

Agrimonde-Terra: Foresight on Land use and Food security Insights for European agriculture and food systems

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Agrimonde-Terra

A collective work

A foresight on land use and food security at the global level

Project team:

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Thematic workshops and their scientific coordinators:

- (i) *“Urban-rural relationships”*: F. Aubert (Agro-Sup, Dijon) & F. Lançon (Cirad)
- (ii) *“Structures of production”*: J. Marzin (Cirad) & L. Piet (Inrae)
- (iii) *“Cropping systems”*: D. Makowski (Inrae), E. Malézieux & F. Maraux (Cirad)
- (iv) *“Livestock systems”* A. Ickowitz & P. Lecomte (Cirad) & P. Lescoat (AgroParisTech)

Scenario committee:

A. Andersson Djurfeldt (LundUniversity, Sweden), L. Ben Becher (Synagri, Tunisia), M. Elloumi (Inrat, Tunisia), A. Faye (IPAR, Senegal), R. Guissou / Y. G. Bazie (Ministry of Agriculture and Food Security, Burkina Faso), H. Kray (World Bank, USA), J. Lewis (Terra Global Capital, USA), P. Meyfroidt (Louvain University, Belgium), M. Mueller (FAO, Italy), S. Msanguu (IFPRI, USA), A. Onorati (International Planning Committee on Food Sovereignty, Italy), S. Parmentier (Oxfam, Belgium), A. Retière (Cap 2100, France), R. Sonnino (Cardiff University, UK), S. Treyer (IDDRI, France), D. van der Mensbrugghe (AgMIP, Purdue University, USA), J. Vervoort (CCAFS and Oxford University, UK), H. Zehni (IFAD, Italy).

2. Objectives and method



Objectives of Agrimonde-Terra

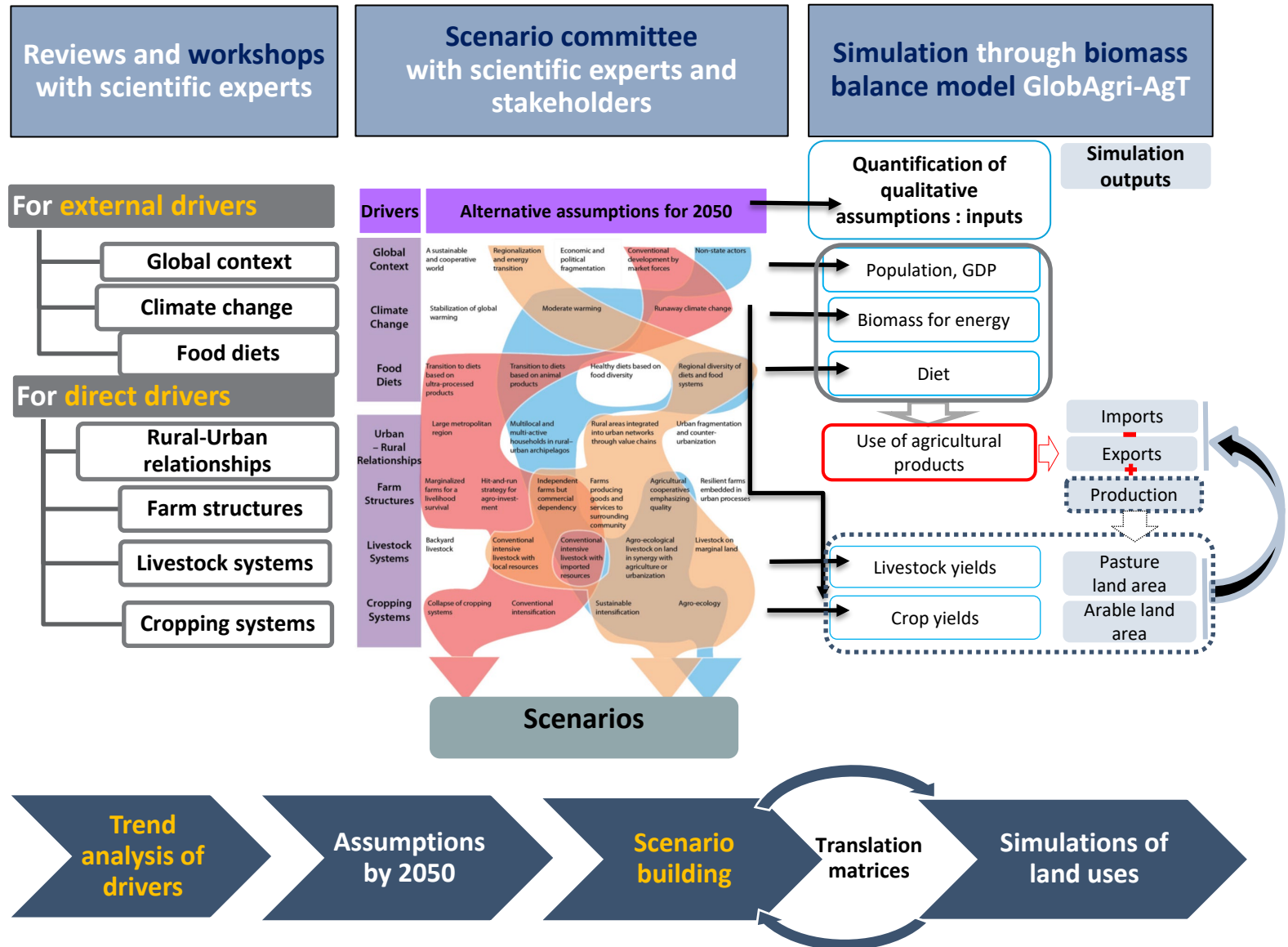
To facilitate informed decision-making
and multi-stakeholder approach
about the possible futures of land use
and food security
by providing :

**Drivers of
land use and food
security systems**
(global and regional)
and alternative
hypotheses about
future changes

**5 scenarios
of land use and food
security**
based on morphological
analysis (narratives) and
quantitative analysis

**A quantitative
platform GlobAgri**
for generating
consistent database
and biomass balance
models
→ GlobAgri-AgT

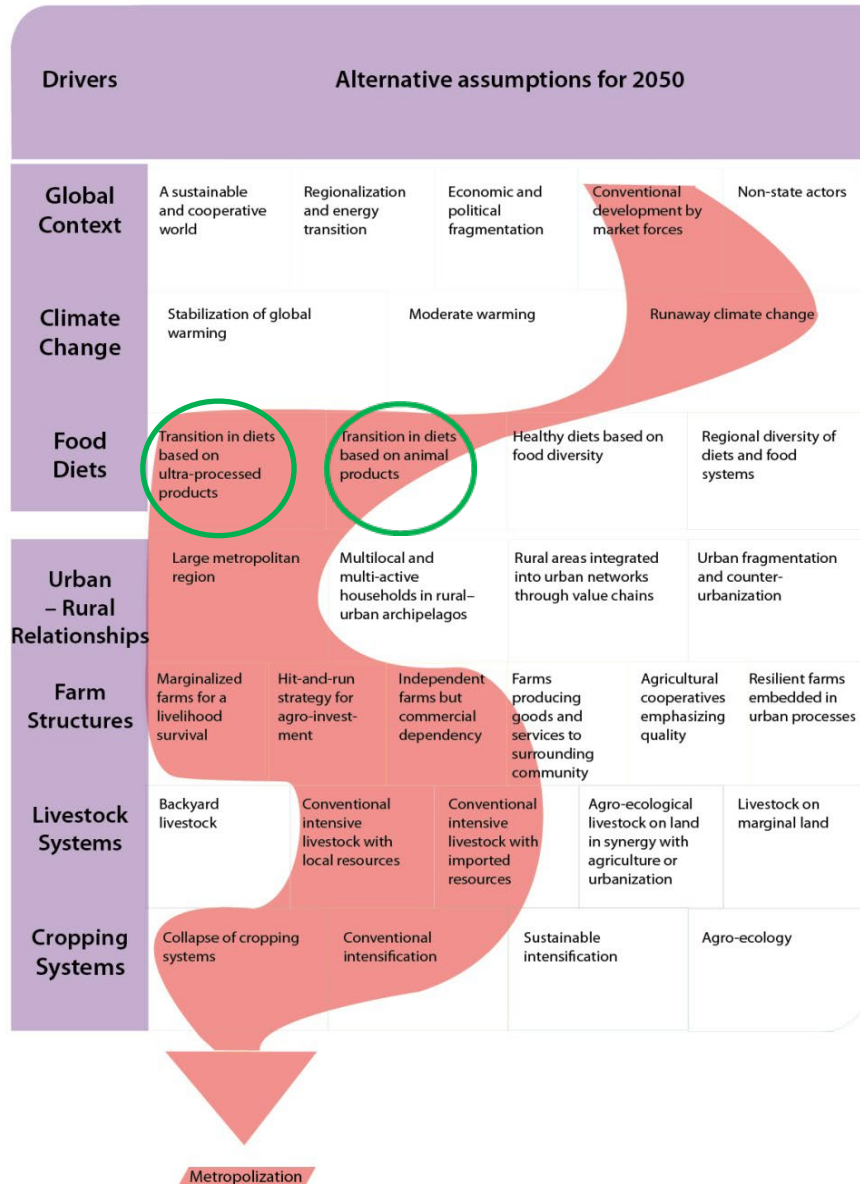
A coupled approach combining scenario building and quantitative simulations through morphological analysis and expert groups



3. The Agrimonde-Terra scenarios

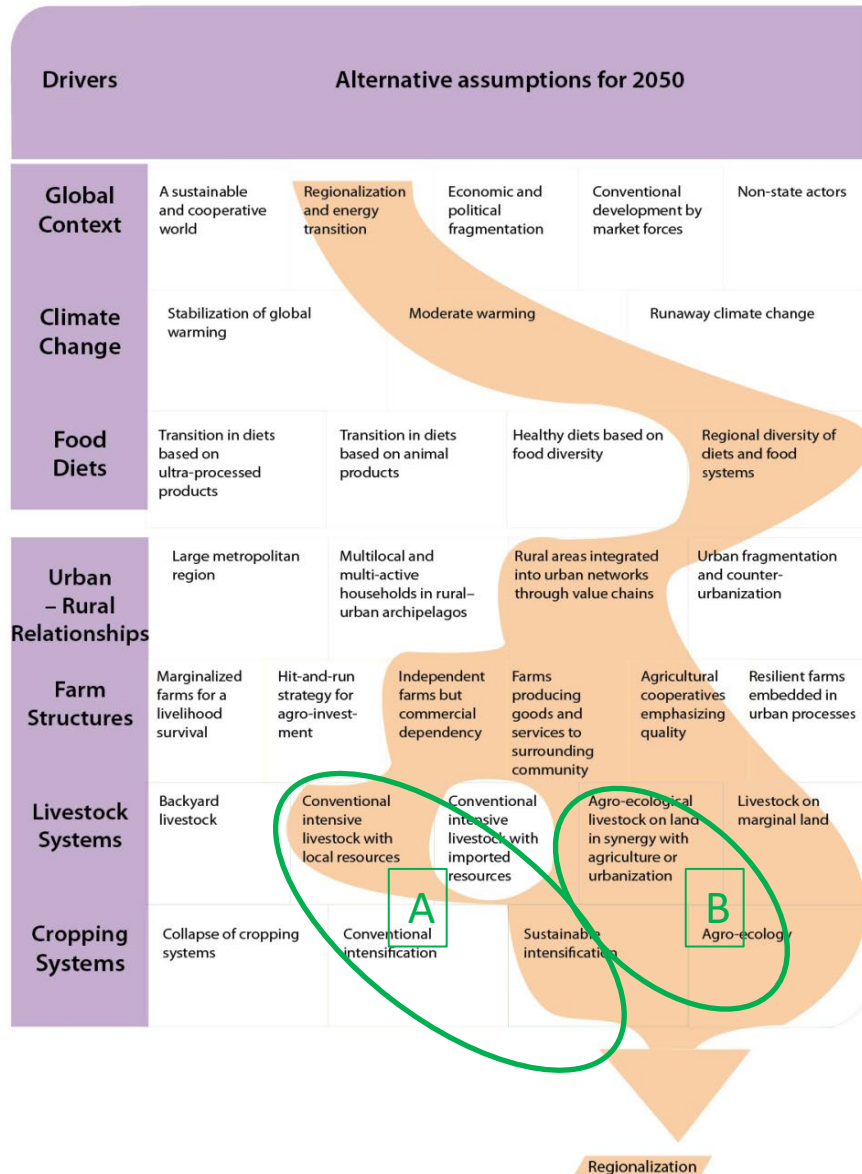


Land Use Driven by Metropolization



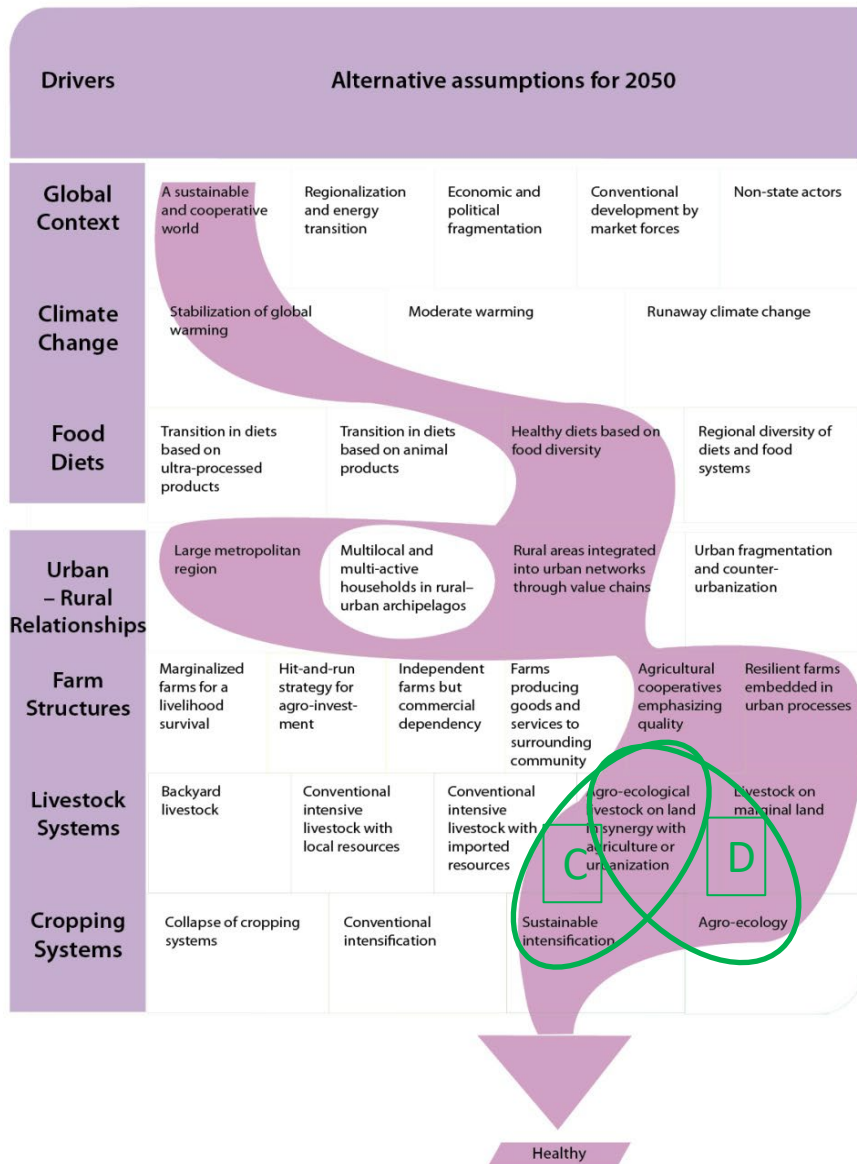
- megacities, international trade, spatial and economic inequalities, migration from rural areas
- globalized food value chains, urbanization and incomes drive diet transition toward ultra-processed and animal-based foods
- Runaway climate change (massive use of fossil fuels)
- conventional intensification of livestock and crop systems linked to global value chains : maize, wheat, soyabean, rice
- spatial segregation: poor small farmers in rural areas poorly linked to international markets
- price volatility - food crises for vuln. pop.
- High levels of diet-related non-communicable diseases and obesity

Land Use for Regional Food Systems



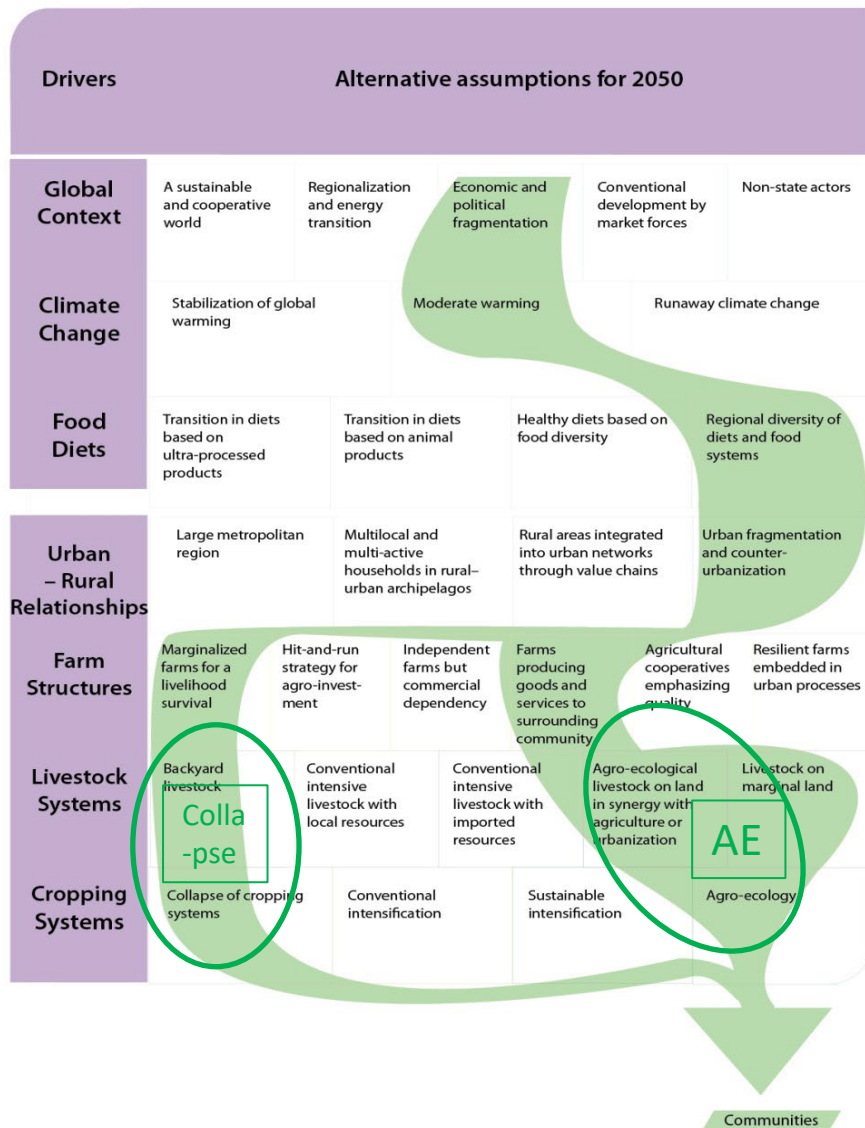
- **supranational regional blocs**
- **medium-size cities connecting rural and large urban areas**
- **food sovereignty and subsidiarity, regional diets**
- **reconnection agri-food industry with regional production, positive knock-on effect for agriculture and for rural incomes**
- **Distinct dominant productions by region:**
tuber and root crops // coarse grains // pulses // fruits and vegetables
- **agricultural cooperatives and contract agreements with agrofood industries**
- **animal feed sourced from region,**
- **crops varieties suited to regional climatic situations**

Land Use for Food Quality and Healthy Nutrition



- **global cooperation** stabilize climate change
- **policy** measures to **shift consumption** patterns towards **healthier diets**
- **diets higher** in fruit and vegetables, coarse grains and pulses, and **lower** in animal products (in developed countries), ultra-processed foods, fats, sugars and sweeteners
- rural-urban **integration**
- diverse, high-quality agricultural products
- **agroecology, diversification** of crops and crop systems. **Integrated crop-livestock farming systems.**
- agricultural coops and farms embedded in rural-urban relationships
- **reduced** food losses and **waste**
- **limiting** agricultural **GHG**, increasing **carbon storage in soil**

Land as Commons for Rural Communities in a Fragmented World



- **multiple crises:** financial, energy, geopolitical and ecological; fragmentation
- **slow down in urban concentration:** increase of medium-size and small towns, and of rural population in some regions.

// **organization in communities**, to develop agro-ecological farms:

- sustainable production of foodstuffs, energy and environmental services;
- **agroecology based** on biological self-regulation and community ... Food security

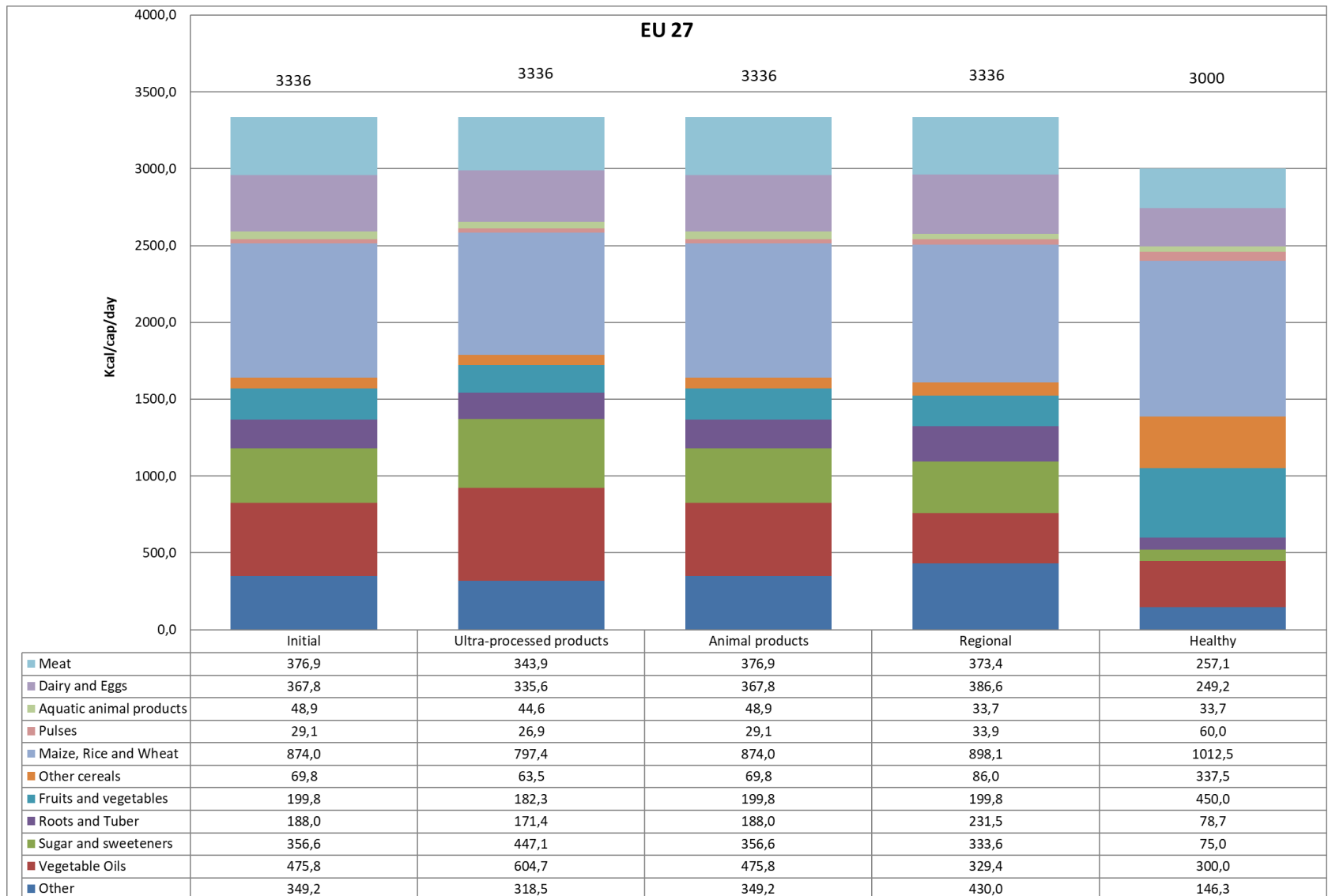
// **subsistence farming** elsewhere:

- declining farm sizes and conventional intensification ... **overexploitation or over-intensification**
- fragility of technical systems and **lack of a resource management** strategy ... Food insecurity

4. Consequences of the scenarios for the EU



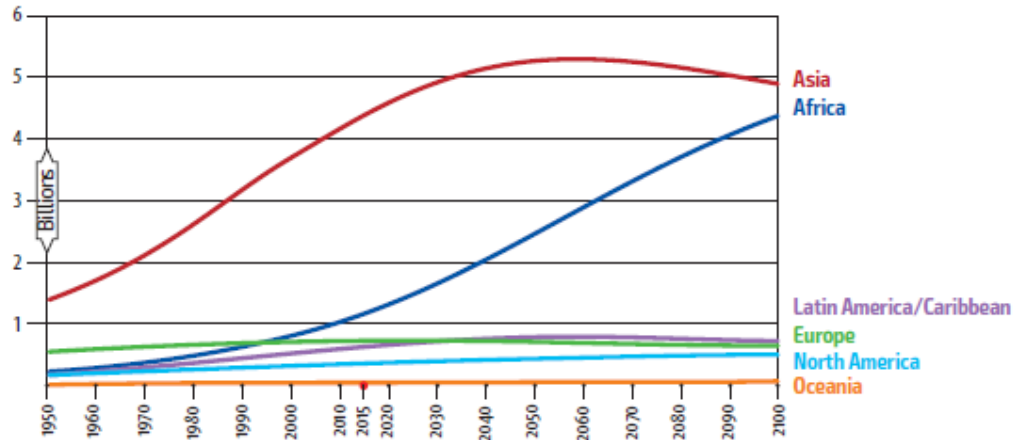
EU diet according to scenarios



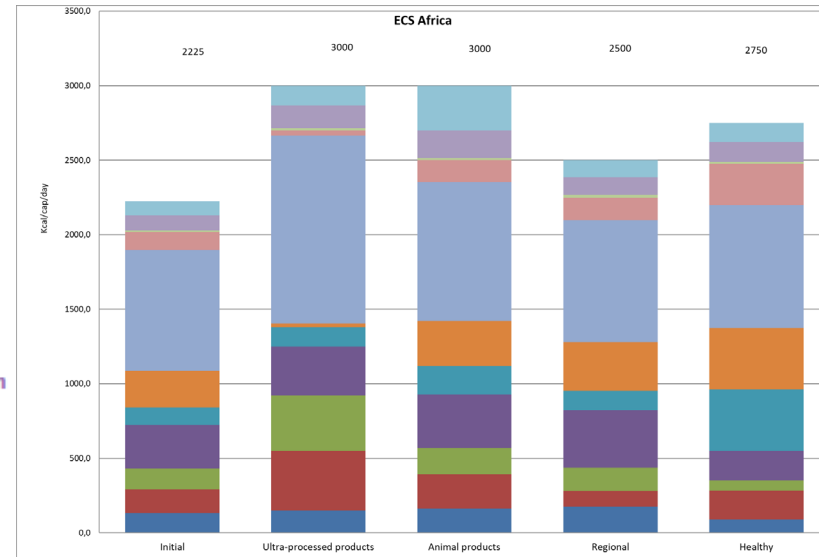
Underlying hypotheses: trend, back to traditional, WHO recommendations

Export potential according to scenarios

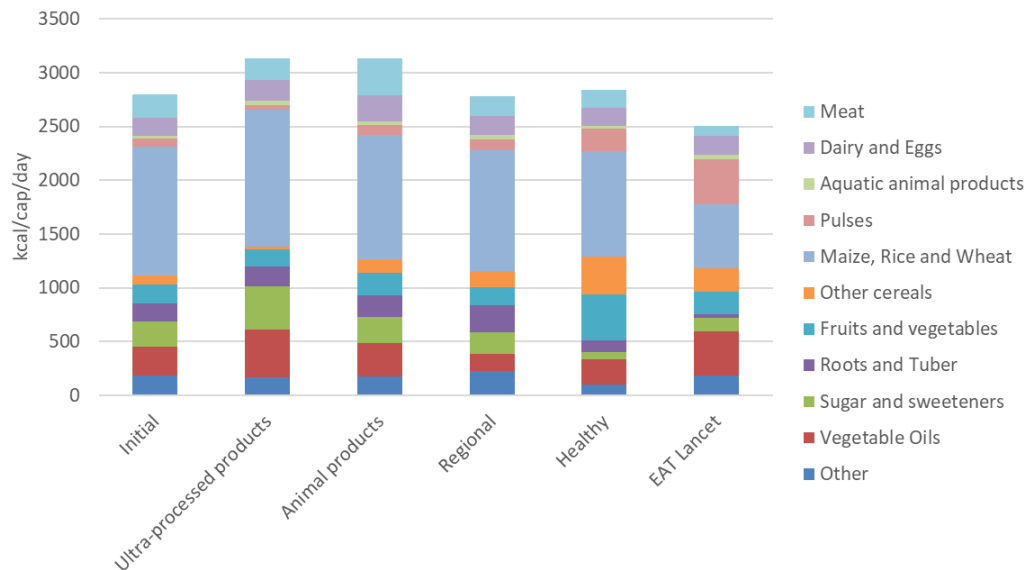
Figure 1.2 Population growth to 2100, by region (medium variant)



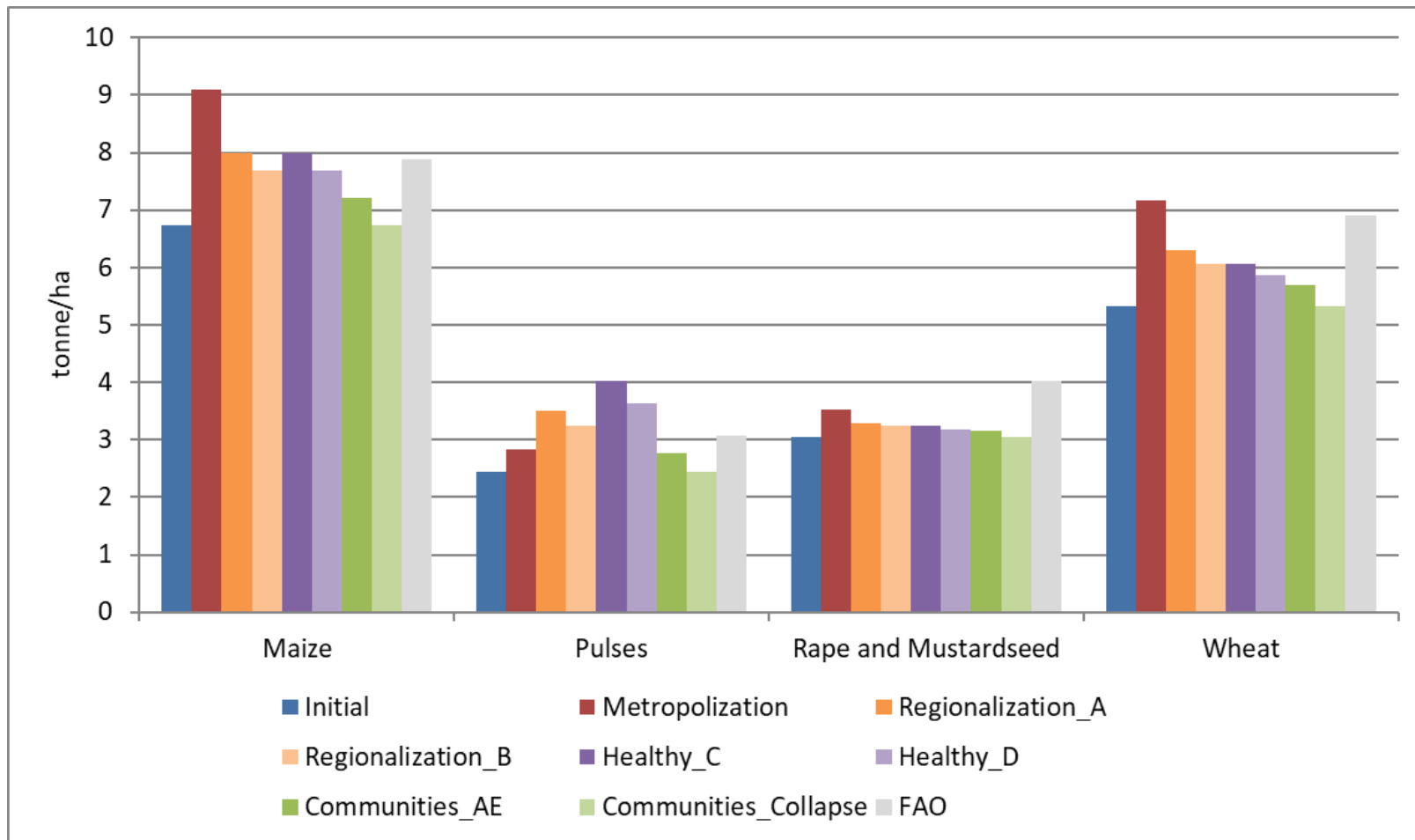
Source: UN, 2015.



Average world diet

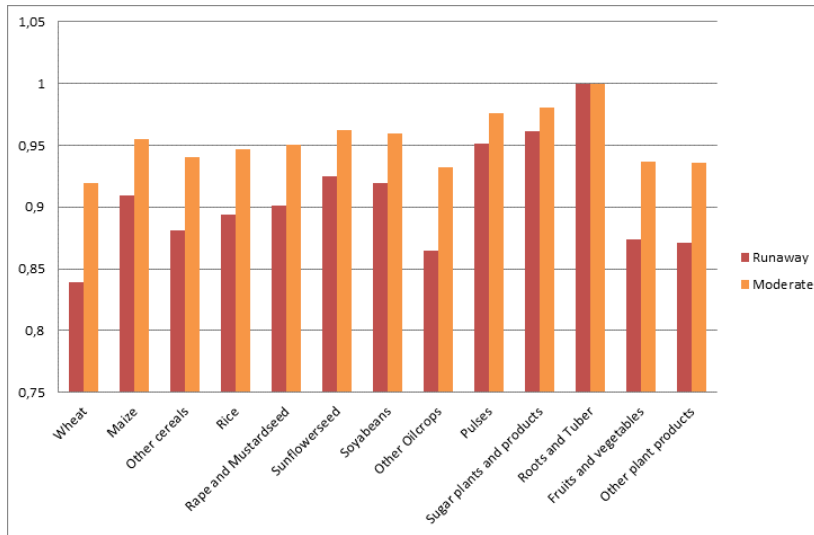


Crop yields according to scenarios



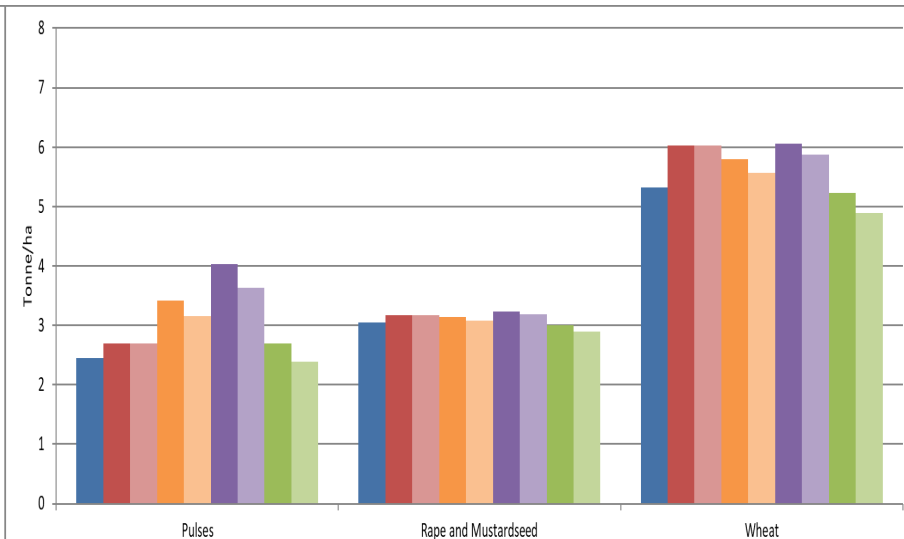
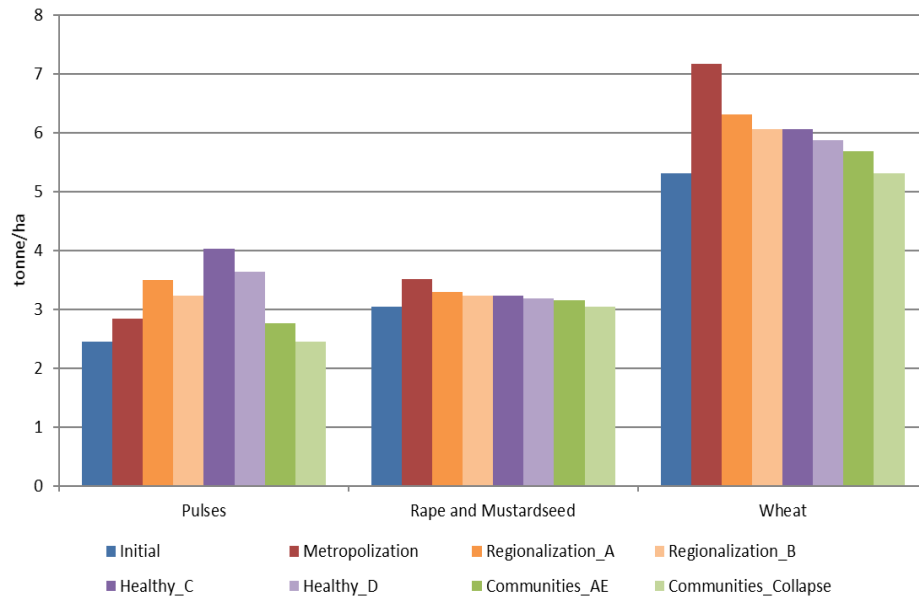
Underlying hypotheses: different extents of yield gap closure + induced technical change in line with domestic demand increase

Crop yields according to scenarios



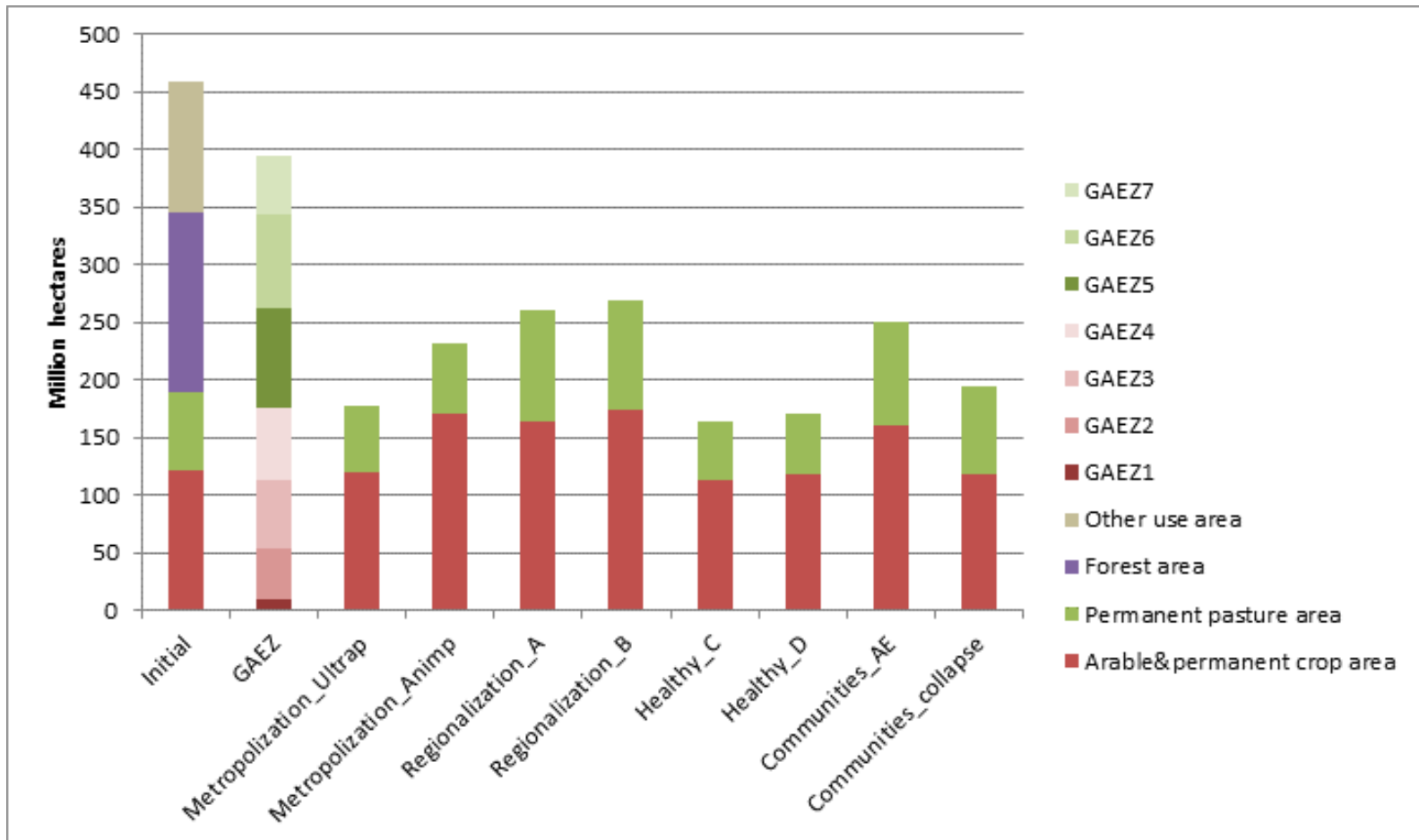
Negative impacts of climate change on crop yields

rapid yield ↗ & severe CC vs. Moderate yield ↗ & moderate CC



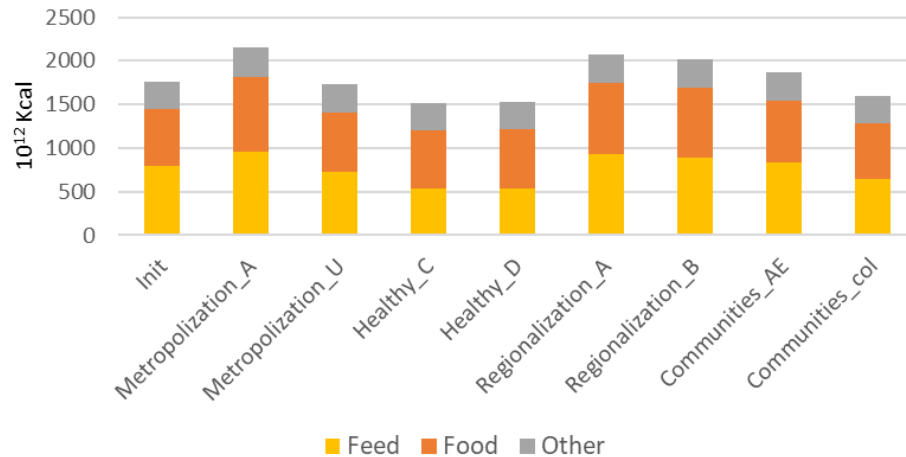
Land-use changes according to scenarios

- Cropland and pastureland expansion with Metropolization_Animp, Regionalization and Communities_AE: tension on land and negative impacts on the environment
- Cropland stagnation and pastureland decrease with Metropolization_Ultrap and Healthy
- Cropland decrease and pastureland expansion with Communities_collapse

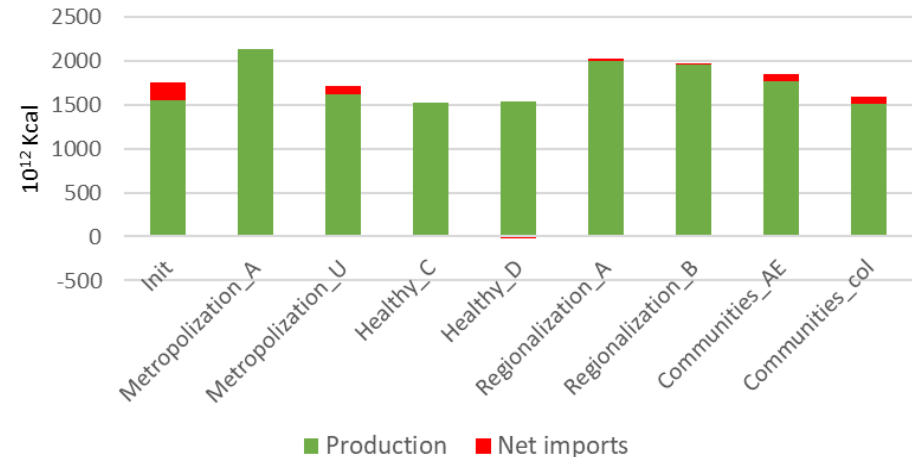


Changes in resource-use balance (kcal) according to scenarios

Total domestic use - total calories



Production & net imports - total calories



- Init: EU 27 net importer of kcal
- Metropolization_A: dramatic increase in feed and food use/production increase thank to yield increase and land expansion/EU self-sufficient
- Metropolization_U: stagnation domestic use/slight production increase thank to yield increase/EU slight decrease in net imports (slight increase in exports)
- Regionalization: dramatic increase in feed use, slight increase in food use/production increase thank land expansion/EU self-sufficient
- Healthy: significant decrease in feed and food use/production stagnation/EU self-sufficient

Main insights for the EU agricultural and food system

➤ Metropolization

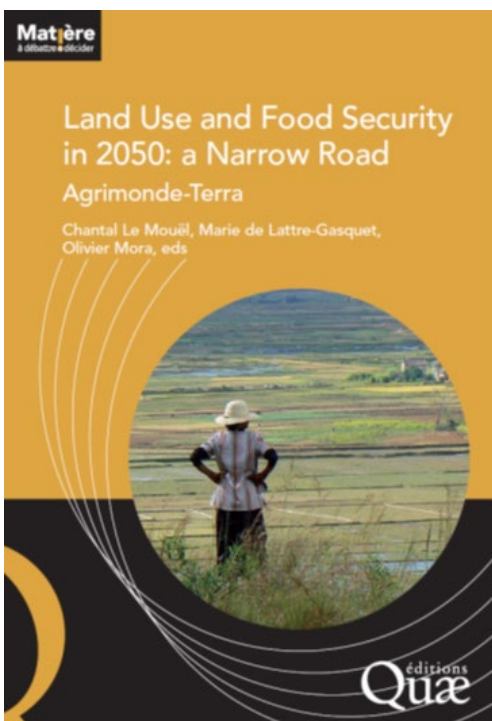
- Negative impacts on human health and environment
- But, with diet based on ultra-processed products, could make EU to increase its exports and benefit from rising foreign demand
- However relative to major world exporters EU disadvantaged by its limited land resource
- High risk to evolve towards the Communities scenarios

➤ Regionalization

- High pressure on land
- Difficult to sustain (except with diet less rich in animal products)
- Not necessarily a reduction in EU food sovereignty

➤ Healthy

- Looks like the most reasonable pathway for EU agriculture and food system
- Very difficult to make this pathway to emerge (integrated agricultural, environmental, nutritional policy)
- Potential tensions between food security and CC mitigation objectives



Free eBook on the QUAЕ website

<https://www.quae-open.com/produit/107/9782759228805/land-use-and-food-security-in-2050-a-narrow-road>
<https://www.quae-open.com/extract/349>

PLOS ONE

RESEARCH ARTICLE

Exploring the future of land use and food security: A new set of global scenarios

Olivier Mora^{1*}, Chantal Le Mouël², Marie de Lattre-Gasquet^{3,4,5}, Catherine Donnars¹, Patrice Dumas⁶, Olivier Réchauchère¹, Thierry Brunelle⁷, Stéphane Manceron¹, Elodie Marajo-Petizon², Clémence Moreau⁸, Marc Barzman¹, Agneta Forslund⁹, Pauline Marty¹