



Near-infrared spectroscopy (NIRS) sensing for organic fertilizers: a chance for an efficient manure management in the EU?

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Introduction

Ineffective management of organic fertilizers in European agriculture results in contamination and eutrophication of water bodies, with nitrates, elevated volatile ammonia emissions threatening biodiversity and increased N₂O emissions.

Innovative technologies in agriculture can play a major role to tackle the current nutrient flow gaps for N and hence to decrease environmental pressure.

NIRS sensing technologies identify nutrients in liquid manure:

- Coping with heterogeneous nutrient contents of liquid manure to optimise nutrient supply according to plant needs and site-specific conditions
- Potential reduction of mineral fertilizer application, nitrogen surpluses, and GHG emissions

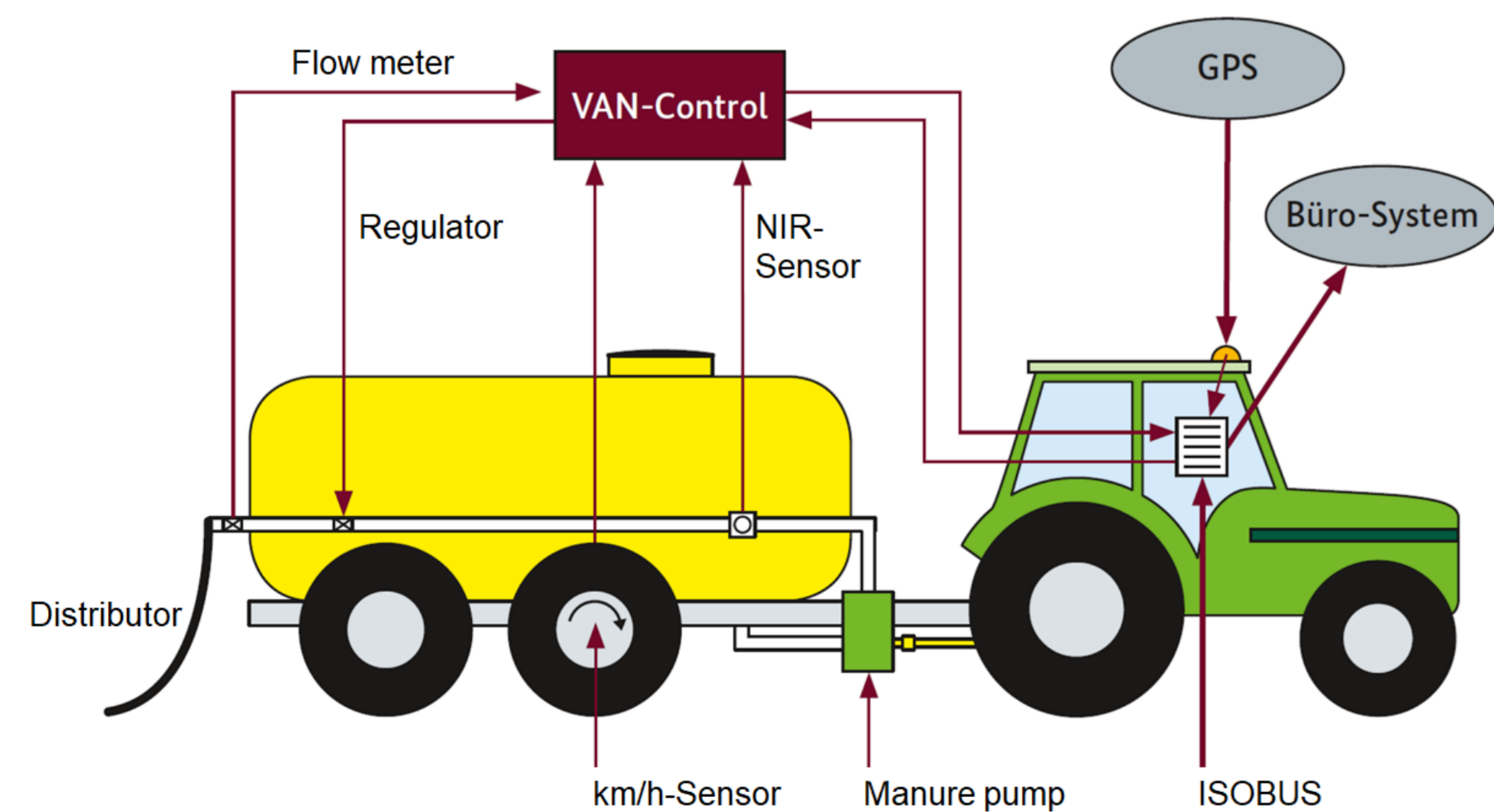


Figure: Adapted from BLE (2018) "Effizient düngen", p. 23

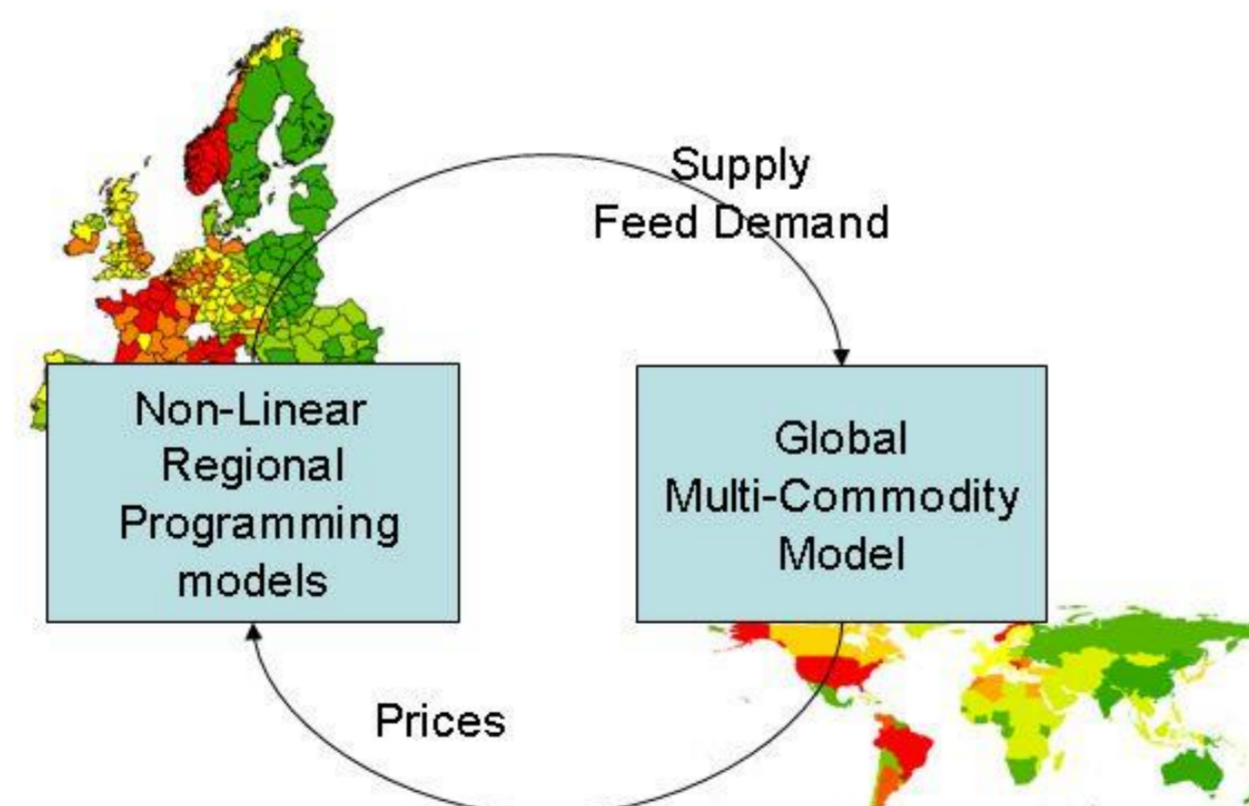
Research Question

What are the economic and environmental effects of increased efficiency of liquid manure via NIRS in the EU-27?

Approach

CAPRI Model

Global partial equilibrium model for the agricultural sector, with a focus on the EU at NUTS 2 level



Scenario assumptions for NIRS

- Increased manure efficiency between 5% (Scen_5_15) and 25% (Scen_25_15)
- Additional costs of 15 €/ha for all agricultural activities

Results

Driven by the higher manure efficiency and substitution effects with mineral fertilizer the average EU N-surplus decreases between -2.2 and -6 kg/ha with heterogenous effects throughout the European NUTS 2 regions

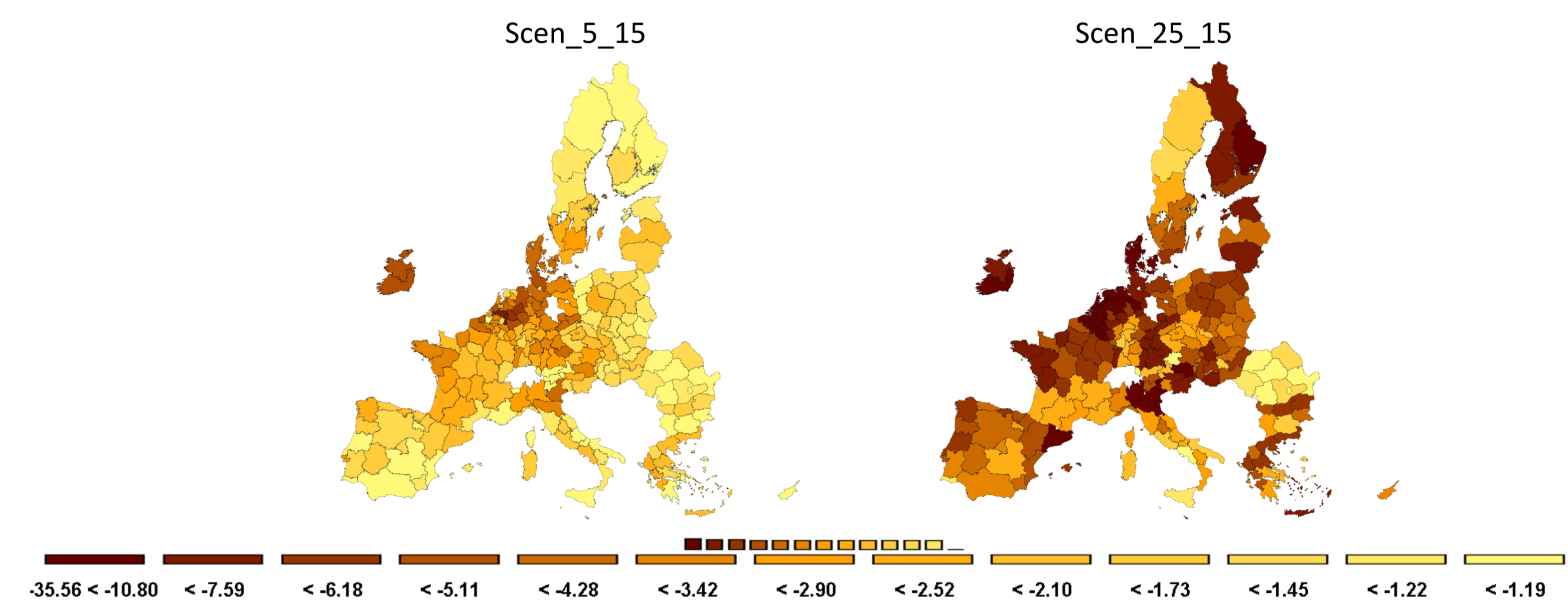


Figure 1: Absolute changes in N-Surplus in kg/ha of Scen 5_15 and Scen_25_15 in the EU at NUTS 2 level.

GHG emissions in the EU are reduced between -0.6% and -1.4% mainly driven by reduced N₂O emissions from mineral fertilizer use

Agricultural income in the EU increases up to 1.5% in Scen_25_15 with high regional differences. Particularly in Eastern Europe the assumed costs for NIRS are disproportionately high and outweigh the cost savings and efficiency gains resulting in income losses up to -3%

Outlook

- Endogeneous calculation of technology implementation shares and specification of relevant crops to better account for regional differences in cost structures
- Results from field, farm level models and LCA will be used to extrapolate the impact of NIRS at EU level