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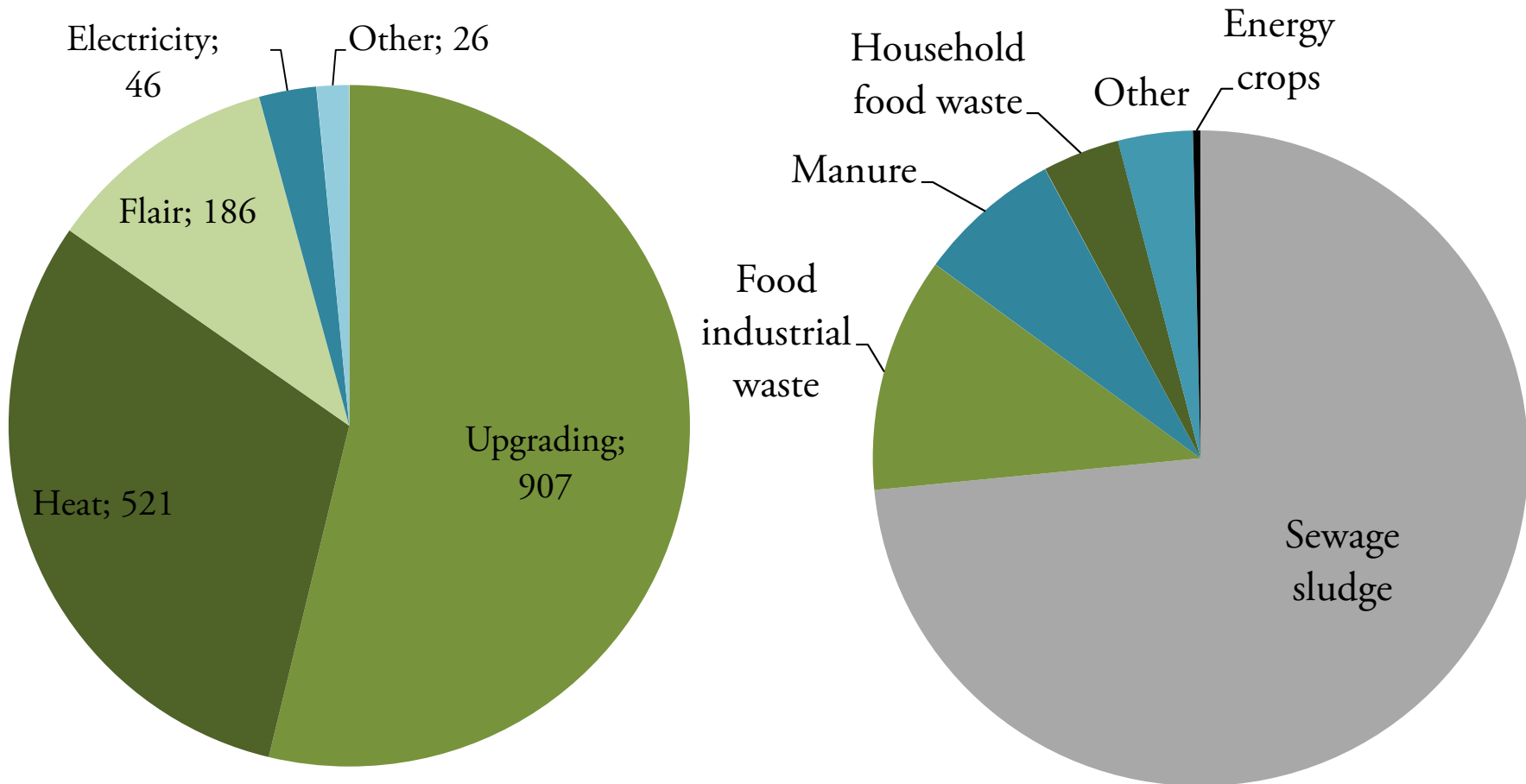
# Introduction of grass-clover crops as biogas feedstock in cereal-dominated crop rotations.

## Part II: Effects on greenhouse gas emissions

LOVISA BJÖRNSSON & THOMAS PRADE



# Biogas is used as vehicle fuel



Source: The production and use of biogas 2013. Swedish Energy Agency



Photo © Björnsson

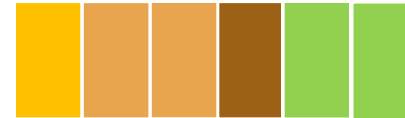
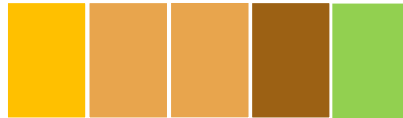


Photo © Crops4Biogas



Photo © Björnsson

# The studied systems



## Reference

### scenario

4-year crop rotation typical for the region

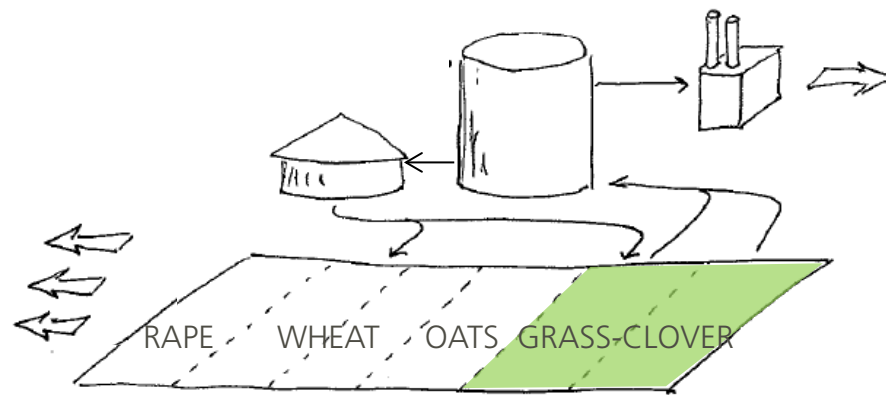
- winter oil seed rape
- winter wheat
- winter wheat
- oats

Conventional cultivation, mineral fertilizer

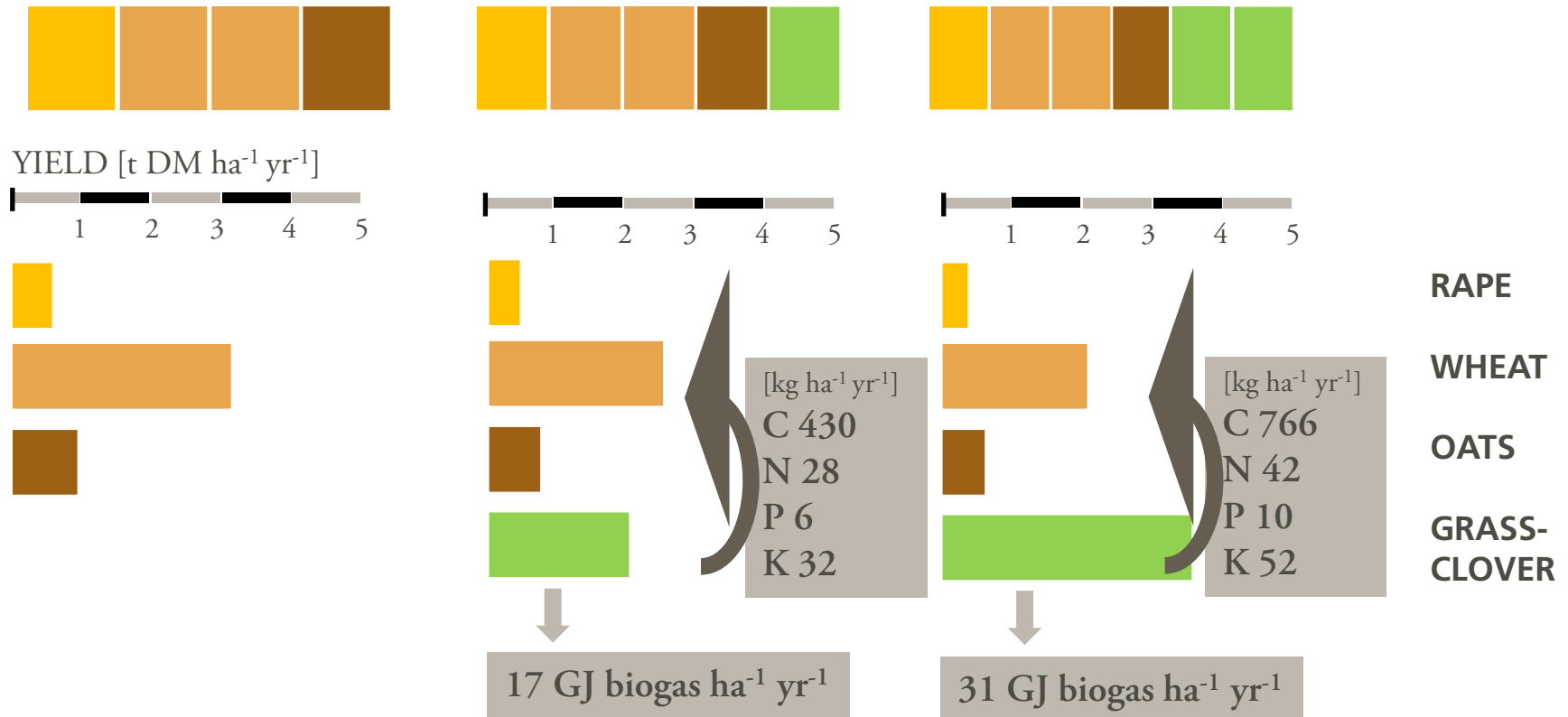
## Grass-clover scenarios

One year in a five year crop rotation

Two years in a six year crop rotation



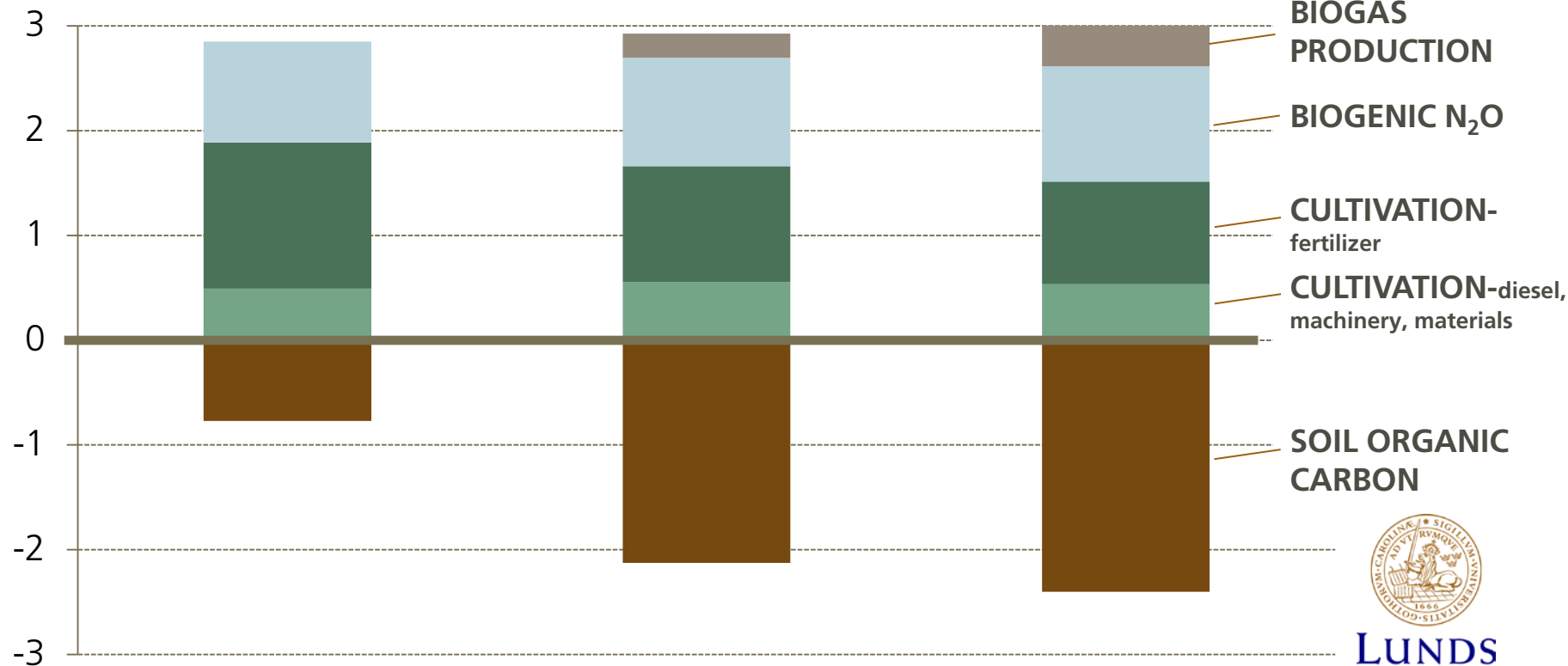
# The studied systems

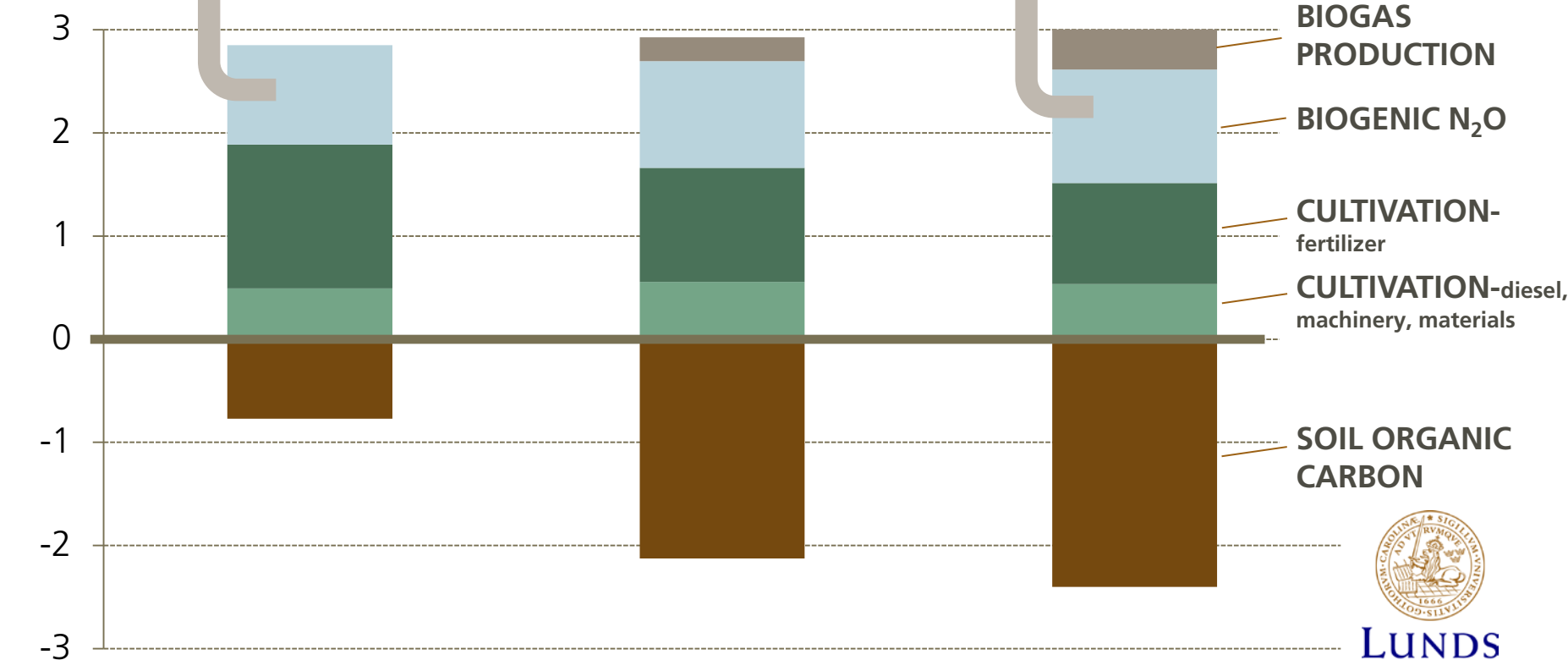
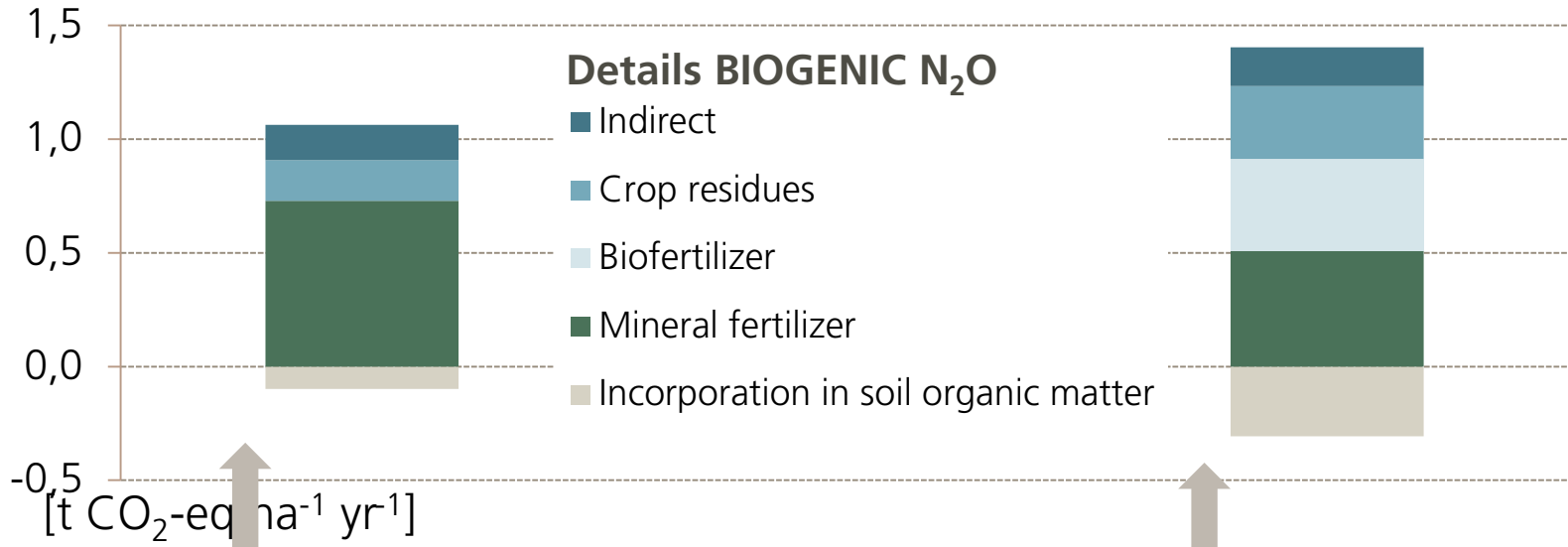


# Greenhouse gas emissions



[t CO<sub>2</sub>-eq ha<sup>-1</sup> yr<sup>-1</sup>]



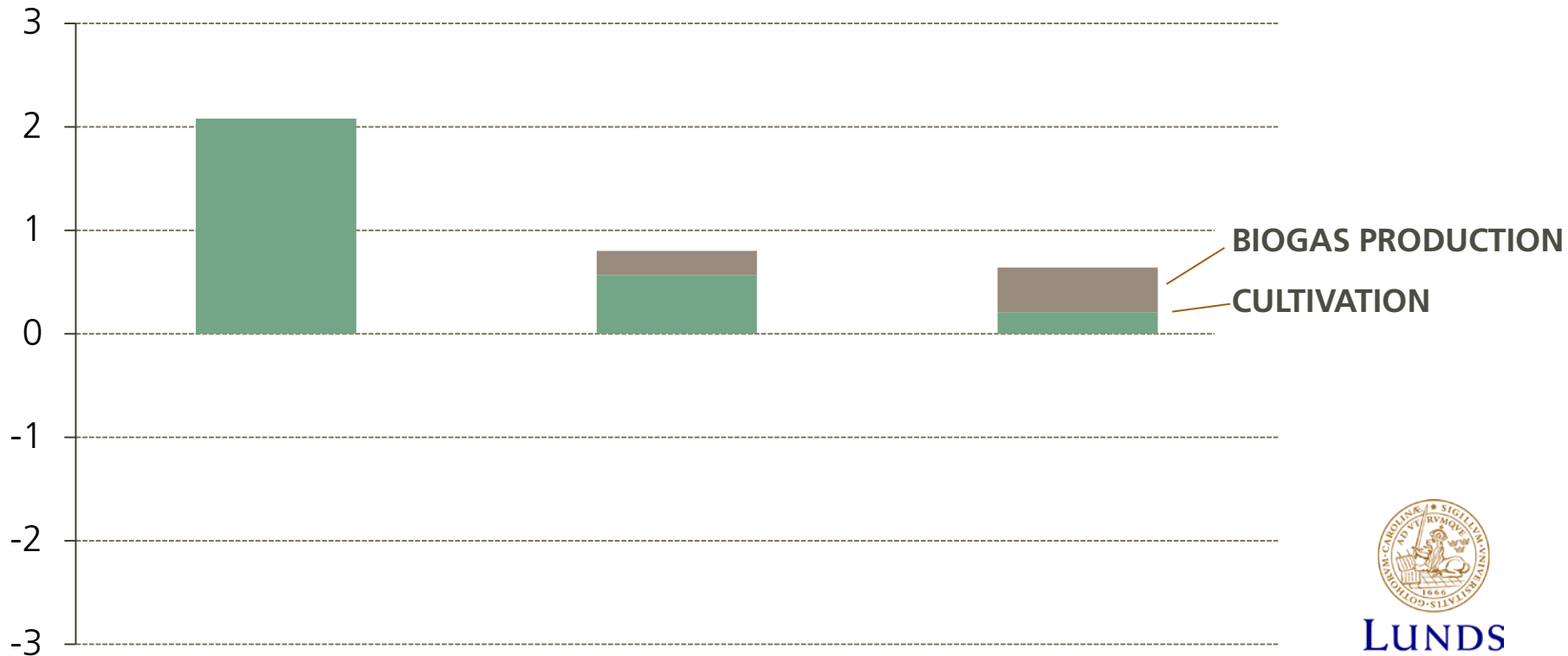




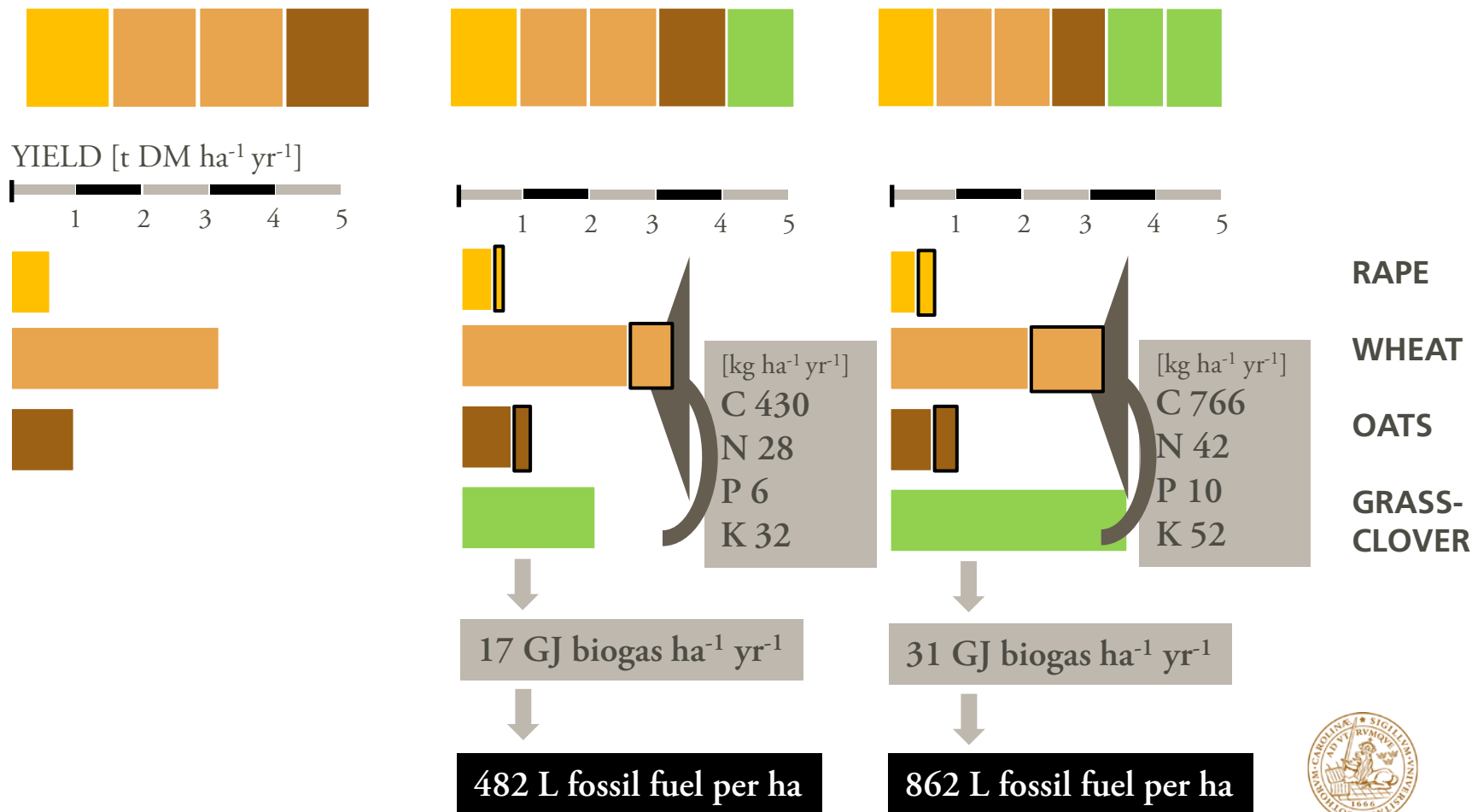
# Greenhouse gas emissions summarized



[t CO<sub>2</sub>-eq ha<sup>-1</sup> yr<sup>-1</sup>]



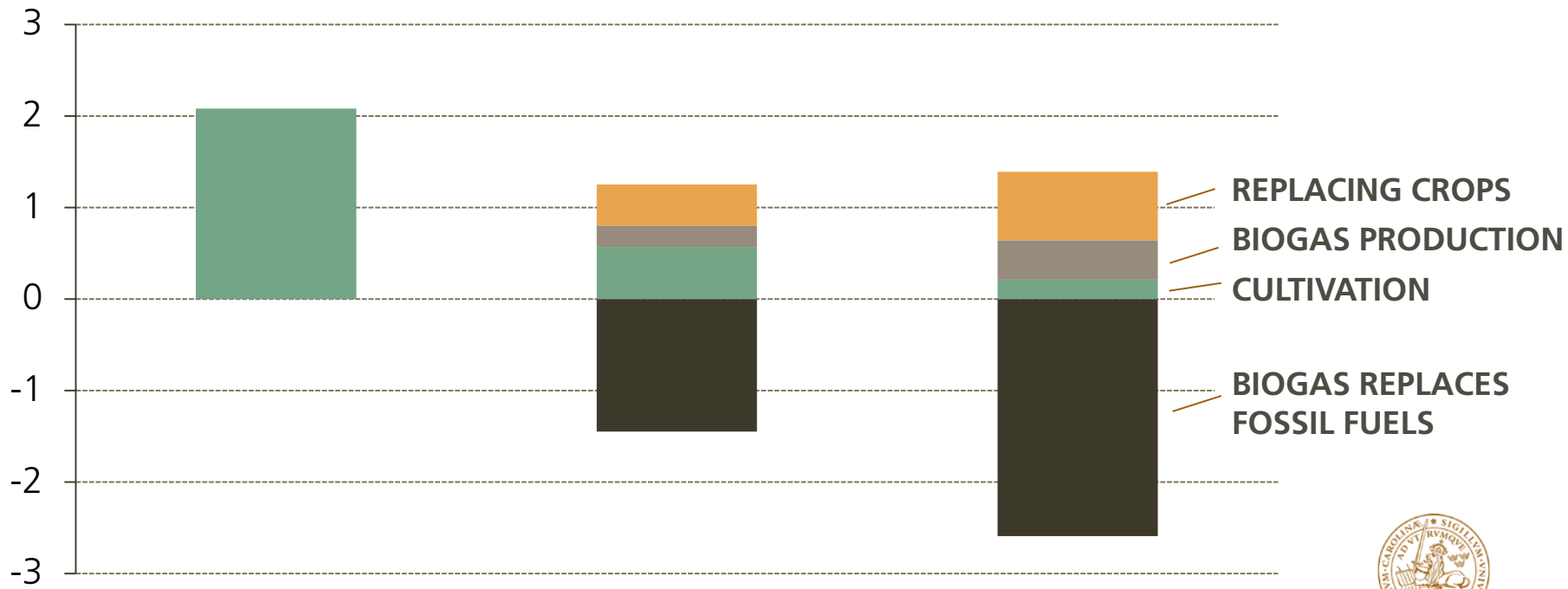
# Systems expansion



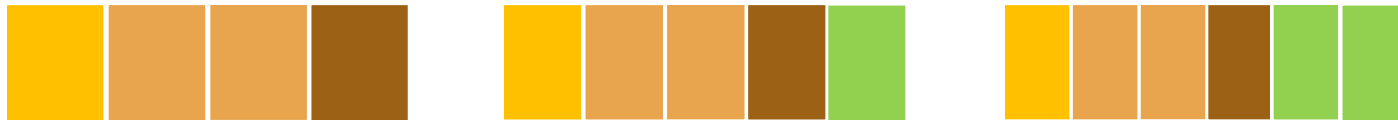
# Systems expansion



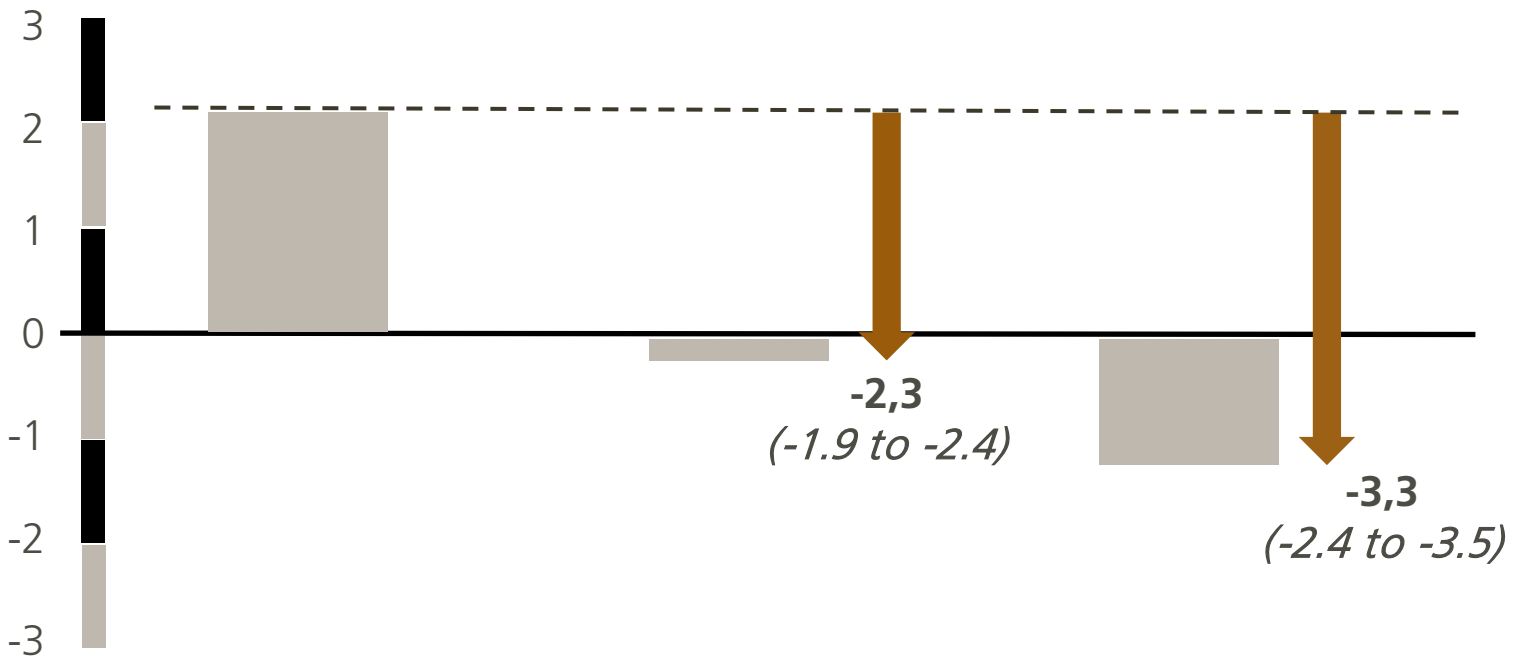
[t CO<sub>2</sub>-eq ha<sup>-1</sup> yr<sup>-1</sup>]



# Impact of the suggested change



[t CO<sub>2</sub>-eq ha<sup>-1</sup> yr<sup>1</sup>]



# To summarize

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The production of a biofuel that can replace fossil fuels is important for the GHG reduction achieved by the studied change in this crop production system.

Equally important is the carbon sequestration that results from the introduction of grass-clover in the crop rotation.

Integrated production of food crops and energy crops can be beneficial, as in this case where it;

- Strongly reduces the GHG emissions of the crop production system
- Can turn a negative trend of soil organic matter degradation, and improve soil structure and potentially fertility
- Increases biodiversity in the crop rotation

This study illustrates two important aspects that should be considered in sustainability evaluations;

- it is important to evaluate crop production systems, not only individual crops
- soil organic carbon changes should be included in crop production LCAs



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