Crop Residue Energy Potentials: What Role for Sustainable Intensification?

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Introduction

The use of agricultural **residues for energy** is appealing due to its potential to contribute to **climate change mitigation** without jeopardizing **food security**.

However, other socio-economic or environmental concerns, such as **soil organic matter** decline or competition with **other uses** need to be considered.

Aim

The **aim** of this study is to assess how a **sustainable intensification** approach can increase the potential of crop residues for emissions reduction and energy output, while considering other environmental objectives and competing demands.

Methods

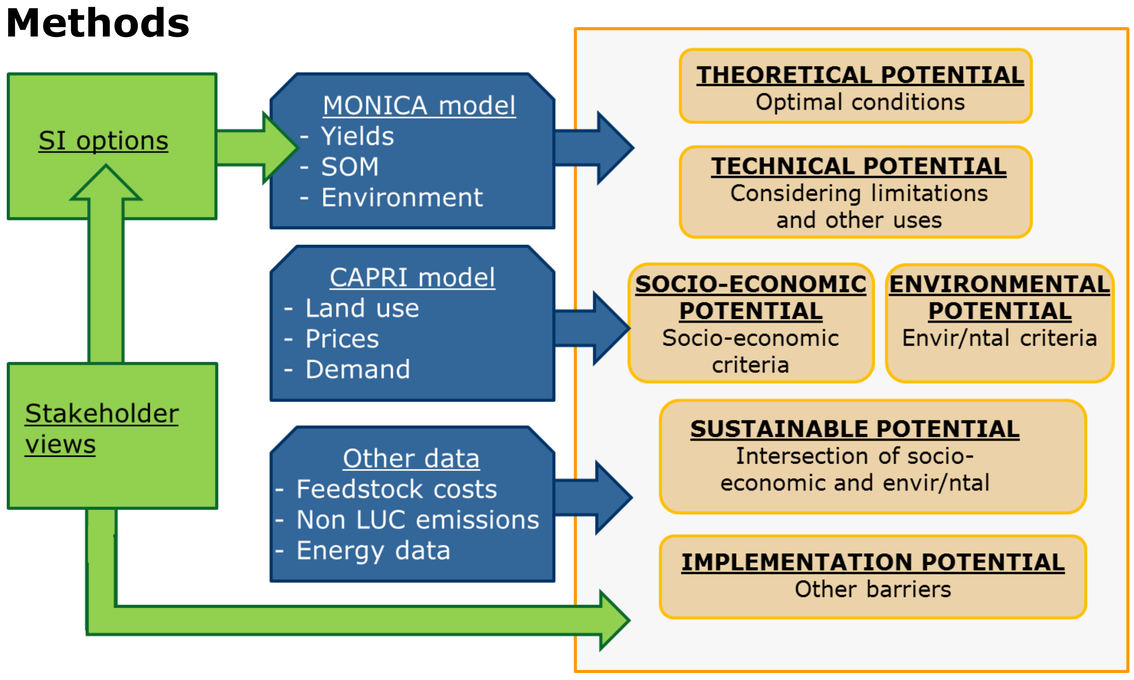

Figure 1: Scheme of the methodology.

Approach: spatially and temporally explicit estimation of energy potentials

Case study of North Rhine-Westphalia (NRW) in Germany: highly productive and intensive agricultural region

Table 1: Scenario description.

	Baseline	Alternative
Residue removal rates	33% cereals 0% other crops	Humus balance adopted by Landwirtschaftskammer (LWK) NRW (2015)
Nitrogen (N) fertiliser rates	Rule-based estimates from LWK NRW (2016)	Estimates based on simulated mineral N content in the soil
Cover crops	25% winter cover	100% winter cover

Results

- There is potential for **higher residue removal** rates, which can result in higher energy and emission reduction potentials.
- More precise estimation of **N fertiliser** application rates **decreases nitrate leaching**.
- The current **humus balance** approach is not sufficient for avoiding **negative trends in soil organic carbon (SOC)**.
- Crop **yields** are affected minimally by the removal of more residues (data not shown here).

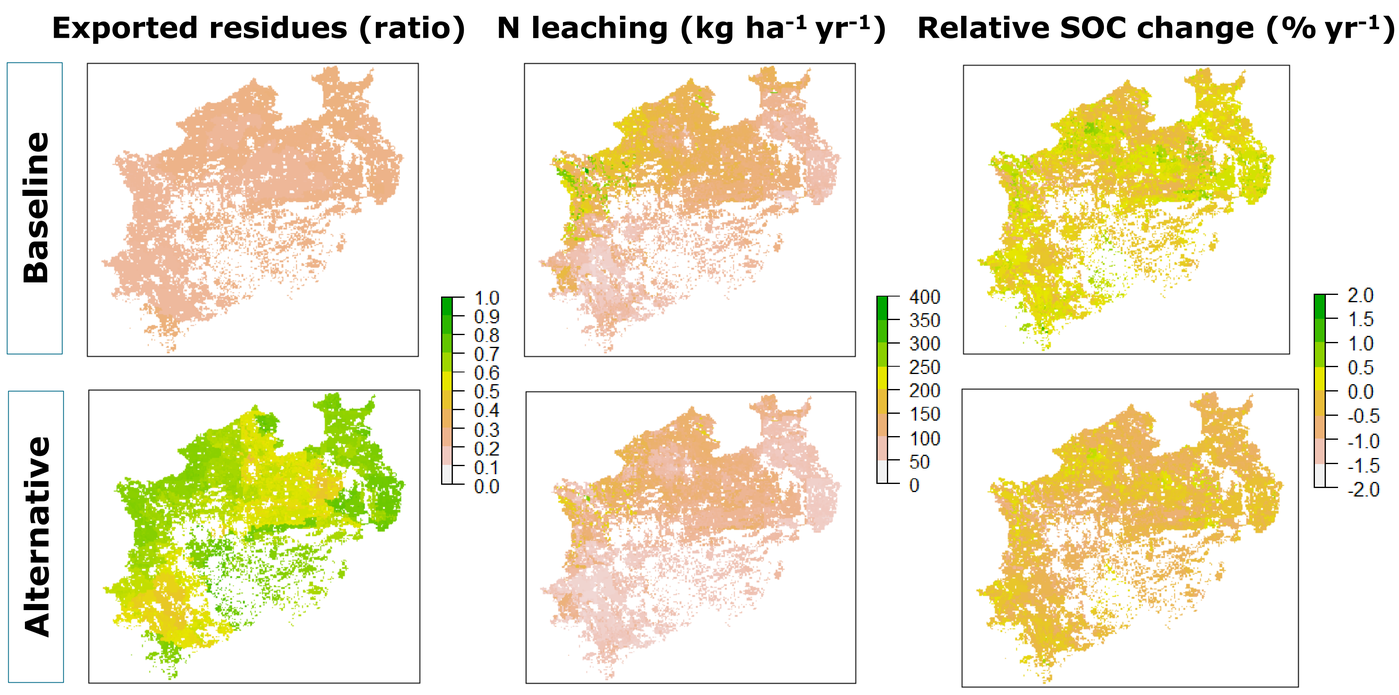

Figure 2: Average values in the period 2011-2030.

Concluding remarks

- **Sustainable intensification** measures in relation to crop residues can be a **win-win** option for **climate protection,** long-term **soil** and **water sustainability,** and **agricultural profitability**.
- **Further research** aims at identifying strategies on **residue removal rates** that would hinder SOC decline while increasing the amount of exported residues.

References

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