Shared Socio-economic Pathways for European agriculture and food systems: the Eur-Agri-SSPs

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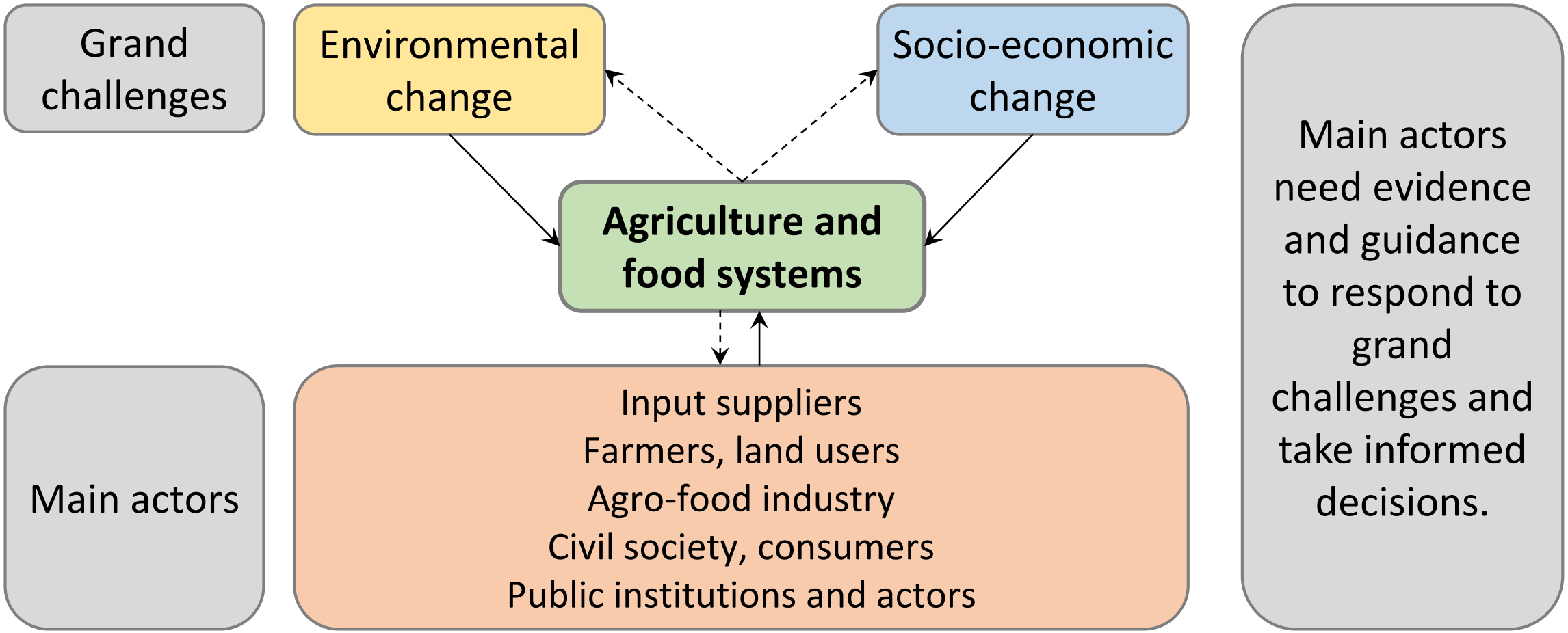
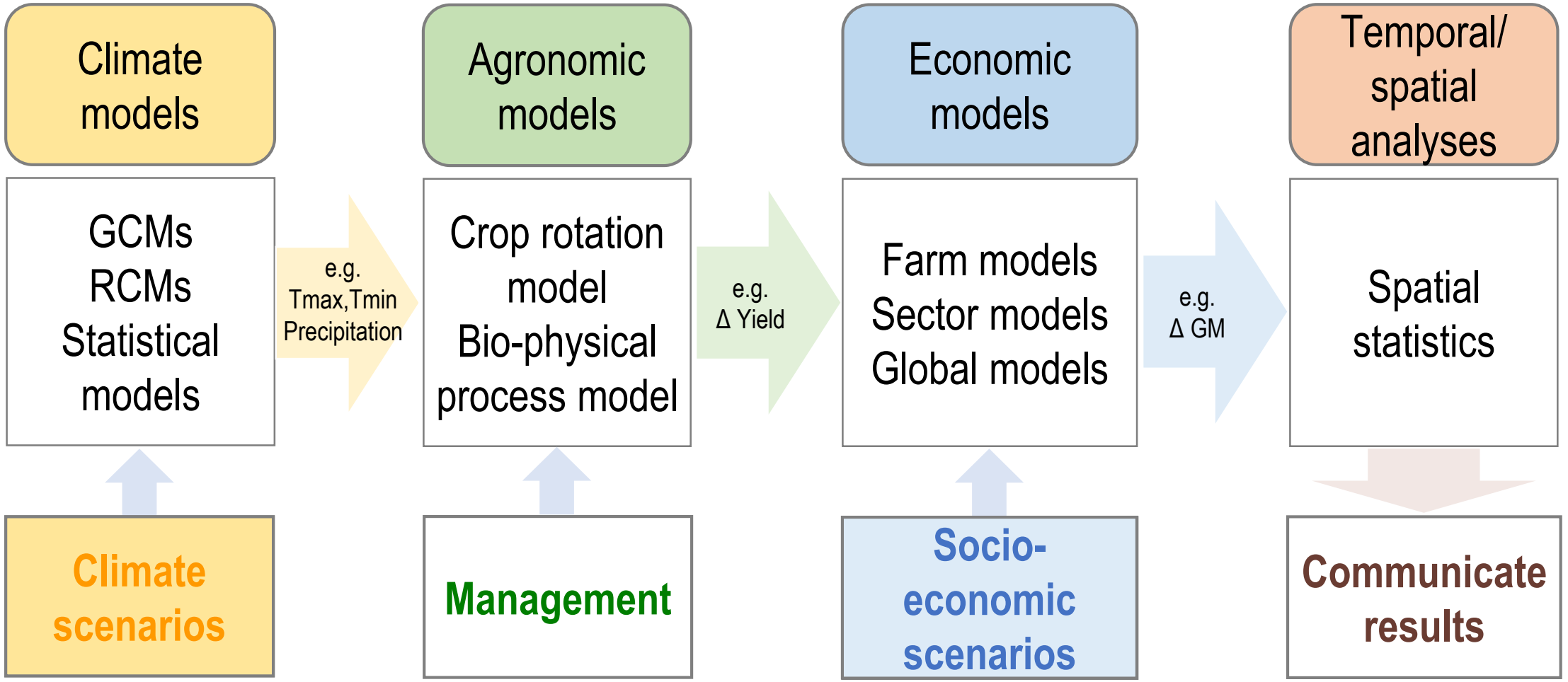
Session 3: Crop Protection and Studies on the Future of Agriculture at the European scale

Motivation


Grand challenges
Environmental change
Socio-economic change
Agriculture and food systems
Main actors
Input suppliers
Farmers, land users
Agro-food industry
Civil society, consumers
Public institutions and actors
Main actors need evidence and guidance to respond to grand challenges and take informed decisions.

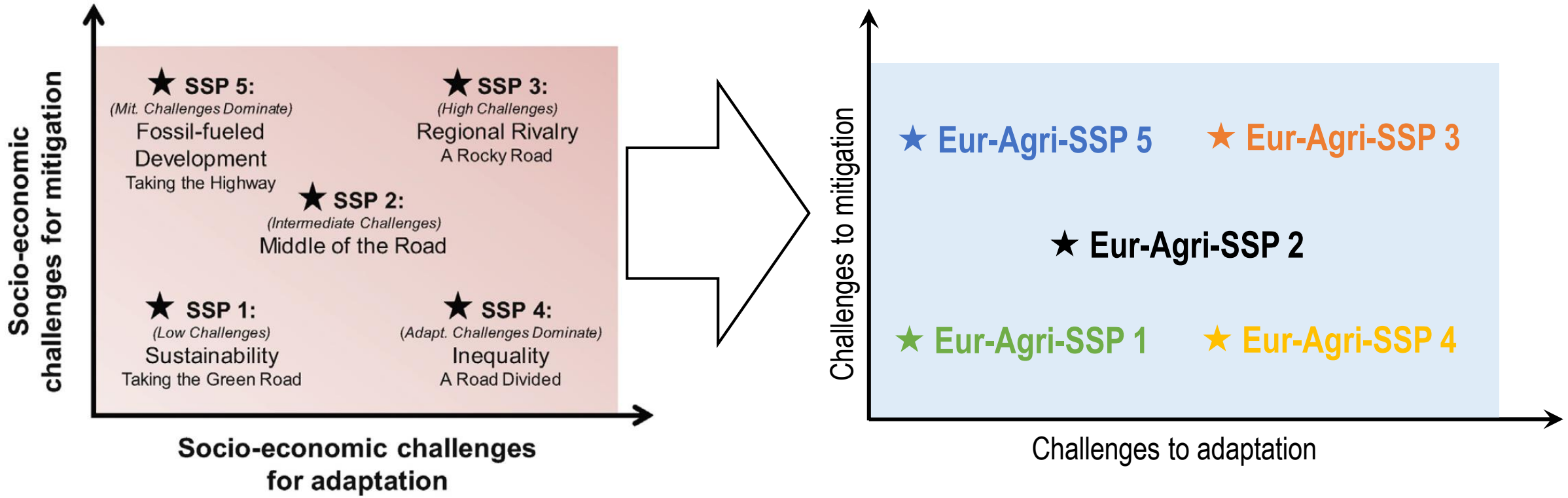
Integrated assessments of agriculture and food systems



Exp: Feusthuber et al. 2017. Agricultural Systems 157, 93–106. https://doi.org/10.1016/j.agsy.2017.07.011;
Karner et al. 2019, Journal of Environmental Management, https://doi.org/10.1016/j.jenvman.2019.109431;
Mitter and Schmid 2019. Agricultural Water Management 221, 430–448. https://doi.org/10.1016/j.agwat.2019.04.005;

Scenarios in climate change research

- Scenarios at **global** scale: **RCPs, SSPs**
- Advancement for **continental** and **sectoral** applications: **Eur-Agri-SSPs**



O'Neill et al. 2014, Climatic Change, doi: 10.1007/s10584-013-0905-2
O'Neill et al. 2017, Global Environmental Change, doi: 10.1016/j.gloenvcha.2015.01.004

Objectives

- Developing a protocol for extending and refining the SSPs
- Operationalizing the protocol for European agriculture and food systems

Journal of Environmental Management 252 (2019) 109701

Contents lists available at ScienceDirect

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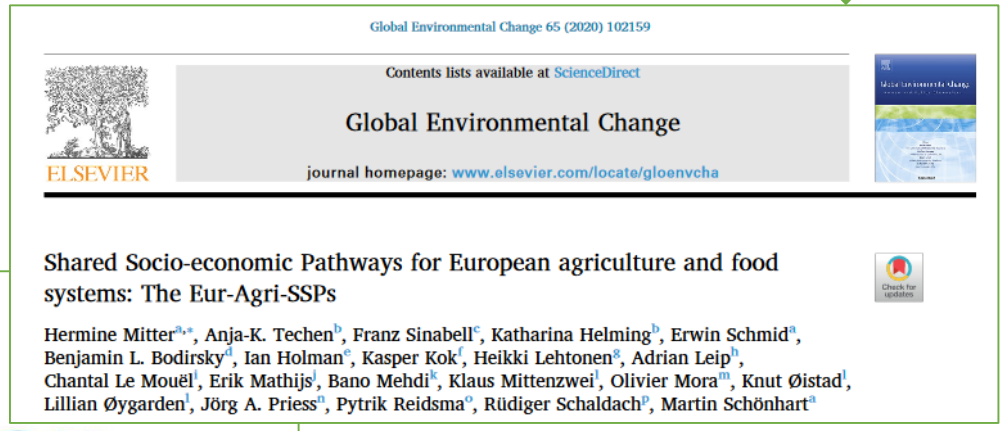
Research article

A protocol to develop Shared Socio-economic Pathways for European agriculture

Hermine Mitter[a,*], Anja-K. Techen[b], Franz Sinabell[c], Katharina Helming[b], Kasper Kok[d], Jörg A. Priess[e], Erwin Schmid[a], Benjamin L. Bodirsky[f], Ian Holman[g], Heikki Lehtonen[h], Adrian Leip[i], Chantal Le Mouël[j], Erik Mathijs[k], Bano Mehdi[l], Melania Michetti[m], Klaus Mittenzwei[n], Olivier Mora[o], Lillian Øygarden[n], Pytrik Reidsma[p], Rüdiger Schaldach[b], Martin Schönhart[a]

https://eur-agri-ssps.boku.ac.at/



Global Environmental Change 65 (2020) 102159

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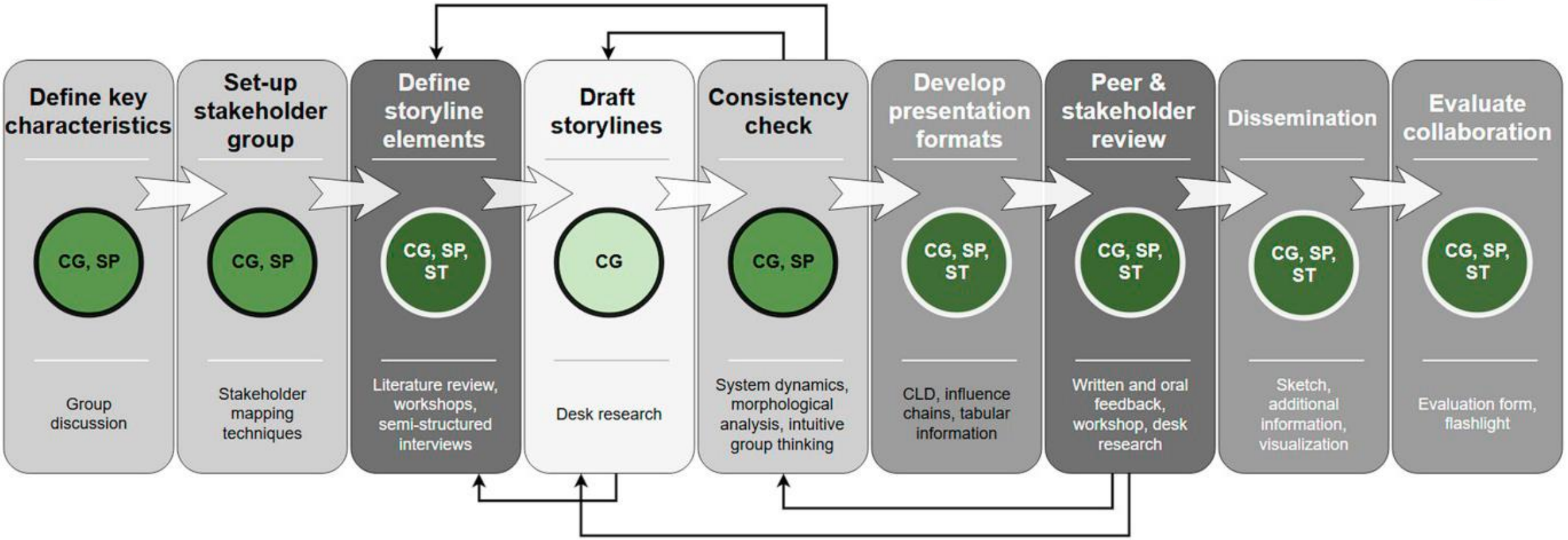
Shared Socio-economic Pathways for European agriculture and food systems: The Eur-Agri-SSPs

Hermine Mitter[a,*], Anja-K. Techen[b], Franz Sinabell[c], Katharina Helming[b], Erwin Schmid[a], Benjamin L. Bodirsky[d], Ian Holman[e], Kasper Kok[f], Heikki Lehtonen[g], Adrian Leip[h], Chantal Le Mouël[i], Erik Mathijs[j], Bano Mehdi[k], Klaus Mittenzwei[l], Olivier Mora[m], Knut Øistad[l], Lillian Øygarden[l], Jörg A. Priess[n], Pytrik Reidsma[o], Rüdiger Schaldach[p], Martin Schönhart[a]

Protocol for developing Eur-Agri-SSPs



The protocol consists of nine major working steps, as indicated by the rectangles and the broad arrows. The thin arrows indicate that the process design is **iterative** and that some working steps need to be repeated until final storylines are available. The team who develops the protocol and the Eur-Agri-SSPs consists of **three working groups:** CG Core group; SP Supporting group; ST Stakeholder group. The responsibilities differ by working steps and are presented in the circles. Color intensity in the circles (shade of green) indicates the involved working groups. The more working groups involved, the darker the color. Color intensity in the rectangles (shade of grey) indicates the suggested **level of stakeholder engagement** ranging from level 0 to level 3. The higher the suggested level of stakeholder engagement, the darker the color.

Mitter et al. 2019, Journal of Environmental Management, doi: 10.1016/j.jenvman.2019.109701

Purpose and focus of scenario development

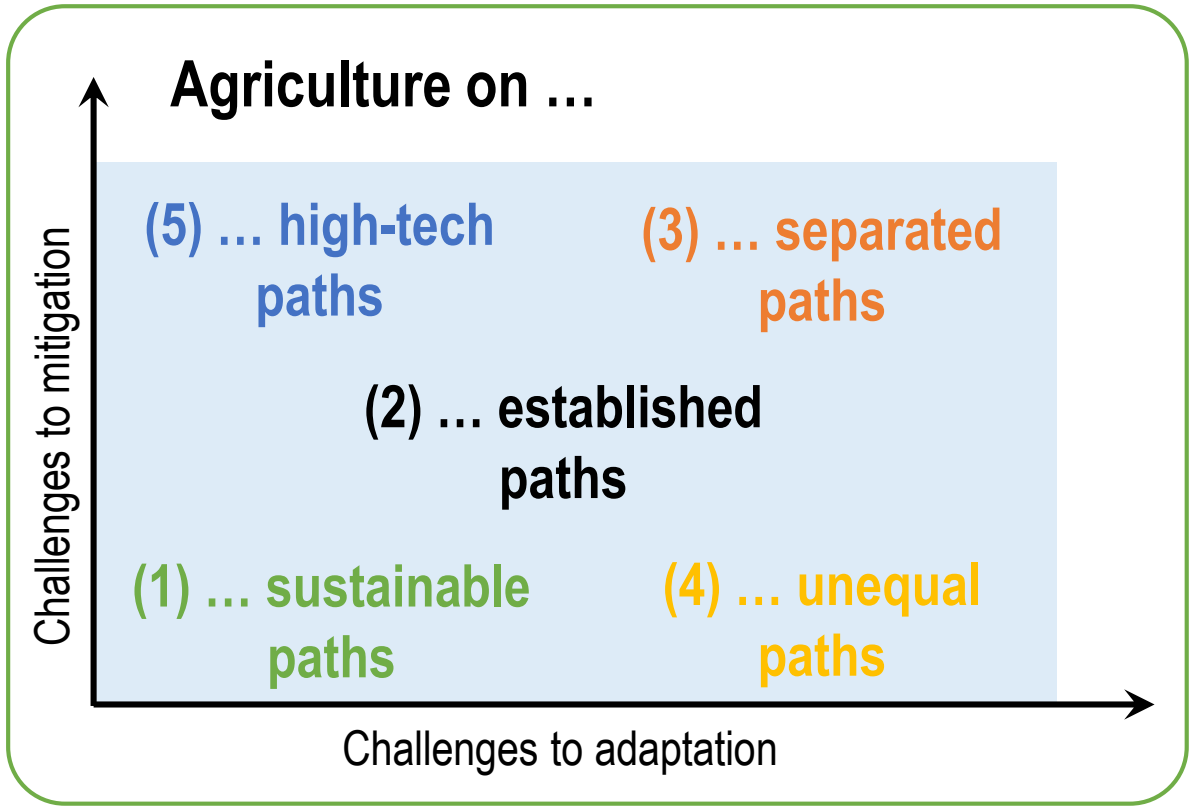
- Extending and enriching global SSPs
- Providing a basis for integrated assessments of agriculture and food systems
- Increasing consistency and comparability of research results
- Providing a basis for decision-making

- **Thematic:** alternative future developments of agriculture and food systems
- **Spatial scale:** Europe
- **Time scale:** 2050
- **Scenario type:** problem-focused, qualitative storylines, semi-quantitative specifications of plausible future developments

Participatory process

- 3 workshops with 55 participants in total
- 49 semi-structured interviews
- 60 organizations and institutions working at different scales, i.e. European and national
- Focus on identifying scenario elements and review

The Eur-Agri-SSPs

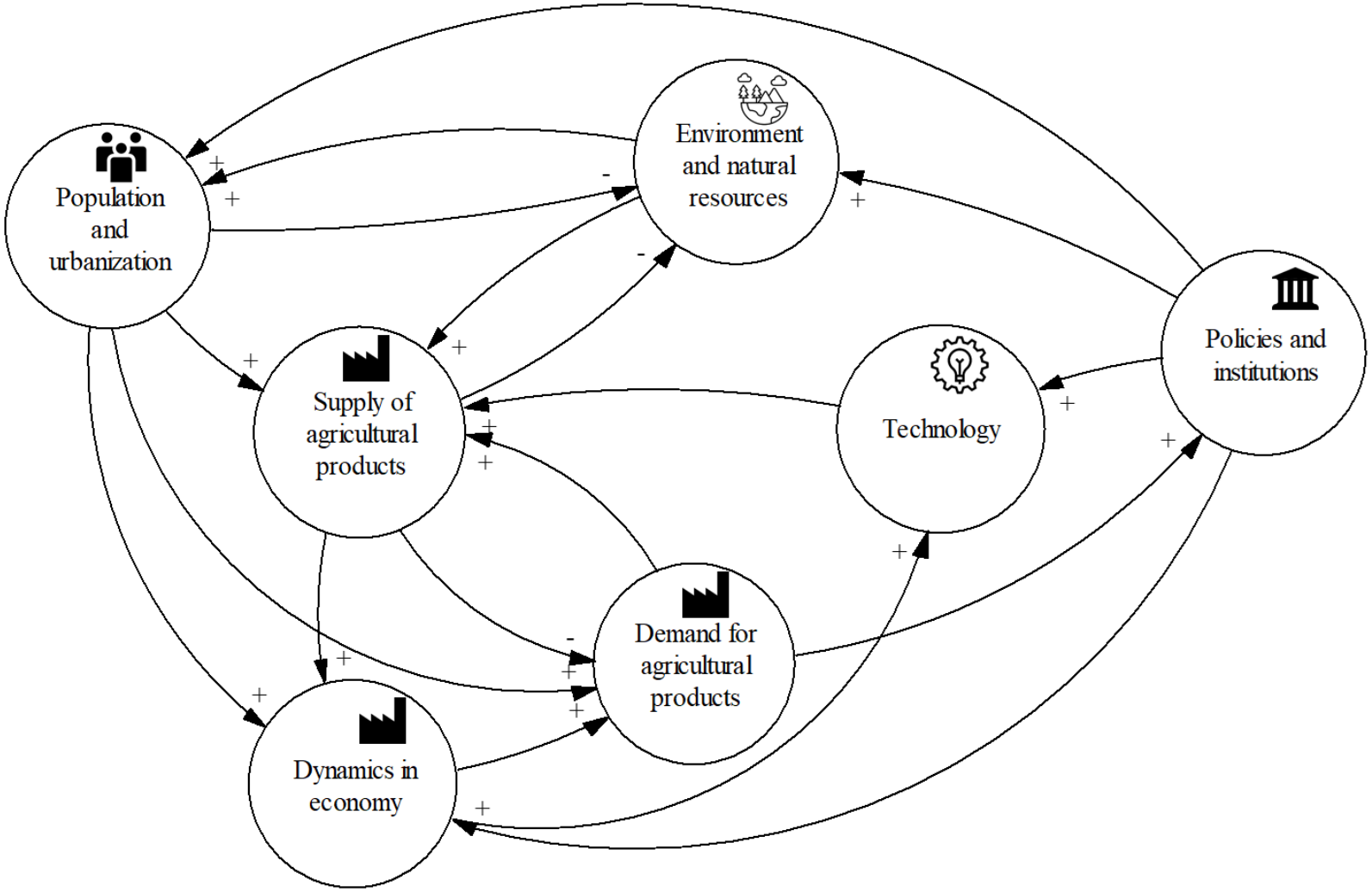


5 Topics

- Population and urbanization
- Economy
- Policies and institutions
- Technology
- Environment and natural resources

Mitter et al. 2020, Global Environmental Change, doi: 10.1016/j.gloenvcha.2020.102159;
Concept based on O'Neill et al. 2014, 2017

Relationships between Eur-Agri-SSP topics



Mitter et al. 2020, Global Environmental Change, doi: 10.1016/j.gloenvcha.2020.102159;
Concept based on Armendariz et al. 2015

‘Impression’ about the Eur-Agri-SSPs

Eur-Agri-SSP1: Agriculture on sustainable paths

- Strong network of small and medium sized towns and large cities

- Diversity in agricultural supply chains supported by globally connected markets with internalized costs of trade

- Multi-level co-operation, policy integration and societal participation

- Pronounced technology development directed towards environmentally friendly processes and cooperation between farmers and consumers

- Increasing environmental awareness, resource use efficiency, and environmental health

Civil society, consumers

Eur-Agri-SSP2: Agriculture on established paths

- Urban agglomerations continue to grow

- Few, powerful companies dominate agricultural supply chains and benefit from integrated markets

- European agricultural policies follow multiple goals that are not always achieved

- Agricultural technology development and diffusion focuses on resource use efficiency

- High competition for resources and structural change affect environmental performance

Agro-food industry

Eur-Agri-SSP3: Agriculture on separated path

- Decelerated urbanization
- National agricultural supply chains benefit from protectionism
- National agricultural policies aiming for national food and energy security
- Slow agricultural technology development and uptake because of reduced investments and skepticism
- High pressure on natural resources through high national demand for agricultural commodities and limited coordination and technological progress

National public authorities

Eur-Agri-SSP4: Agriculture on unequal paths

- Territorial fragmentation
- A business-oriented elite dominates agricultural supply chains
- A business-oriented elite dominates European institutions and sets the policy agenda
- Rapid technology development focusing on production and energy efficiency
- Environmental awareness limited to the neighborhood of the wealthy upper class

Business-oriented ‘elite’

Eur-Agri-SSP5: Agriculture on high-tech paths

- Metropolization

- High-tech large companies dominate globalized agricultural supply chains

- European institutions foster international trade but delay environmental action

- High affinity for output oriented technology

- Lack of global environmental awareness

Tech companies

Selected scenario elements and directions of change for the five Eur-Agri-SSPs

Topic	Eur-Agri-SSP element (selected)	Eur-Agri-SSP1	Eur-Agri-SSP2	Eur-Agri-SSP3	Eur-Agri-SSP4	Eur-Agri-SSP5
	**Population and urbanization**					
	Population size*	→	→	↘	→	↗
	Environmental awareness of citizens	↗	↗	↘	↘	↘
	**Economy**					
	Market concentration in the up- and downstream sector	↘	↗	↗	↗	↗
	Pace of structural change in agriculture	→	↗	→	↗	↗
	Meat demand per capita	↘	→	→	→	→
	Demand for regulation and cultural services from the agricultural sector	↗	↗	↘	↘	→
	Relative prices for agricultural inputs	↗	→	↗	↗	↘
	**Policies and institutions**					
	International trade agreements	↗	↗	↘	↗	↗
	Socio-environmental focus of agri-food policies	↗	↗	↘	→	↘
	Food standards	↗	↗	→	→	↗
	**Technology**					
	Speed of agricultural technology development	↗	→	↘	↗	↗
	**Environment and natural resources**					
	Resource use efficiency	↗	↗	↘	↗	→

Main actors and their scope for action with relevance to crop protection

Main actors	Scope for action
Input suppliers	New technologies (e.g. smart farming, plant breeding) New inputs (e.g. phyto-sanitary products)
Farmers, land users	*Land cover, land use, land management (e.g. efficiency, substitution, redesign)* *→ not defined in the Eur-Agri-SSPs*
Agro-food industry	Processing (e.g. standards, food loss, labels) Storage, transport
Civil society, consumers	Food demand (e.g. dietary preference, food waste) Demand for ecosystem services
Public institutions and actors	Policy targets, policy mix & coherence Policy instruments (e.g. direct regulation, market based instruments, information) Transparency (e.g. monitoring) & cooperation (e.g. across scales)

See also: Möhring et al. 2020, Nature Food, doi: 10.1038/s43016-020-00141-4; Pretty et al. 2018, Science, doi: 10.1126/science.aav0294

Methodological challenges

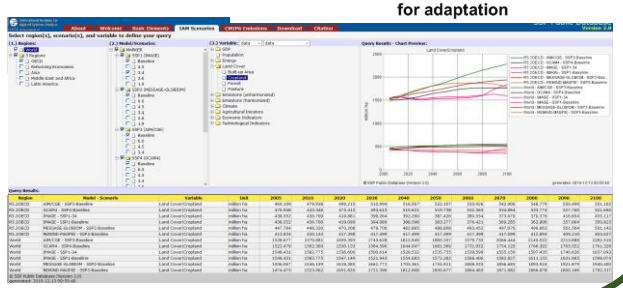
- Differentiating between ‘drivers’ and ‘impacts’
- Effectively engaging key stakeholders
- Linking global scenarios with continental and sectoral perspectives
- Maintaining and evaluating consistency
- Incorporating existing storylines and scenarios
- Encouraging out of the box thinking
- Preparing usable results

Conclusions

- The Eur-Agri-SSPs
  - form the basis for national, sub-national and sub-sectoral storylines.
  - can inform integrated assessments of agriculture and food systems.
  - help to improve comparability of integrated assessments.
- Integrated assessments allow to
  - identify efficient land use and land management practices under climate and policy scenarios (Mitter and Schmid 2019).
  - assess economic damage potentials occurring from pest pressure and identify efficient land management practices for pest regulation (Feusthuber et al. 2017).
  - identify cost-effective policies, e.g. to regulate pests (Falkner et al. 2020).
  - analyze trade-offs and co-benefits, e.g. between economic and environmental objectives (Karner et al. 2020).

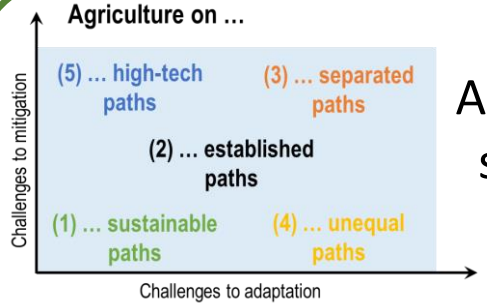
On-going activities (examples)

Quantification of storylines in models



IIASA

Application of scenarios in models



Quantification of model parameters

SURE Farm

Global
SSP 1-5

Eur

Nat

Reg

Global | Eur | National | Regional | Sub-sectoral

Development of national scenarios and application in models
e.g. Austria, Finland, UK

biodiversa

SALBES

Development of regional soil management scenarios

Mitter et al. 2019, Journal of Environmental Management, doi: 10.1016/j.jenvman.2019.109701
O'Neill et al. 2014, Climatic Change, doi: 10.1007/s10584-013-0905-2
O'Neill et al. 2017, Global Environmental Change, doi: 10.1016/j.gloenvcha.2015.01.004

The best way to predict the future is to create it.
(Abraham Lincoln)

Thank you very much!

Eur-Agri-SSP Team

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