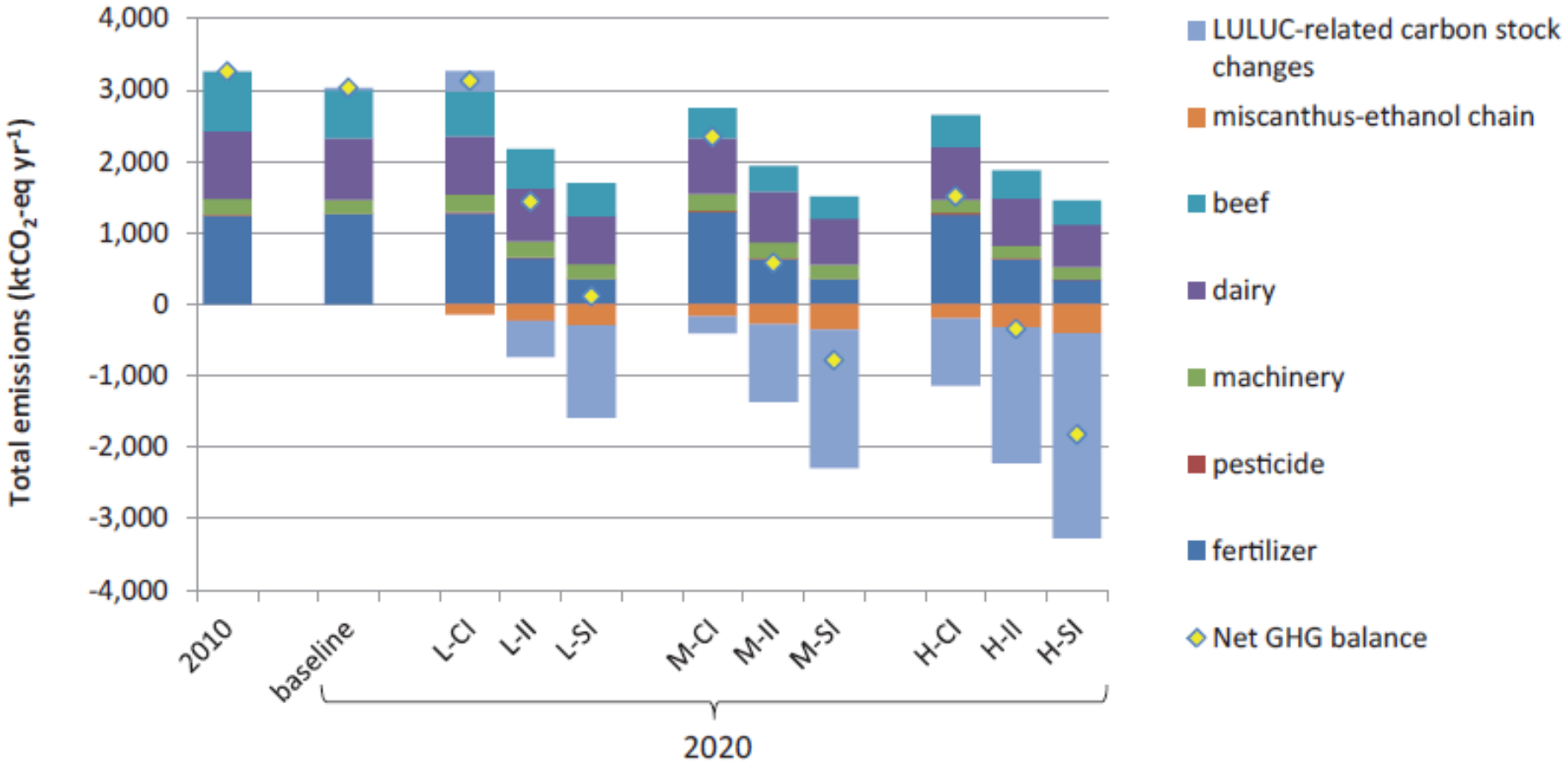
Emission sources & Net emissions



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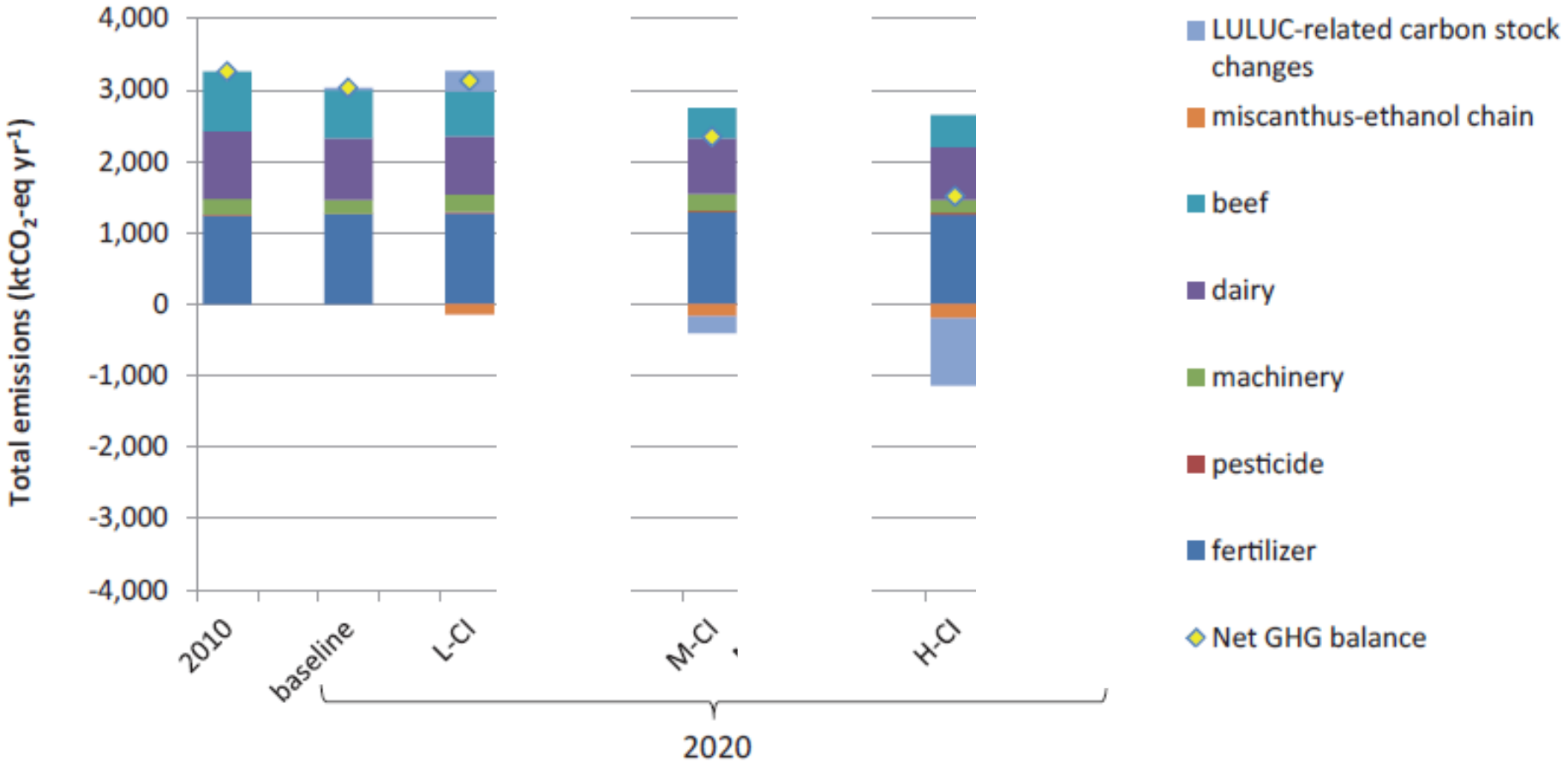

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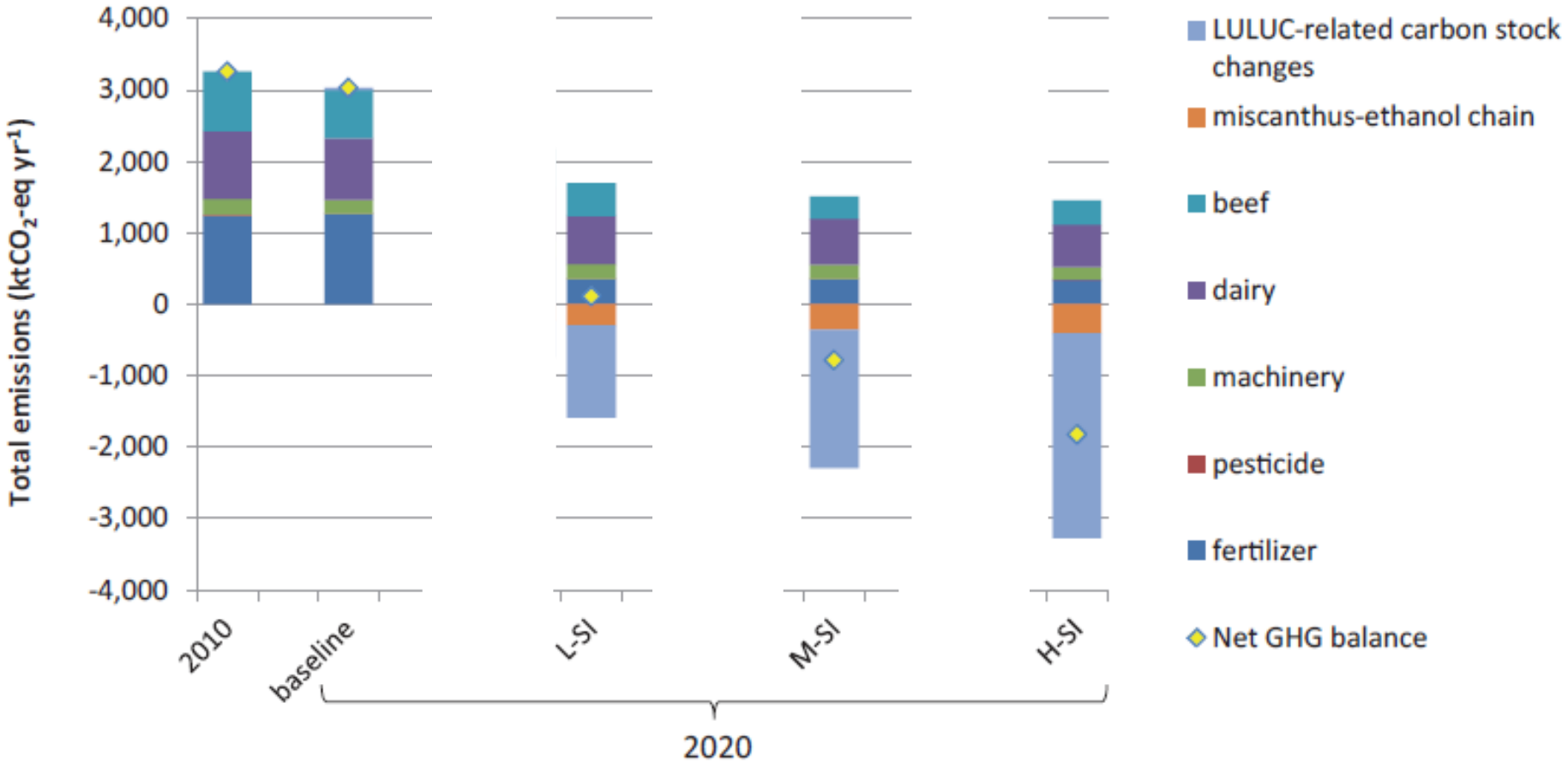

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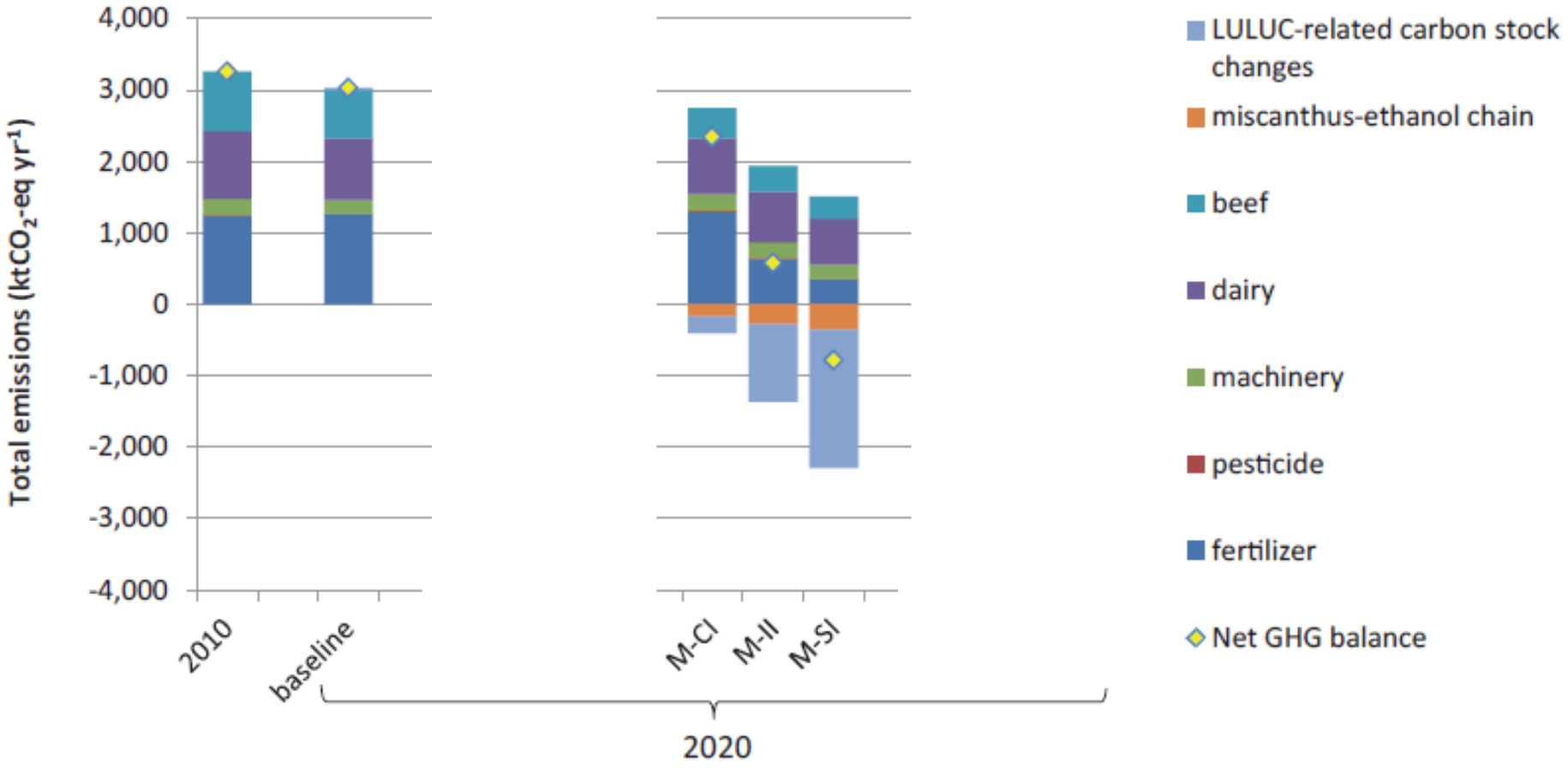

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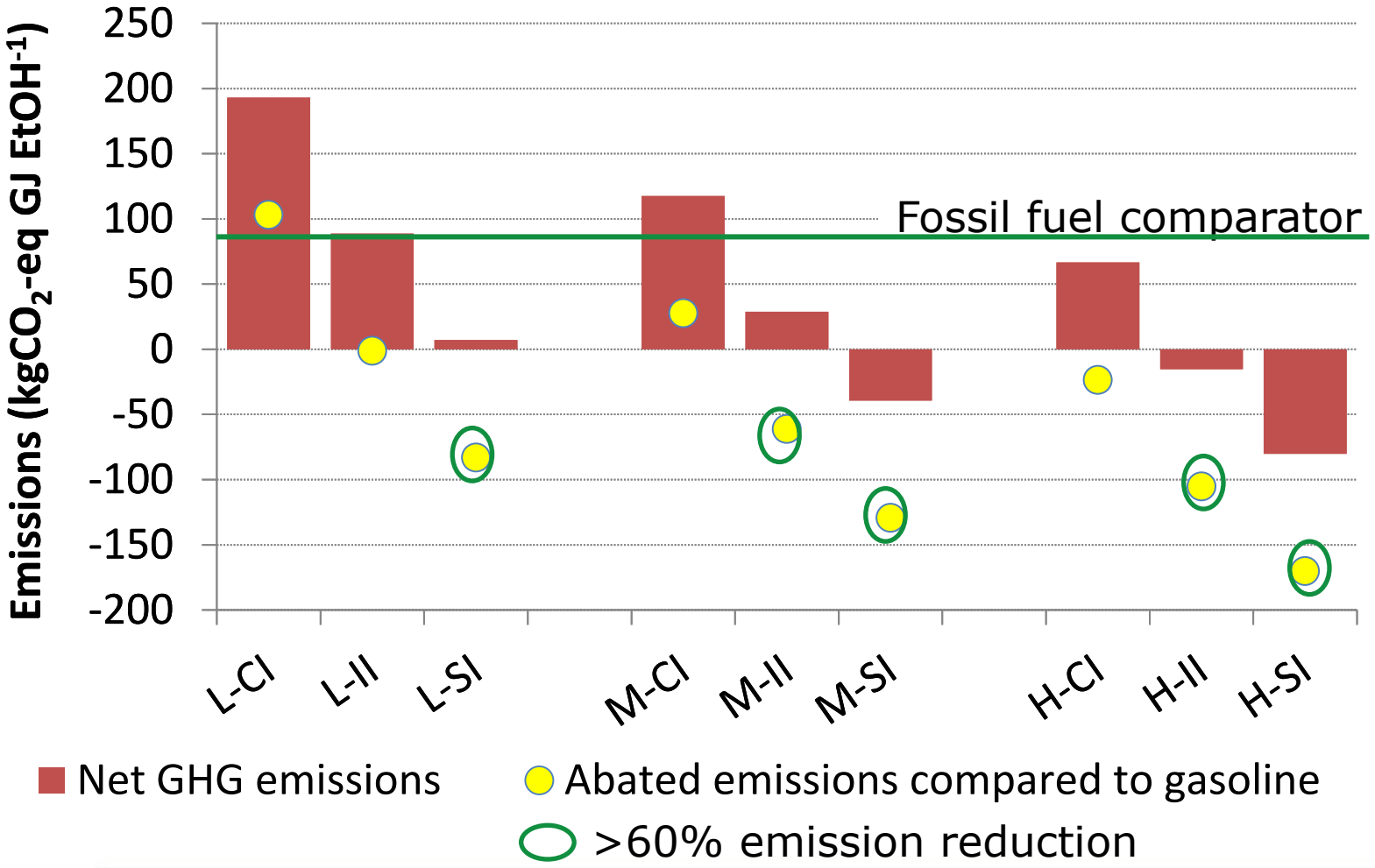
Net GHG emissions per GJ EtOH



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So it depends all on how we intensify!

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"The world needs more LUC" (title of session at the EUBCE in Amsterdam June 2016)

- Toward more sustainable production of crops and livestock – agriculture as whole!
- Toward making better use of currently under-utilized land resources

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The world also needs policies that address land use in a comprehensive manner, independent of the final user

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Big social component: how to get farmers to sustainably intensify? What about the small-sized farms?

- Not addressed in our study (what is technically feasible), but is key for defining and realizing strategies, policy and governance options for sustainable LUC

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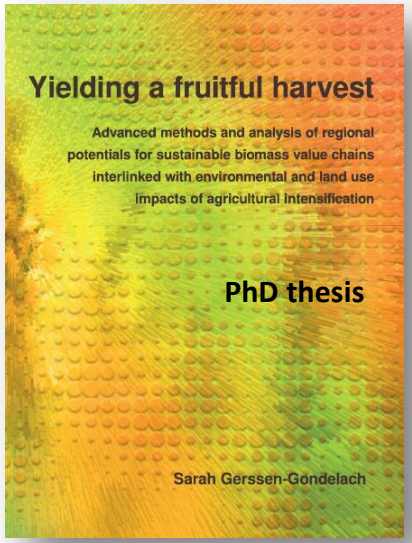
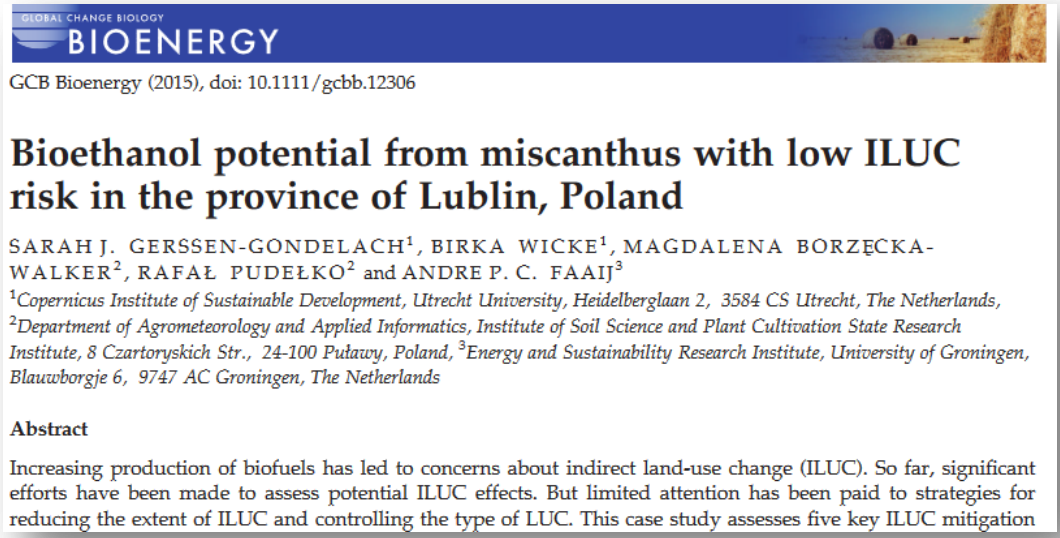
Publications

Gerssen-Gondelach, Wicke and Faaij. GHG emissions and other environmental impacts of ILUC mitigation. Accepted in *GCB Bioenergy*.




GLOBAL CHANGE BIOLOGY BIOENERGY

GCB Bioenergy (2015), doi: 10.1111/gcbb.12306

Bioethanol potential from miscanthus with low ILUC risk in the province of Lublin, Poland

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Abstract

Increasing production of biofuels has led to concerns about indirect land-use change (ILUC). So far, significant efforts have been made to assess potential ILUC effects. But limited attention has been paid to strategies for reducing the extent of ILUC and controlling the type of LUC. This case study assesses five key ILUC mitigation

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Thank you for your attention!

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