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Integration of soil carbon changes in LCA studies – Focus on energy crop production

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Who we are

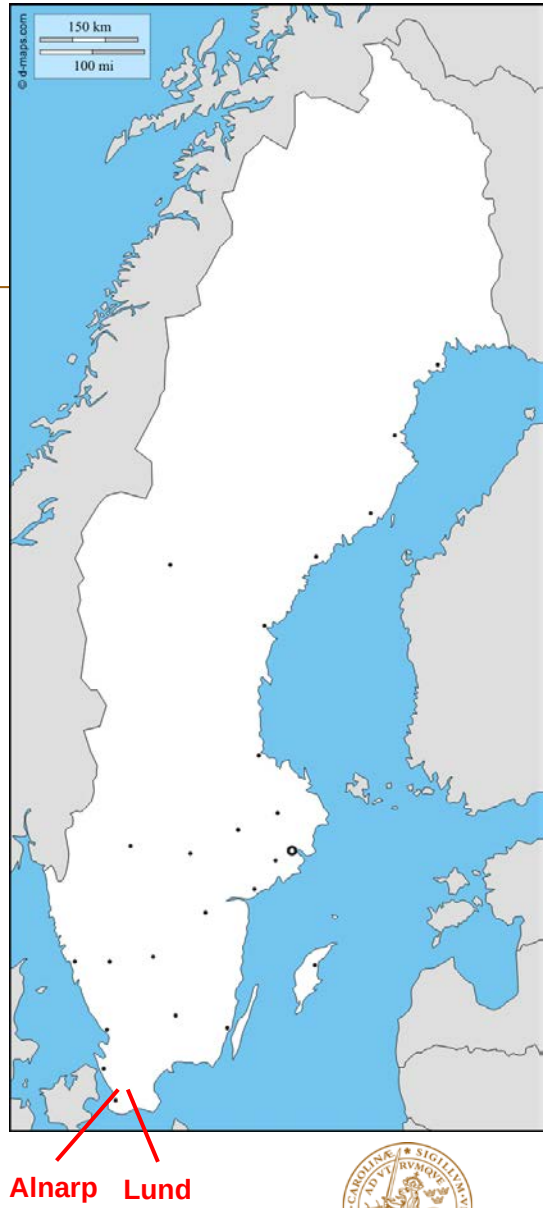
Collaboration between

Dept. of Biosystems and Technology,
Swedish University of Agricultural Sciences, Alnarp

- New data from field and machinery experiments
- Soil carbon modelling
- Techno-economic assessments of crop production systems

Environmental and Energy Systems Studies,
Lund University

- Energy conversion processes
- LCA studies



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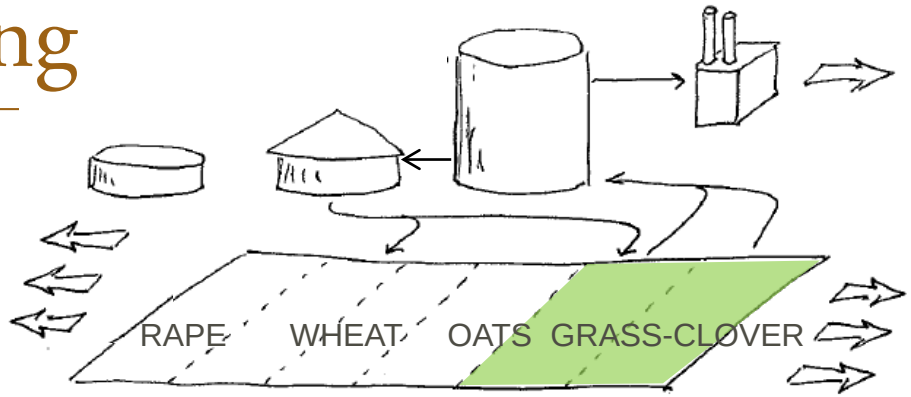
Soil carbon modelling

Case study

- Biogas vehicle fuel
- Fertilizer replacement
- Soil carbon changes



Reference scenario

4-year crop rotation typical for the region
Conventional cultivation, mineral fertilizer
Year 1 - winter oilseed rape
Year 2 - winter wheat
Year 3 - winter wheat
Year 4 - oats

Grass-clover scenarios

One year in a five year crop rotation

Two years in a six year crop rotation

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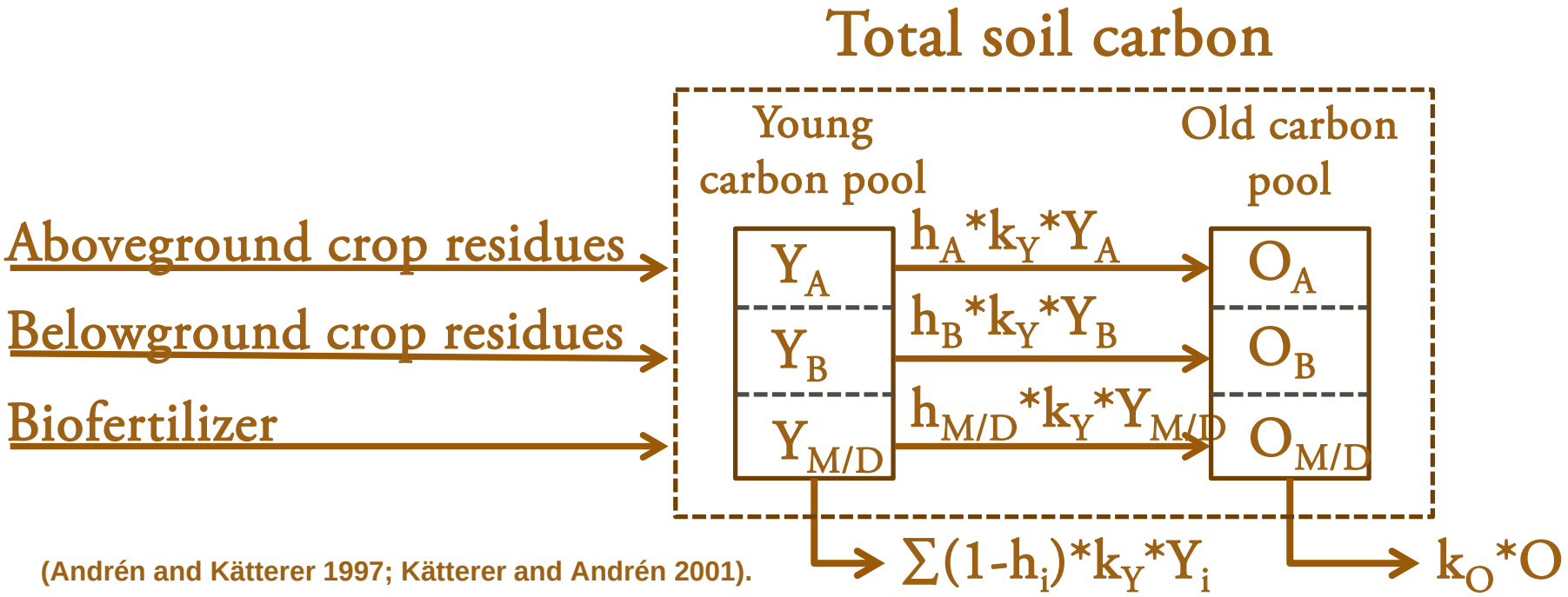
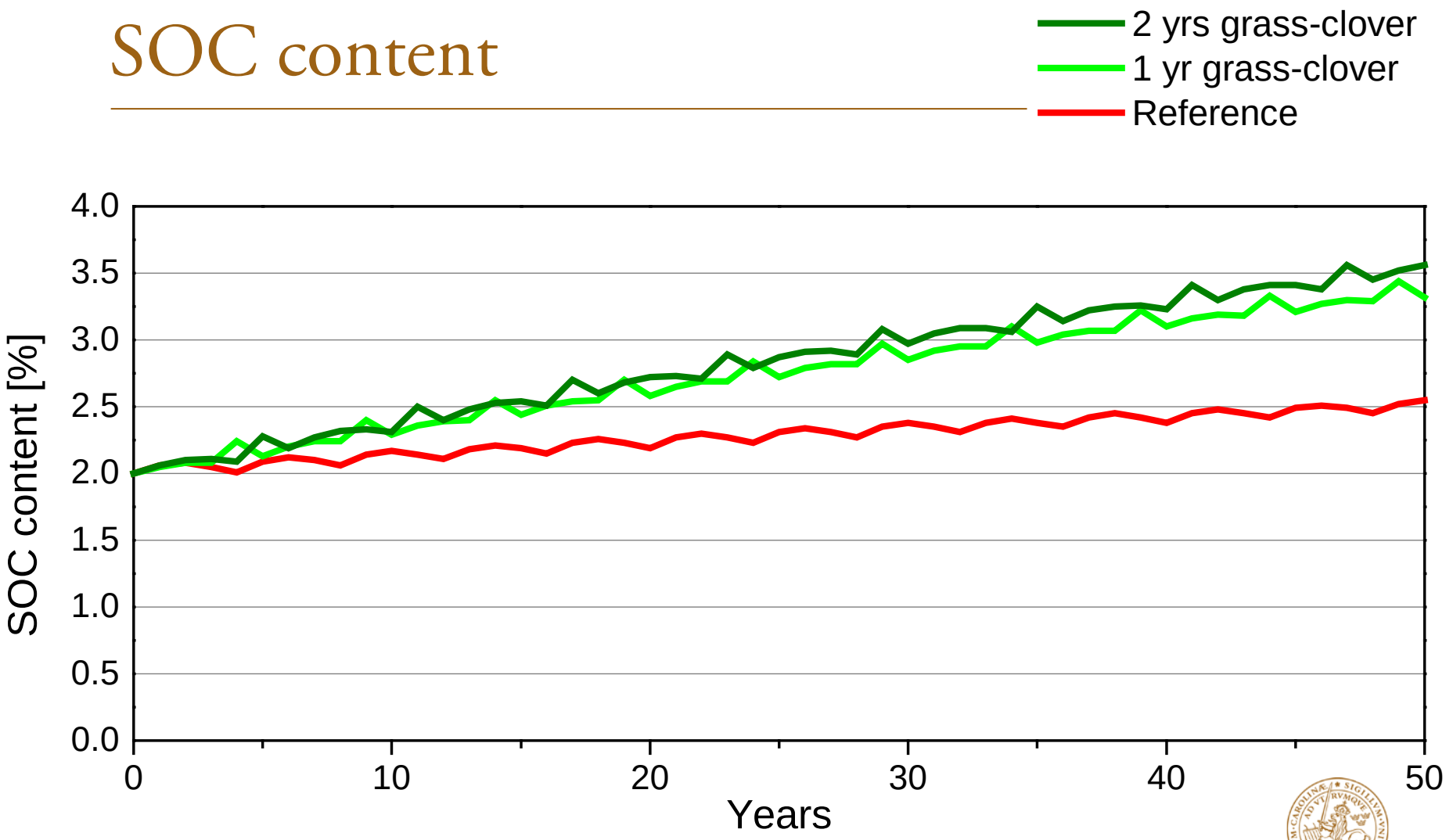
Soil carbon changes

- Diffcult to measure directly (annual fluctuations, soil heterogeneity)
- Long-term experiments are used for calibrating **SOC models** to estimate changes



(Andrén and Kätterer 1997; Kätterer and Andrén 2001).

SOC content



- **Based on Nordic constraints**

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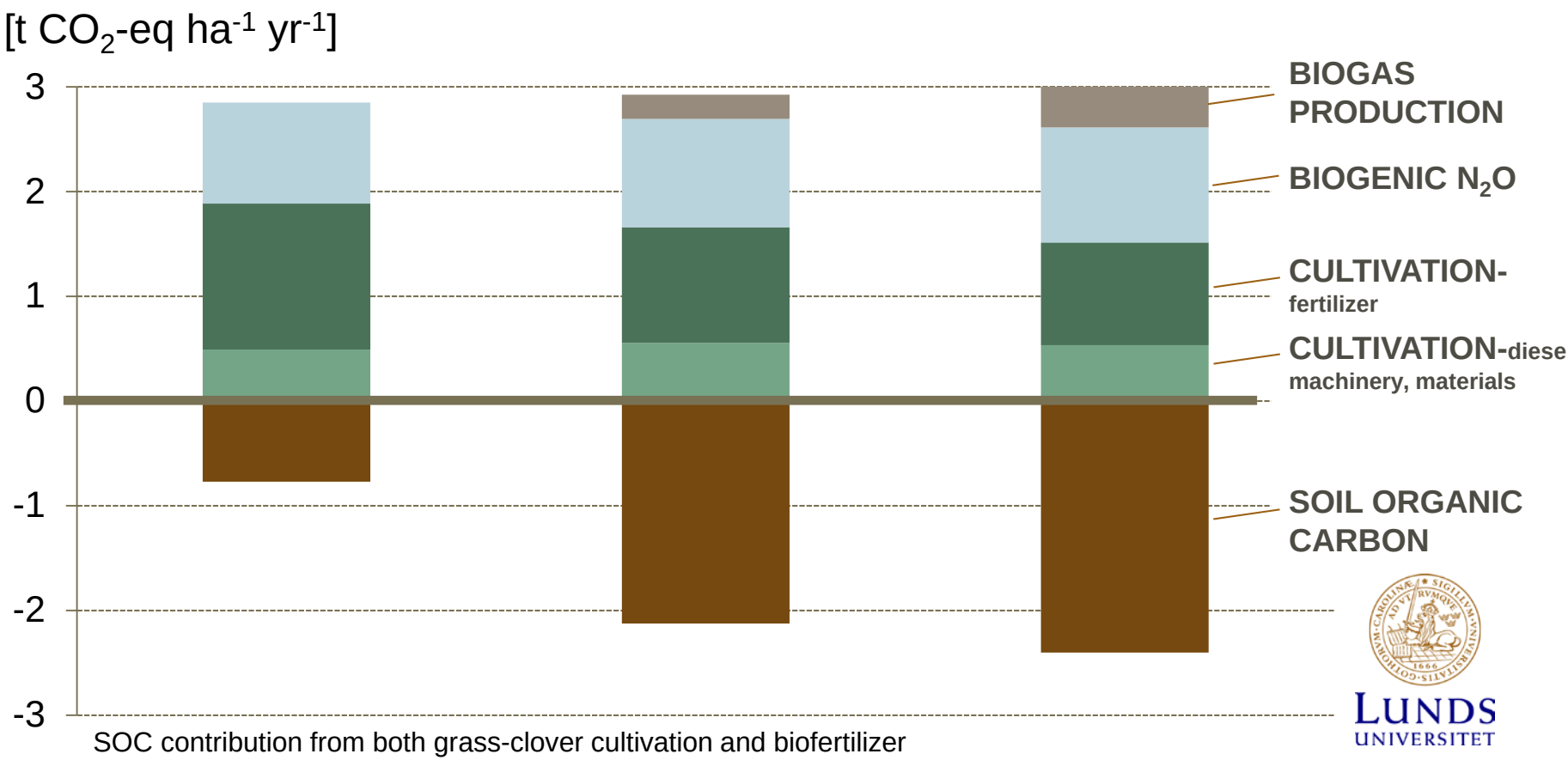
Greenhouse gas emissions



SOC contribution from both grass-clover cultivation and biofertilizer

Systems expansion: fossil fuel replacement & food crop cultivation elsewhere => 1.5-2.5 t/ha avoided CO_2-emissions

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To summarize

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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