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UNDERSTANDING & IMPROVING
THE SUSTAINABILITY OF AGRO-ECOLOGICAL FARMING SYSTEMS IN THE EU

# Territorial impacts of agro-ecological farming practices and food systems transformation in the European Union in 2050

Input to the symposium on Agroecological transitions of farming systems: Strategies and their implications for sustainability and governance in different European contexts

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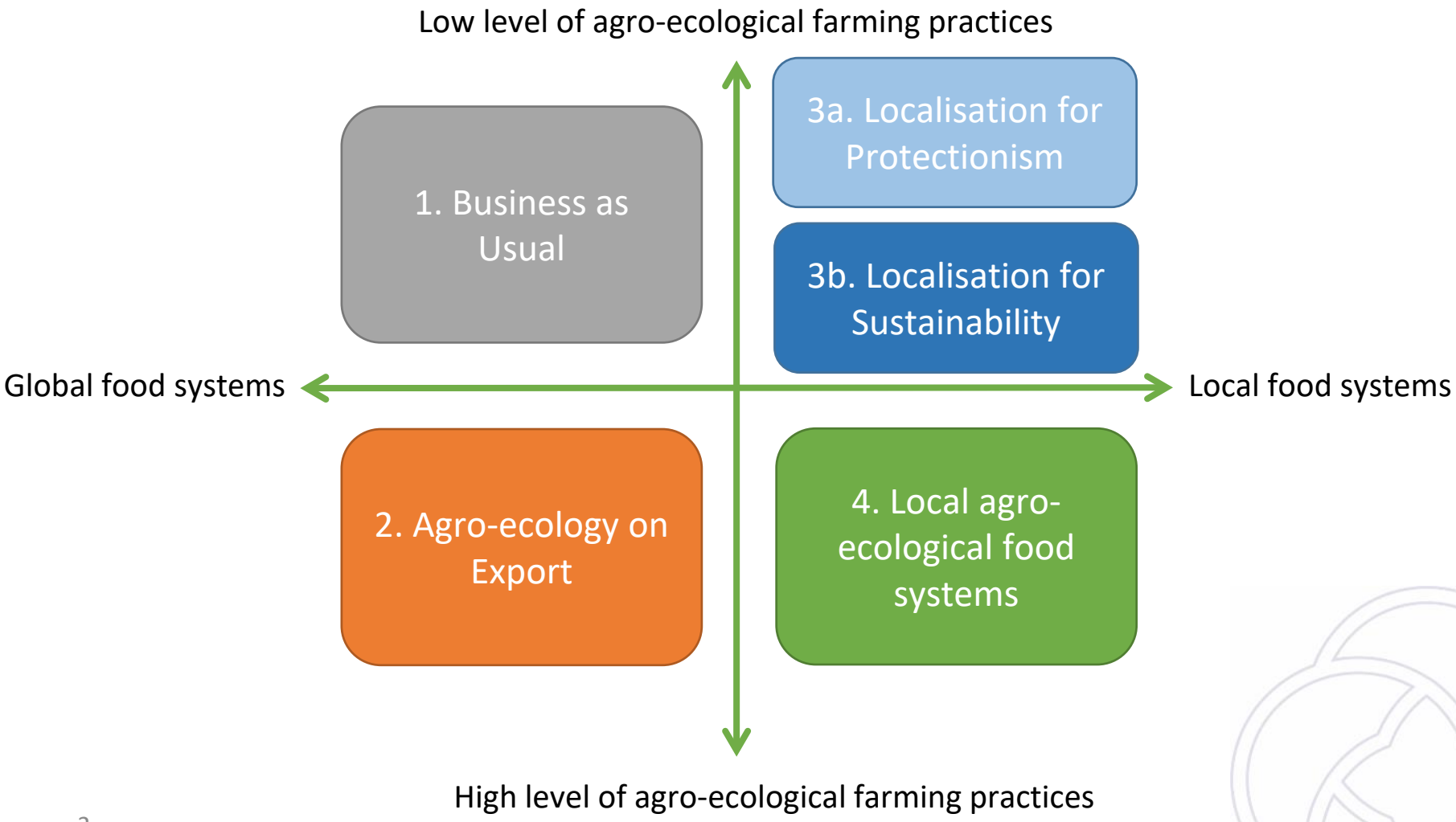
**AES 94th Annual Conference | 29-30 March 2021**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 773901.

# Five storylines for future EU food systems



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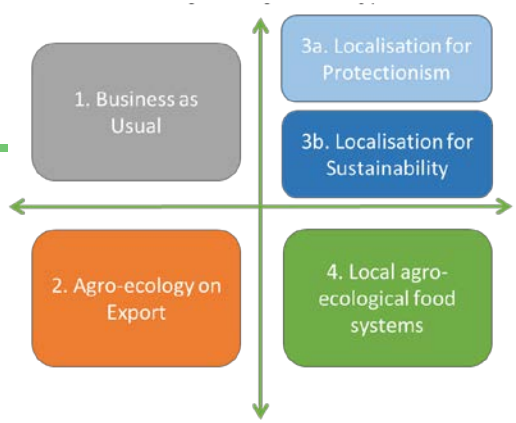


# Storyline 1: Business-as-usual

- Globalisation of the EU food system continues
- Farmers incentivised to produce low value commodities leading to further specialisation of farming systems and regions
- Current production and consumption trends in the EU continue



Photos: iStockPhoto

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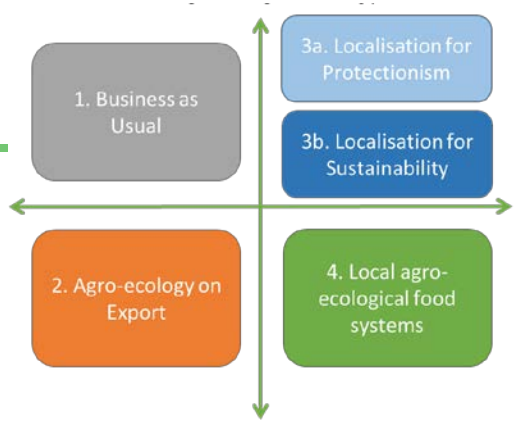


# Storyline 2: Agro-ecology for exports

- Globalisation of the EU food system continues
- Strong support for agro-ecology **driven mainly by export opportunities**
- Substantial expansion of agro-ecology for export oriented products
- Cropland expansion allowed



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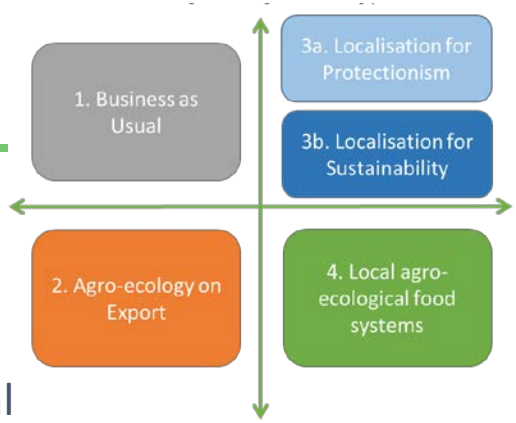
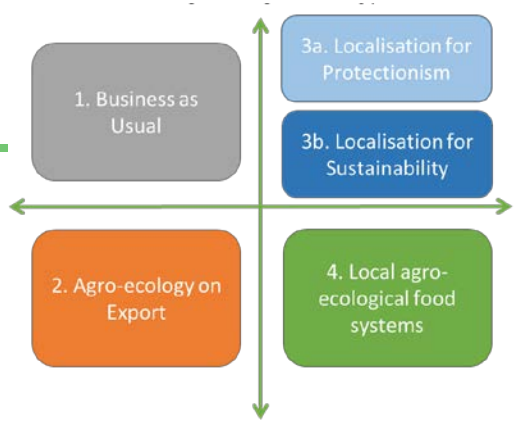



# Storyline 3a: Localisation for protectionism

- Nationally or locally produced foods, regardless of production methods, are prioritised over foods produced in agro-ecological farming systems
- Drivers: **rise in nationalism and protectionism**
- Focus is on increased production of bulk commodities
- Diet develops according to current BAU-projections



Photos: iStockPhoto

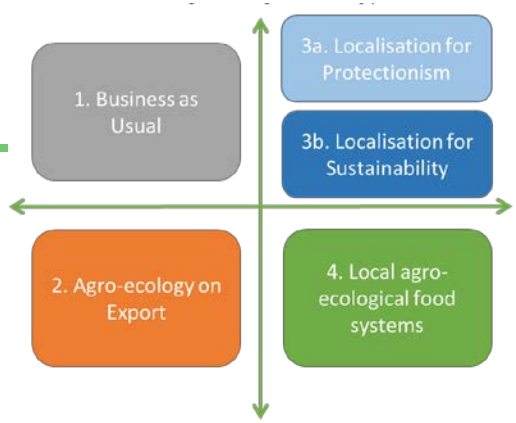



# Storyline 3b: Localisation for sustainability

- As Storyline 3a but developments are **driven by sustainability objectives**
- No cropland expansion allowed
- Still a moderate implementation of agro-ecological practices
- Diets change toward more plant based and food waste is reduced



Photos: iStockPhoto




# Storyline 4: Local agro-ecological food systems

- Drivers: A rapid **increase in climate and environmental concerns** among large population groups
- In 2050, on average across member states between 20-50% of land is farmed with strong agro-ecological practices serving mostly local markets.
- Healthier and more sustainable diets – aligned to the local availability
- Animal species consuming human edible feeds (pigs and poultry) decrease, ruminant production is mainly grass-based



Photos: iStockPhoto

# Modeling results

Two types of models:

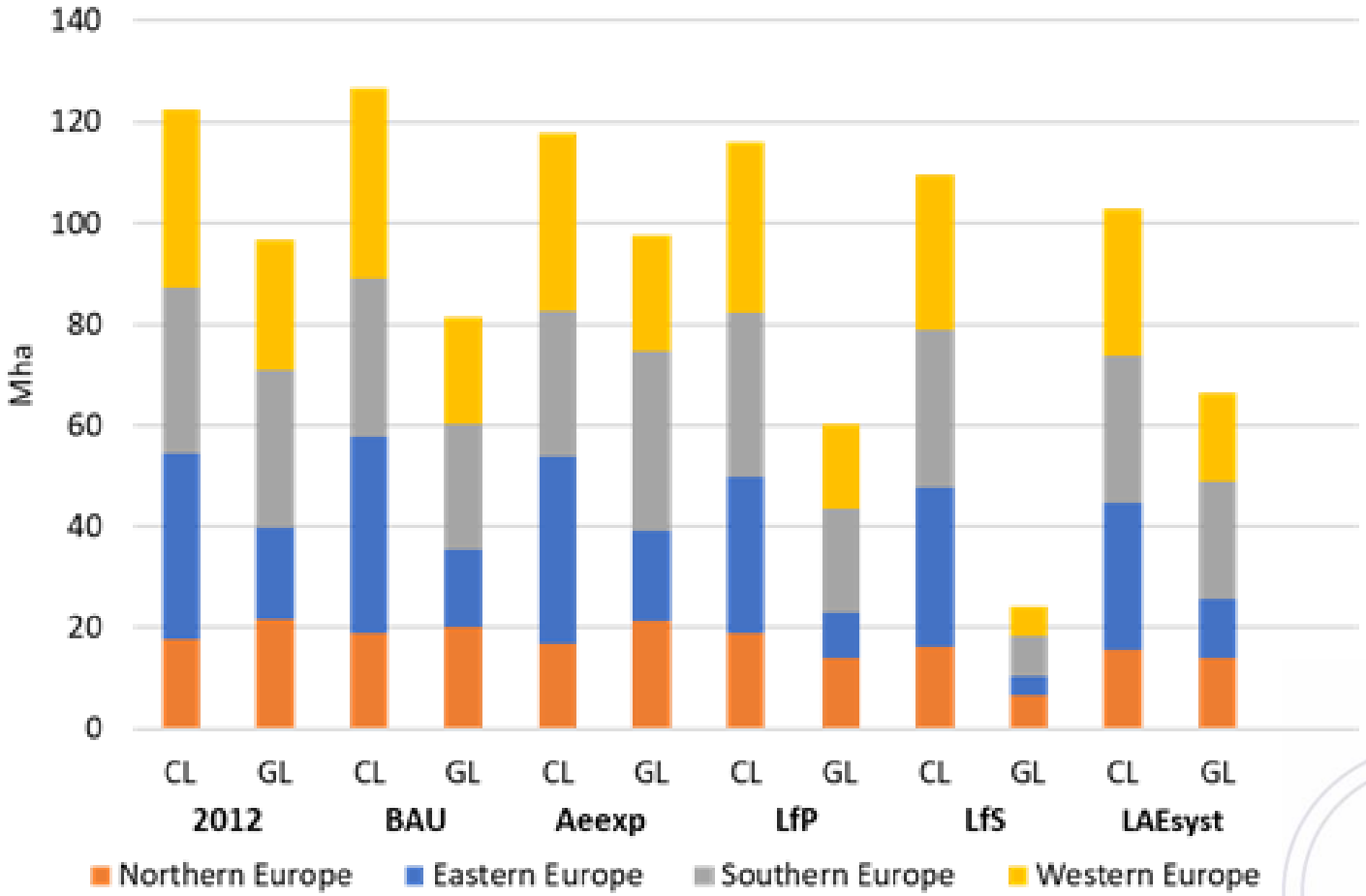
- Biophysical
- Complementary economic equilibrium model

- Main aim: to identify robust strong patterns, in particular related to trade-offs and synergies

Patterns behind the results:

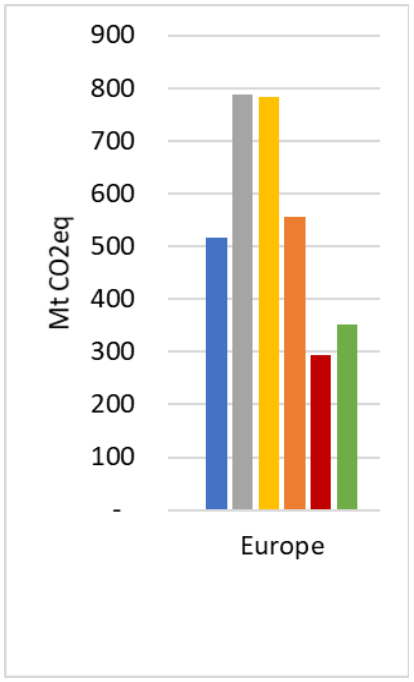
- The food system becomes smaller – in particular: less animal source food (and thus less feed production)
- Commodity group shares change (e.g. more vegetables)
- Regional production patterns change

# Cropland and grassland use

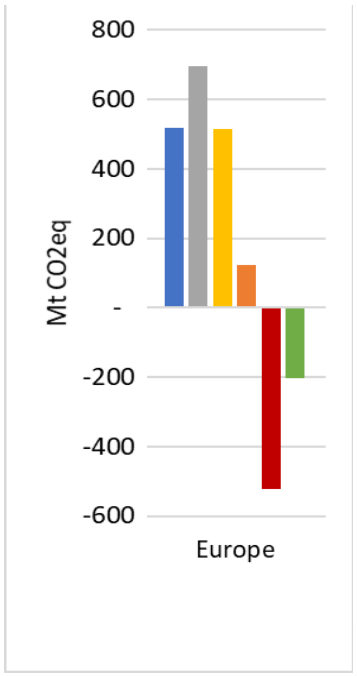


# Biophysical outcomes

Greenhouse gas emissions

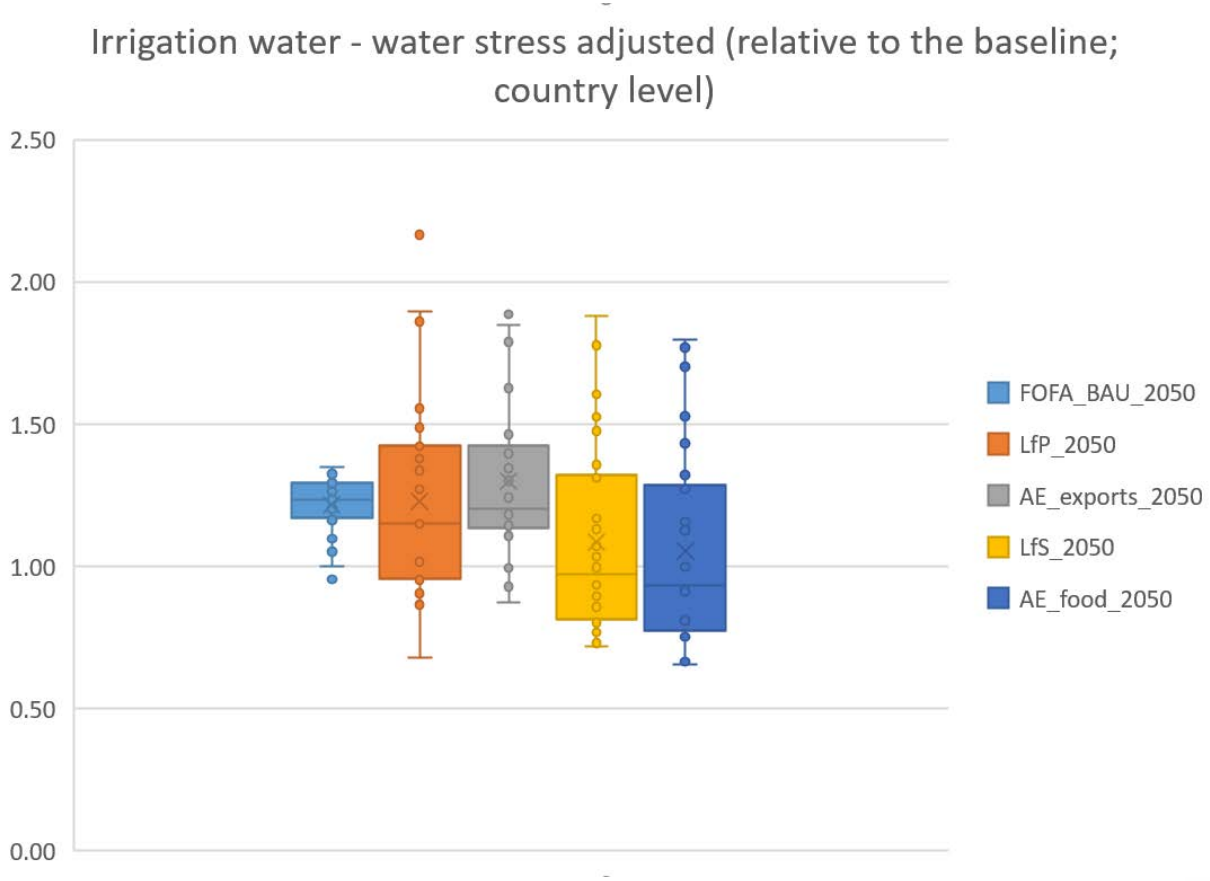



Greenhouse gas emissions with vegetation regrowth

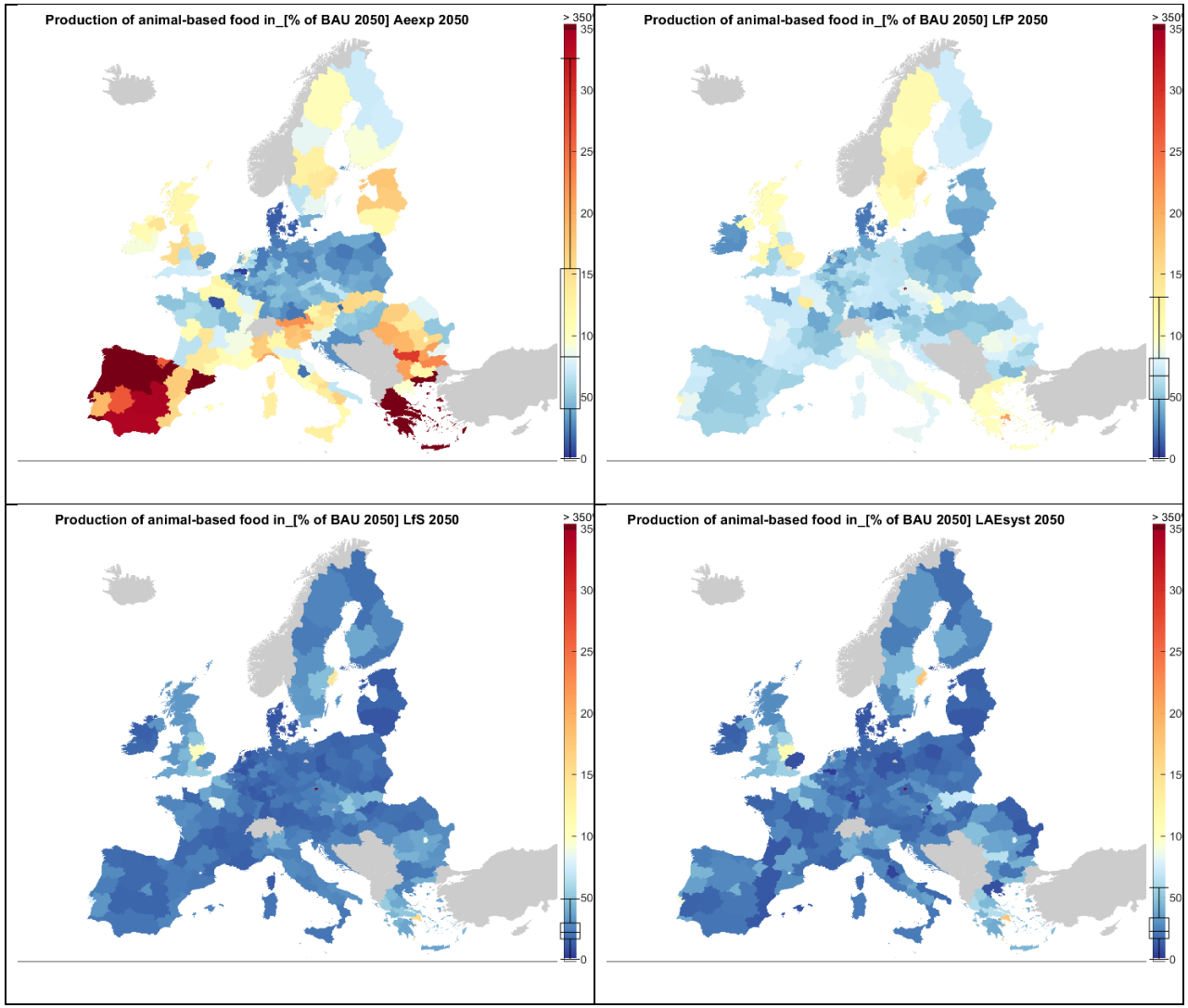



2012 BAU Aeexp LfP LfS LAEsyst

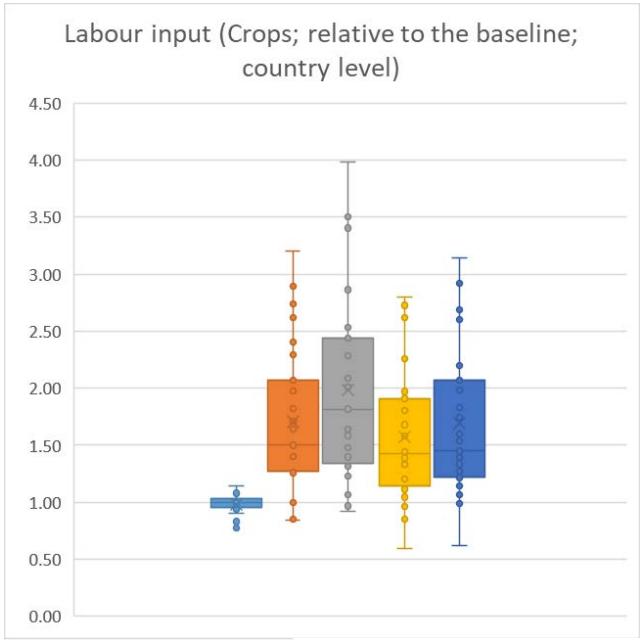
# Irrigation water use (relative to the baseline)

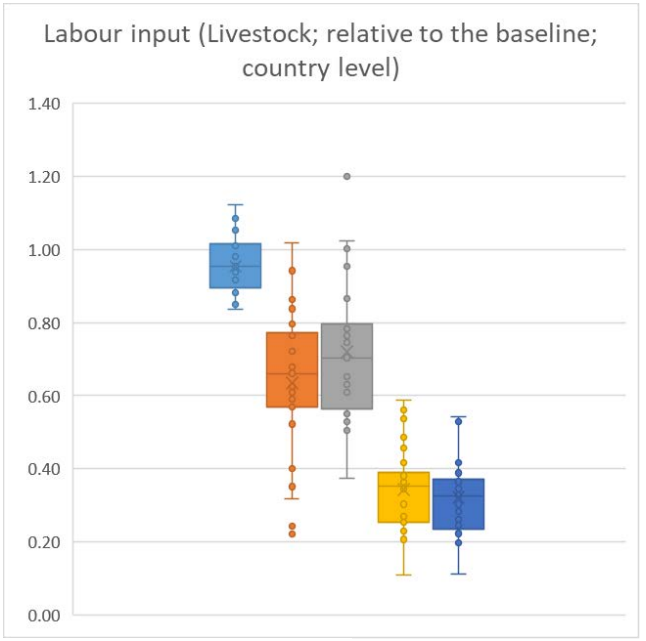


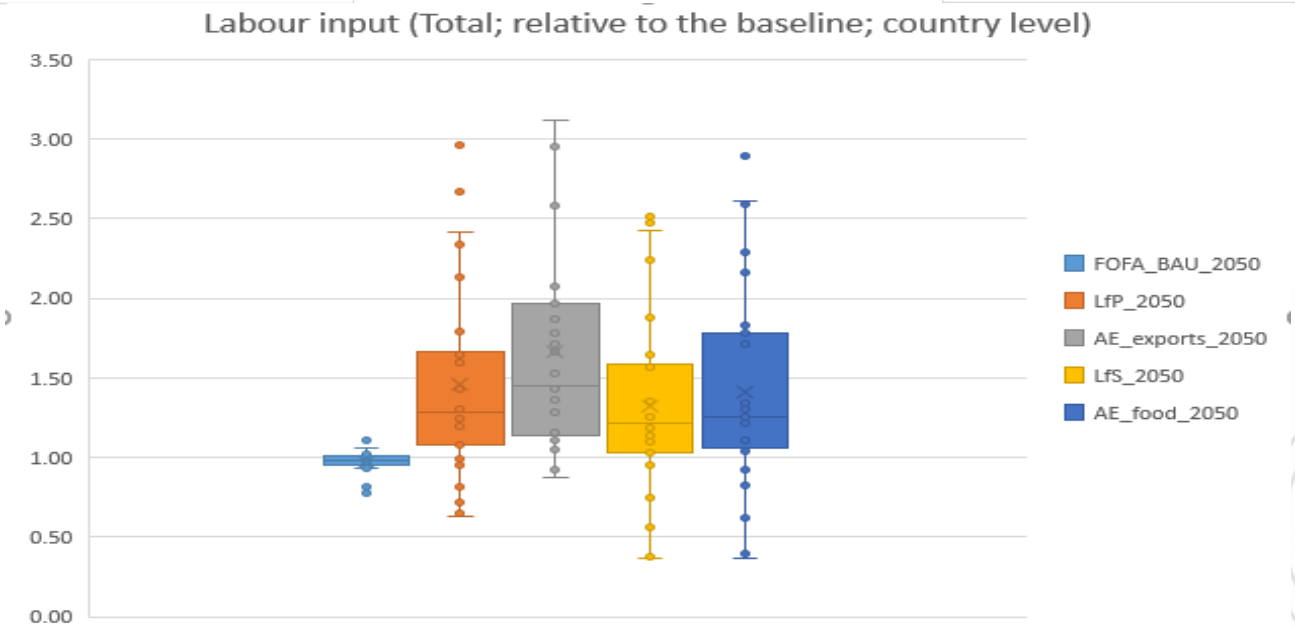
# Production of animal-based food (rel. to BAU 2050)



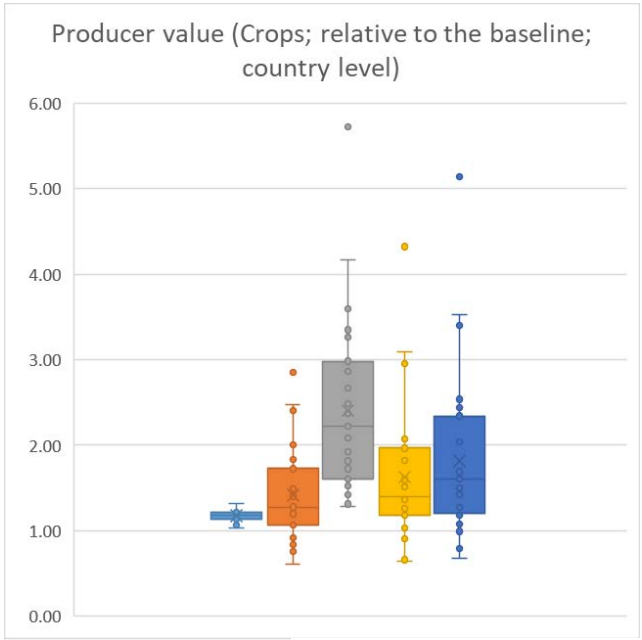
# Labour

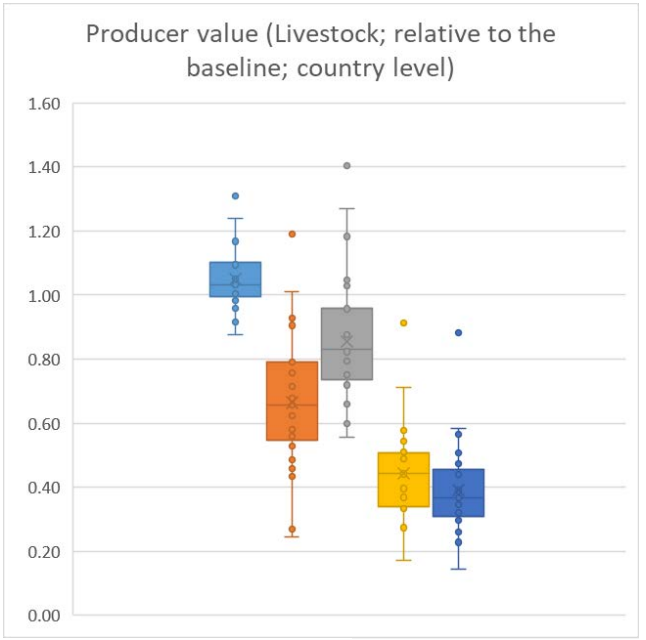

Labour input (Crops; relative to the baseline; country level)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00

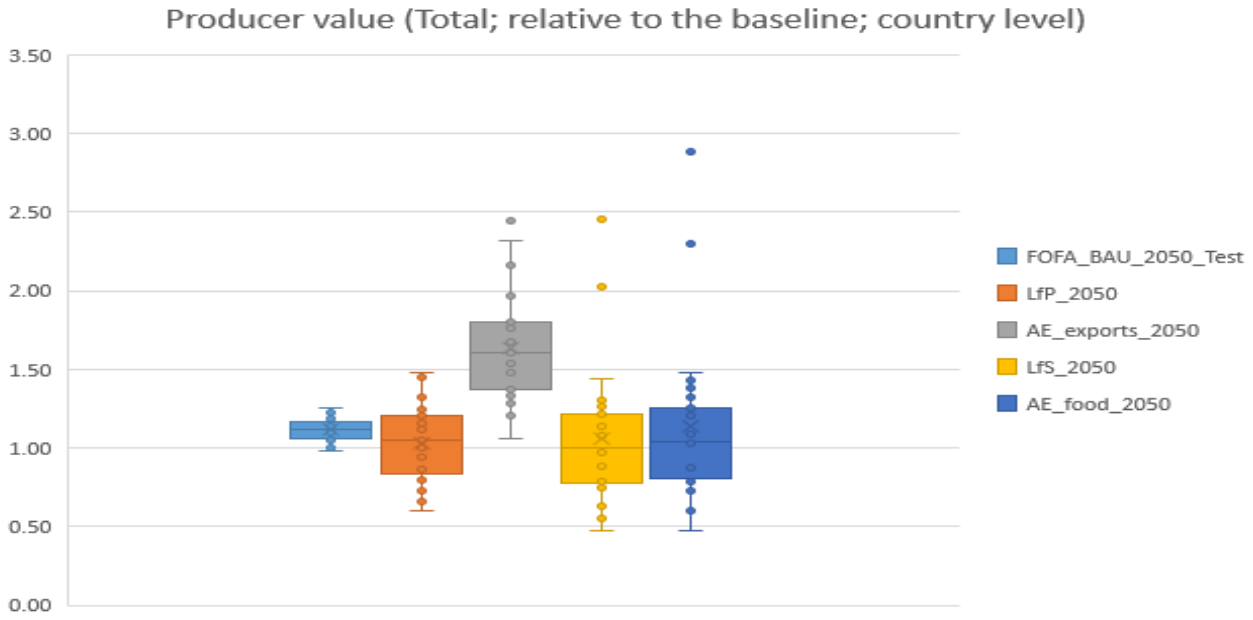

Labour input (Livestock; relative to the baseline; country level)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00


Labour input (Total; relative to the baseline; country level)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FOFA_BAU_2050
LfP_2050
AE_exports_2050
LfS_2050
AE_food_2050

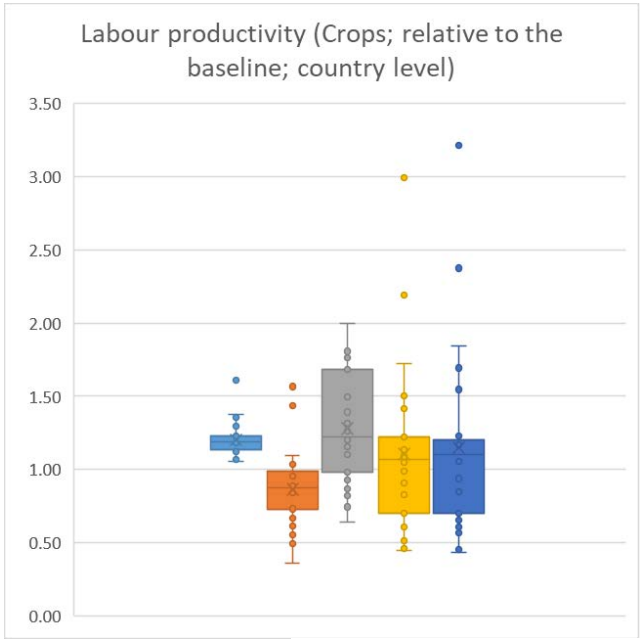
# Producer value

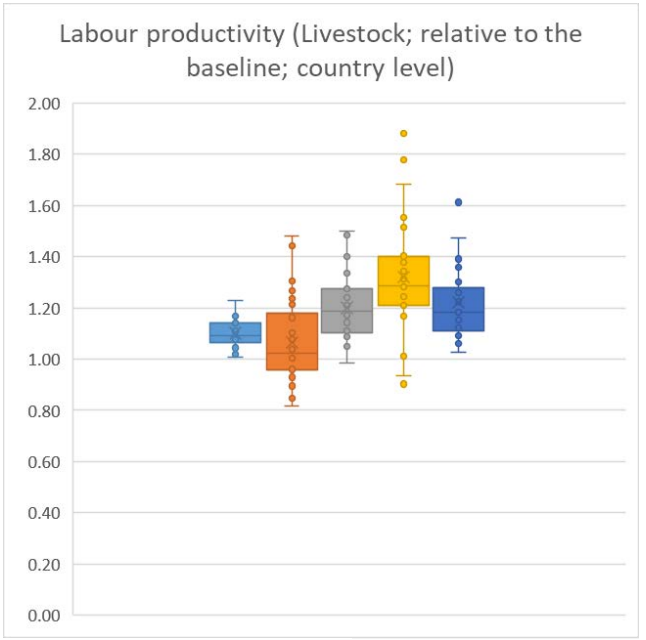


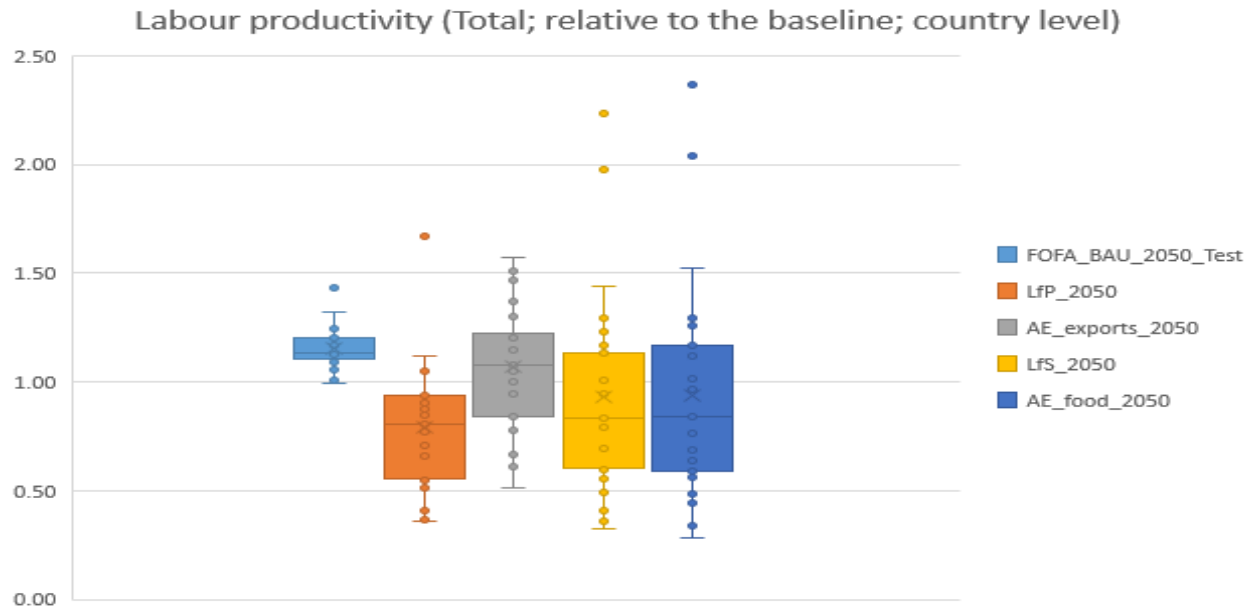



# Labour productivity



# Economic modelling: goals and caveats

- Goal:
  - Which price changes would be needed to see the biophysical outcomes as economic equilibria?
  - i.e.: which combination of economic taxes or subsidies are needed to reach the alternative 2050 scenarios?
  - 3 policies:
    - EU Production tax/subsidy
    - EU Consumption tax/subsidy
    - EU import tariff
- Caveats
  - We model policies required to reach the desired production, and consumption
  - We do NOT model policies to induce agro-ecological production methods
  - The model does not include the welfare benefits from agro-ecological production (ecological services etc)

# Economic modelling: main results

- Agro-ecology leads to higher prices, lower economic welfare for many commodities
- The required changes in prices are very large

- Results highly dependent on how responsive future production is to policies
  - Highly responsive (”elastic supply”): smaller price and welfare impacts to reach agro-ecology
  - Non-responsive (”inelastic supply”): large price and welfare impacts to reach agro-ecology

# Economic modelling: Takeaways

- Agroecology requires fundamental shifts in production and consumption
  - Infeasible to reach agroecology using market-based economic policies alone
  - Consumer preferences need to change
  - Production mandates may be more feasible than taxes

- Need to “flatten the (supply) curve” / avoid lock-in in the long run
  - Future production systems need to be flexible, responsive to market conditions

# Key messages

- Agro-ecological transformation in the EU can be a promising option, but **need to be complemented with dietary changes to avoid leakage of environmental pressures**
- **Drastic changes are needed** – that likely are not achievable with known market-based policies alone
- **Particularly, healthy low-meat diets** and reduced food waste allow for several important measures
  - Increasing self-sufficiency
  - Nature-based climate solutions (i.e. re-/afforestation)
  - A general extensification of crop yields
  - Agricultural reserves for the future, if needed (higher resilience)
- **Potential trade-offs** require particular attention:
  - e.g. increased water use with increased vegetable production
- The biggest effects relate to changes that address the total production, and **not on improving efficiencies** – "make the food system smaller"

# Contacts

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European Union's
Horizon 2020 Programme
GA N° 773901

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## Understanding and Improving the Sustainability of Agro-ecological Farming Systems in the EU

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 773901.