



Carbon footprints and land use of conventional and organic diets in Germany (master thesis)

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Introduction

- Food consumption is responsible for a high share of global GHG emissions and land use
- Research questions: (1) **What are the differences in food consumption between organic and conventional consumers?** (2) **How do the climate impacts and land use requirements differ between conventional and organic consumers?**

Results

• The analysis shows significant differences in food consumption between conventional and organic consumers: **Conventionally eating consumers eat 30% more meat products and 40% less fruits and vegetables than organically eating consumers.** Women eat on average 50% less meat but 20% more fruits than men.

• The **carbon footprint of the organic diet is 4% lower** compared to the conventional diet. The **land use of the organic diet is 38% higher** than the conventional diet.

• Carbon footprints and land use are mostly driven by the **consumption of meat and dairy products.** Animal-based food products are responsible for 77% and 73% of GHG emissions in conventional and organic diets, respectively, and for 79% of the land use in both diets.

Explanations

• The carbon footprint of organic animal-based products is significantly higher than of conventional animal-based products (+20% for poultry and nearly 40% more for pork production) → Organic consumers' lower meat consumption compensate for higher carbon footprints of organic animal-based products → Carbon footprints are the result of different food choices as well as of different amounts of GHG emissions during production.

• Whereas most plant-based carbon footprints of organic products are similar to conventional plant-based food product, the land use of organic products is generally much higher. Data used in the thesis show 20% and 80% higher land use for organic plant-based and animal-based food products, respectively, compared to conventional food products. Unlike in the case of carbon footprints, differences in consumption patterns reduce, but do not compensate for the higher land use of organic production.

• Regardless of the preference for organic or conventional products, the **diet of women causes 33% less GHG emissions and 36% lower land use in comparison with men.**

Findings

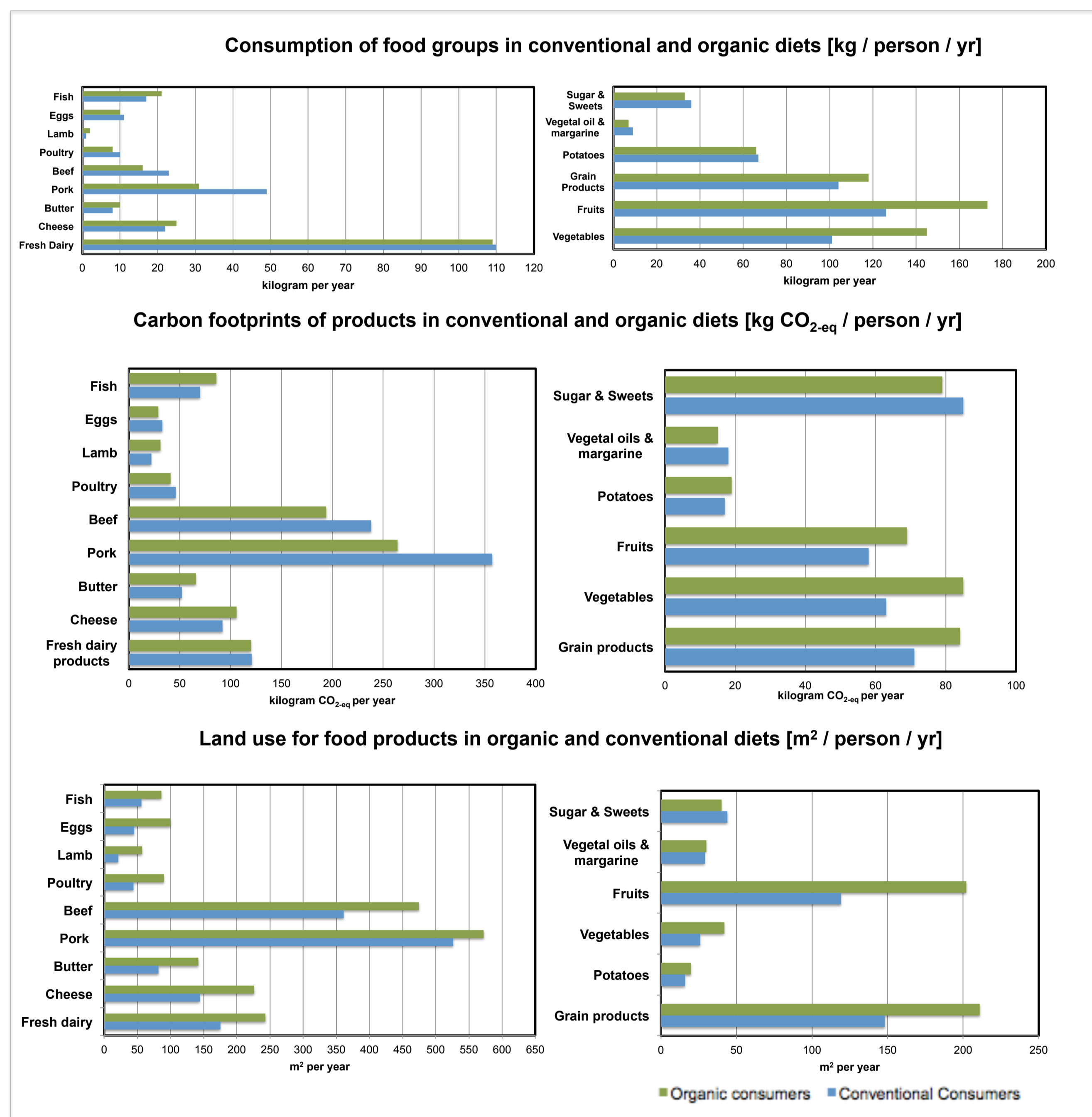
- The thesis identified various measures that could help to reduce the diet-related carbon footprints and land use:
- **Changing dietary preferences to more plant-based products** offers large potentials to reduce GHG emissions and land use (diet shifts).
- Less meat consumption is also recommended from a health point of view: **Healthier diets are also more sustainable diets.**
- **Reducing food waste** is important
- **(Organic) agricultural productivity has to improve**
- In parallel to mitigation options related to food production and consumption, awareness raising campaigns could be strengthened

Conclusions

- **Conventional farming systems have provided large amounts of food but often at the expense of environmental services.** Productivity is an important factor in the light of a fast growing world population and related food security issues. However, not only volumes but also the quality of food is of paramount interest. Therefore, environmentally sustainable production systems are an increasingly urgent requirement.
- In order to feed 9.7 billion people in accordance with environmental sustainability, consumption patterns as well as food production have to be transformed simultaneously. **Reducing yield gaps in organic agriculture without causing further environmental burdens will be required.** However, today, organic farming might not be able to feed the world. But, coupled with more plant-based diets, organic agriculture is a necessary element of a more sustainable food system.

Material and methods

- Data on food intake (**National Nutrition Survey II**) were obtained from the **Max Rubner-Institute** (research agreement)
- To calculate the diet-related carbon footprints and land use, the food intake data were matched with results from studies using mainly **life cycle assessment (LCA)**



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(for the reference list, please refer to original master thesis)