Improving Regional Specific Life Cycle Assessment of Energy Crops in Germany

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Introduction

Germany has been working in the development , use and promotion of renewable energies as a key strategy to achieve the envisaged target of greenhouse gas (GHG) emissions reduction of 40% by the year 2020. Biogas production is promoted and still growing making the country to one of the major biogas producers in the world [1]. Possible increase of ammonia emissions due to returning digestate from biogas plants to crop land and the occupation of agricultural land have opened a controversial discussion [2]. Therefore a project is launched to investigate the influence of returning digestate to crop land on C/N-Interactions in different soils and GHG- as well as ammonia emissions.

Aim of the project

This joint research project aims to investigate the regional variability concerning GHG- and ammonia emissions on a life cycle basis. Emission factors for ammonia, nitrous oxide and methane will be derived from direct measurements on the field after the application of digestate, mineral fertilizer and the combination of both. Measurements are taken place at five test sites located in different regions of Germany. In this way, it will be possible to analyze and compare the influence of site specific conditions (soil type, fertilizer type, precipitation, etc.) on emission factors and on suitable emission reduction options.

Approach

➔ Method

Input

- Diesel for mechanisation + harvest operations
- Seeds
- Pesticides
- Mineral Fertilizer
- **Digestate** (from Biogas)

Field

Site specific

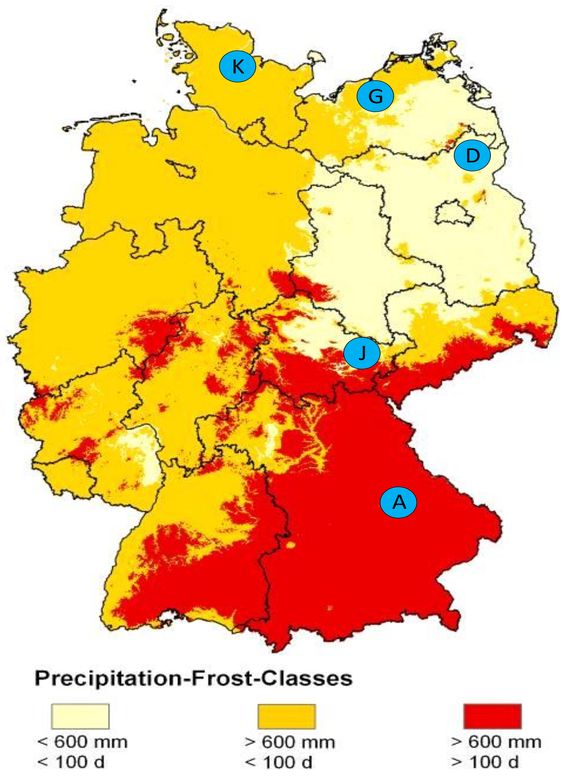
Crop rotation

Output

Emissions:

- CO_2 (measured)
- CH_4 (measured
- N_2O (measured)
- NH_3 (measured)
- NO^-_3 (measured/ modeled)

➔ Test sites



- Ascha (A)
- Jena (J)
- Dedelow (D)
- Gülzow (G)
- Hohenschulen (K)

Fig. 1*: Location of the test sites of the Project*
Ascha (Baveria), Jena (Thuringia), Dedelow (Brandenburg), Gülzow (Mecklenburg-Western Pomerania) and Hohenschulen (Schleswig- Holstein).

Expected results

A key point of the investigation is to identify trade-offs and to estimate the GHG-emission reduction potential by comparing environmental impacts of energy crop production using generic and site specific emission factors for the regions under investigation. The project results will contribute to an improved environmental impact assessment of energy crops within typical crop rotation cycles for the regions shown in Fig. 1. Furthermore, the outcomes should allow to make both precise and generalisable statements concerning the environmental impacts not just of energy crops but also other renewables. Investigations on soil-carbon are part of the project but robust statements about its alteration will not be possible within the project's life time.

References

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[2] Cherubini, F., et al. (2009). "Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations." Resources, Conservation and Recycling **53** (8): 434-447.

Acknowledgements

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