Policy analysis of the transformation of the EU’s agri-food sector:
A review of model capabilities and an outlook for future research

Christine Wieck and Arndt Feuerbacher
Chair group „Agricultural and Food Policy“
University of Hohenheim, Stuttgart (Germany)

2nd biennial EU Conference on modelling for policy support

22.11.2021
Introduction

• **Sustainability challenges in the EU agri-food sector**
  • Trade-off between natural resource and biodiversity protection ⇔ resource efficient food, fiber and biomass production
  • Resource efficiency along the value chains
  • Consumption habits
  • Human rights and social justice
  • Animal welfare
  • One Health: animal-food-human health nexus
• Several of these topics picked up in **Green Deal proposal**, mainly F2F, but also Biodiversity Strategy and others
• **Economic impact modelling** important element in formation of political will and decision-making
Our study

• **Objective:** review research topics and economic model capabilities of most common simulation models used for agricultural policy analysis and *analyse how they match* the policy agenda of the EU’s Green Deal / Farm-to-Fork strategy

• **Approach:** using Scopus database, we analyze the existing literature of model applications published between 2000 and 2022 (advance access)

• **Selected model types:**
  - Single farm or multi-agent models (various ones)
  - Partial equilibrium models (e.g. CAPRI, ESIM, AgMemod)
  - Economy wide models (e.g. GTAP, MAGNET)

• **Further characteristics:**
  - EU-focused
  - Economic-focused

• **Sample size:** 96 journal articles
What has been the dominant focus of past model applications?

- Partial equilibrium simulation models: n=46
- Farm level simulation models: n=31
- CGE model: n = 25
- Double counting possible
Policy agenda for sustainability transition: EU Green Deal and related strategies (F2F, Biodiv)

**Proposed elements**

- New carbon farming
- Pesticide reduction
- AMR reduction
- Improve animal welfare
- Code of conduct in food chain
- Food in School scheme
- Fairer distribution along value chain
- Use of biocides
- Reduction of nutrient losses
- New feed additives
- Improve sustainability labels
- Tax incentives for healthier diets
- Boost innovation in agri-food sector
- Increase in diversity-rich landscape
- Reduction of food loss
- Better nutrient mgmt.
- Facilitate sustainable procurement
- Use of bio-pesticides
- Increased use of sustainability labels
- Promote sustainable food consumption
- New carbon farming
- Increase organic farming
- Increase in diversity-rich landscape
- Better nutrient mgmt.
- Facilitate sustainable procurement

**Potential trade offs**

- Optimal economic state
- Optimal environmental state
- Optimal social conditions, better animal welfare

- Change in production **and** consumption pattern needed
- Danger that instead of changes in consumption, **production leakage** and **import substitution** occurs
Policy priorities: Trade offs between objectives; costs and benefits, ambiguities call for economic impact modelling

- New carbon farming
- Use of bio-pesticides
- Reduction of nutrient losses
- Pesticide reduction
- Increase in diversity-rich landscape
- Increase organic farming
- AMR reduction
- Improve animal welfare
- New feed additives
- Better nutrient mgmt.
- Food in School scheme
- Tax incentives for healthier diets
- Increased use of sustainability labels
- Promote sustainable food consumption
- Facilitate sustainable procurement
- Code of conduct in food chain
- Reduction of food loss
- Boost innovation in agri-food sector
- Overall welfare and sustainability ↑
- Social and econ. welfare + Costs?
- Costs ↓ Environment +
- Farm income ↑?
- Example yield changes
  - Likely good for the environment and biodiv,
  - But likely reduction in overall output
  - Will shift in consumption be sufficient to counter less output?
  - Or will import substitution occur?
Policy priorities: Limitations in model capabilities

**Proposed elements**

- Use of bio-pesticides
- AMR reduction
- Pesticide reduction
- Improve animal welfare
- Code of conduct in food chain
- Food in School scheme
- Fairer distribution along value chain
- New carbon farming
- Reduction of nutrient losses
- New feed additives
- Tax incentives for healthier diets
- Boost innovation in agri-food sector
- Increase in diversity-rich landscape
- Reduction of food loss
- Increased use of sustainability labels
- Promote sustainable food consumption
- Facilitate sustainable procurement
- Better nutrient mgmt.
- Increase organic farming

**Limitations in model capabilities**

- Missing data on
  - Detailed pesticide use
  - Animal welfare status and compliance level
- Intra-EU data on trade and demand of organic products very weak
  - Also holds for sustainability labels
- Modelling positive effects of biodiversity measures require high spatial resolution
  - Ecological mechanisms need to be incorporated (e.g., higher pollination/pest-control) services due to diversity-rich landscapes
- Challenge to bridge market-level and landscape-level
- Power asymmetries along food chains: aggregation issues
Conclusions

• Sustainability transition of agri-food system involves many trade-offs and offer new challenges for economic impact modelling
• Benefits and costs of the transition need to be depicted in models in order to be able to analyse these trade-offs
• Where impacts are ambiguous… …use transdisciplinary approaches to close knowledge gaps on impacts, …”refine” modelling approaches e.g. through model linkages
• Demand side of models need more attention (food policies, food loss and waste, social/health dimension, valuation of animal welfare, household disaggregation)
• External (non-EU) dimension need to be considered

Wieck and Feuerbacher 2021, EU Modelling Conference
We thank all modelers and authors for publishing timely and interesting journal articles!

Thank you for your attention!

Contact: christine.wieck@uni-hohenheim.de