

Ec change

Sustainable development & ecosystem goods and services

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**Stakeholder Meeting
Brussels, 09/11/2011**

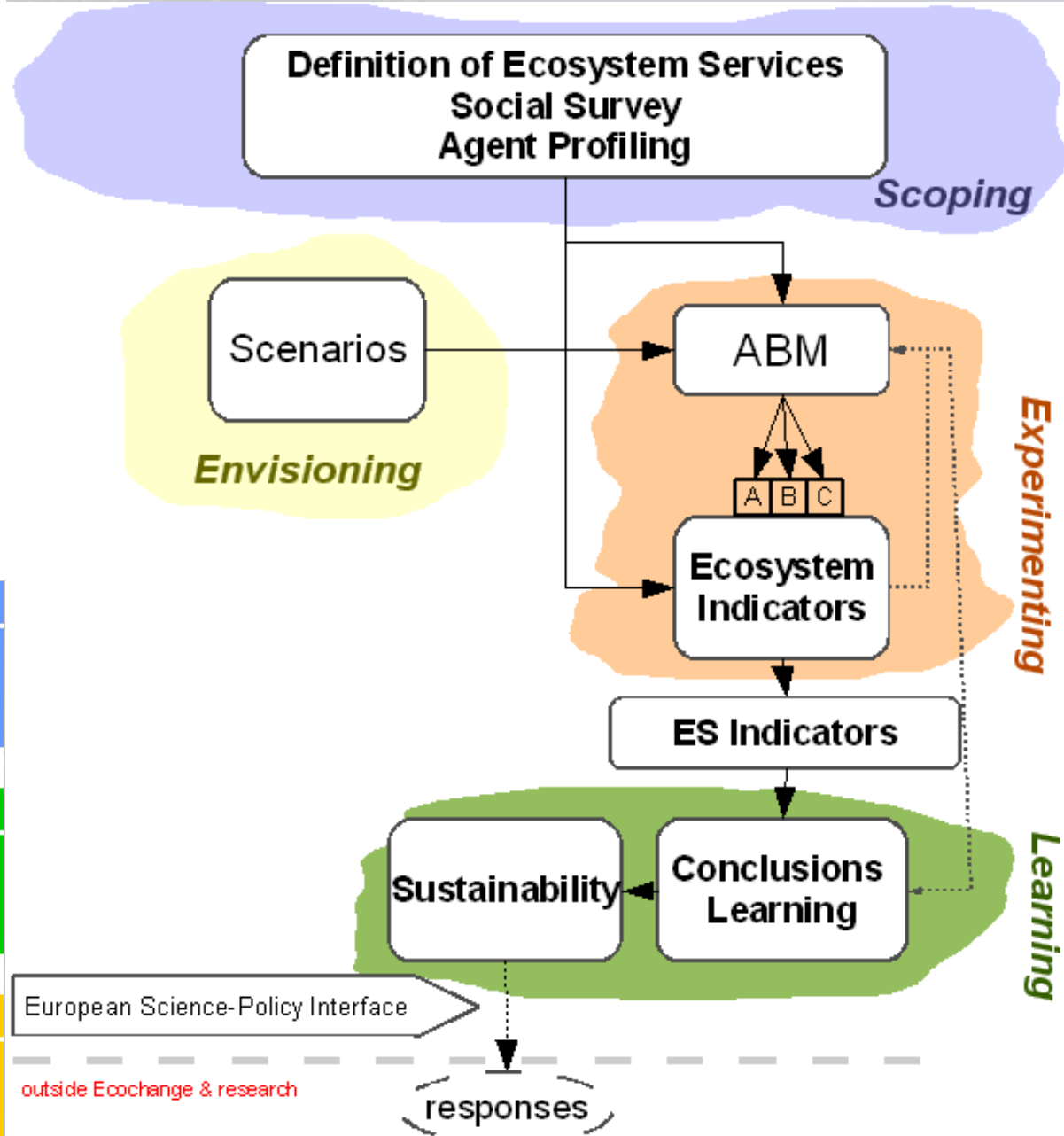
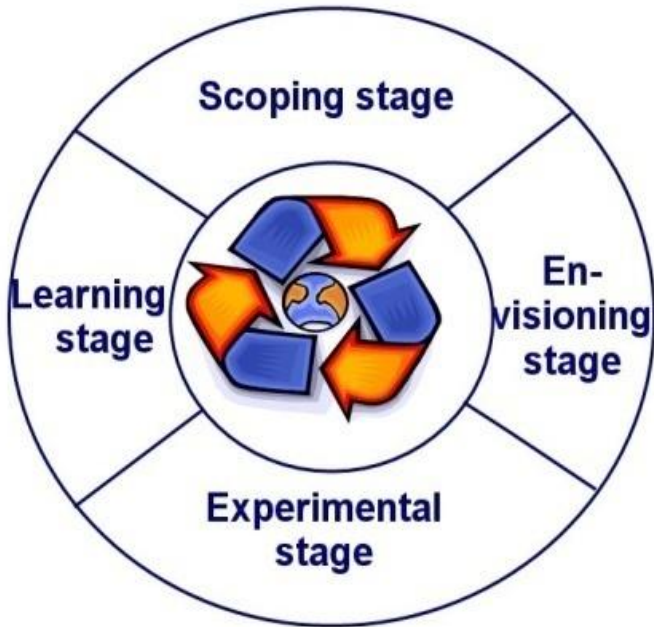
Main issues addressed by this theme

- How will rural landscapes (land use) change in response to environmental change drivers (climate, policy, economics, ...)?
- What are the attributes and preferences of land users (farmers) that underpin their land use decisions?
- How will land use change affect the provision of ecosystem services?
- What are the consequences of land use and ecosystem service change for local stakeholders?

Research methods

- Integrated Sustainability Assessment (ISA) with local stakeholders
- Case study based
- Social survey (of land use decision makers)
- Agent-Based Modelling (ABM) of land use change and ecosystem service provision
- Scenario analysis and model experiments to explore future environmental change

ISA principles



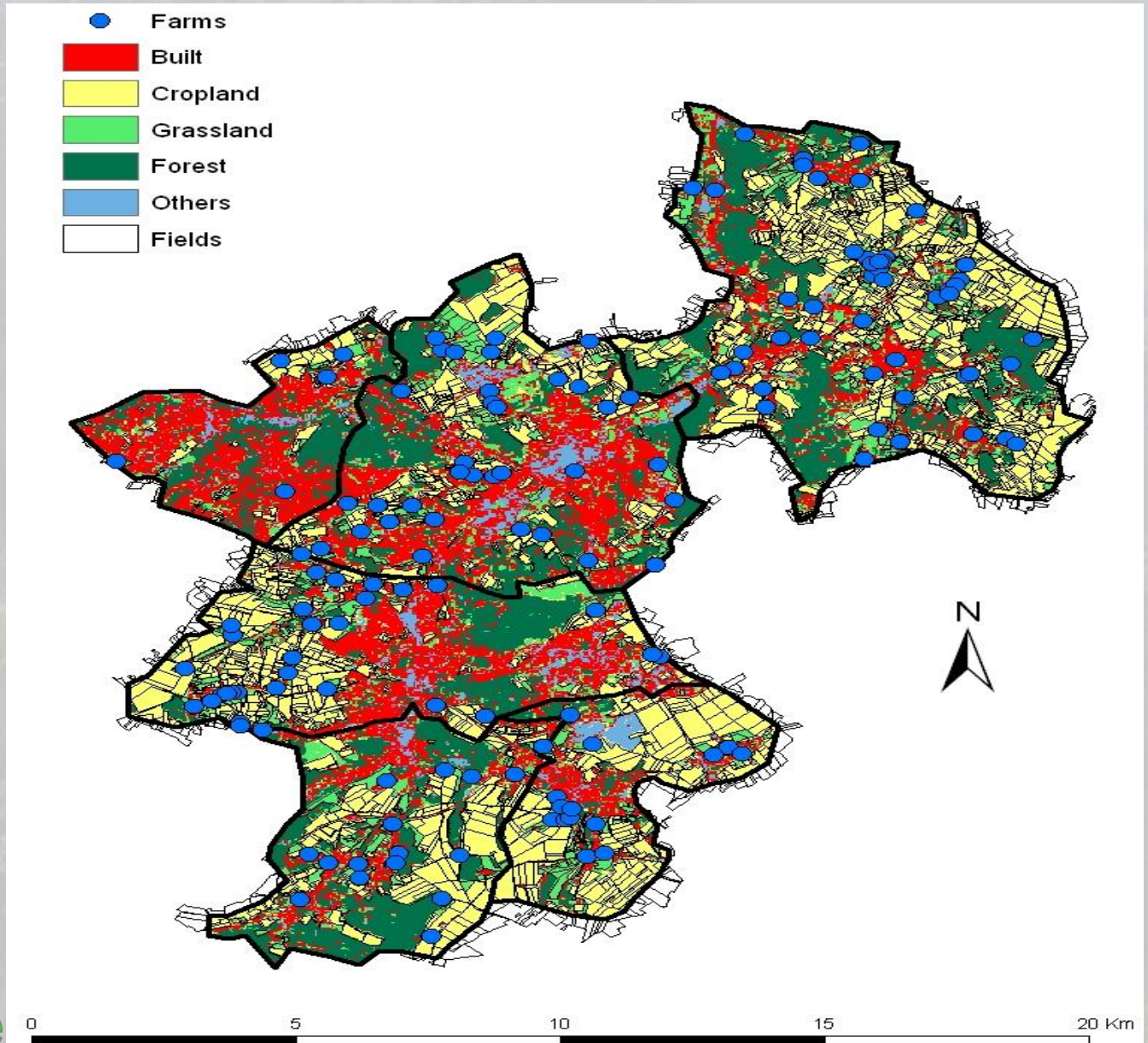
Supporting	Regulating
	<ul style="list-style-type: none"> • Climate Regulation • Water & Air Purification • Disease Regulation • Flood Regulation
	Provisioning
	<ul style="list-style-type: none"> • Food • Water • Wood & Fibre • Fuel
<ul style="list-style-type: none"> • Primary Production • Soil Formation • Nutrient Cycling 	Cultural
	<ul style="list-style-type: none"> • Education • Aesthetic • Spiritual • Recreation

Case studies

- Belgium (Brabant-Wallon), Switzerland (Aargau), Romania (Poieni/Sacuieu) and Scotland (Lunan catchment)
- The level of land use decision makers through social survey and work with local stakeholders
- Stakeholder process - discussion of ecosystem services and indicators, scenario development and learning through research outcomes (ongoing)
- Synthesis/comparison of results across the case studies (ongoing)



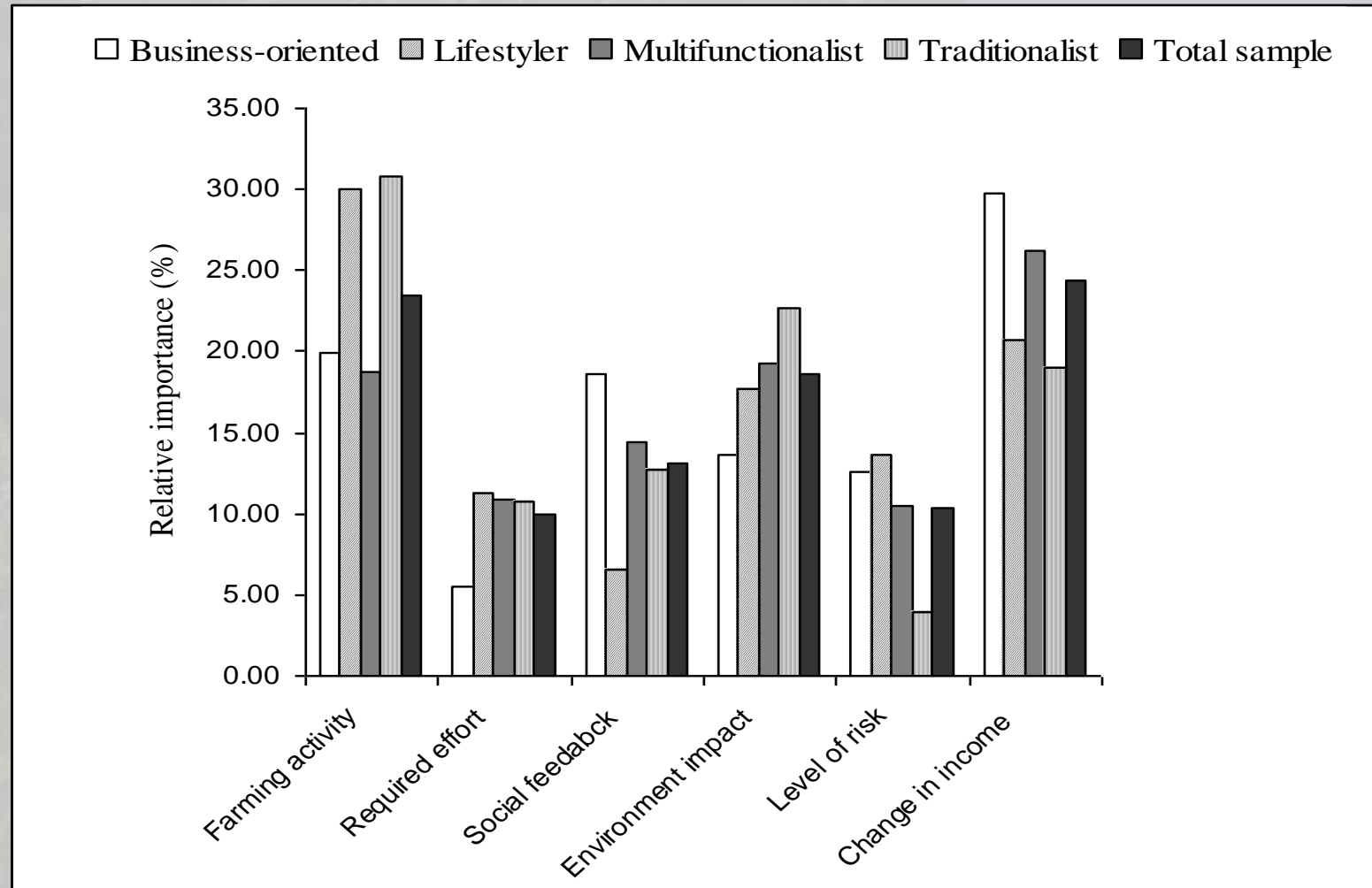
Example case study data - Belgium



Social survey

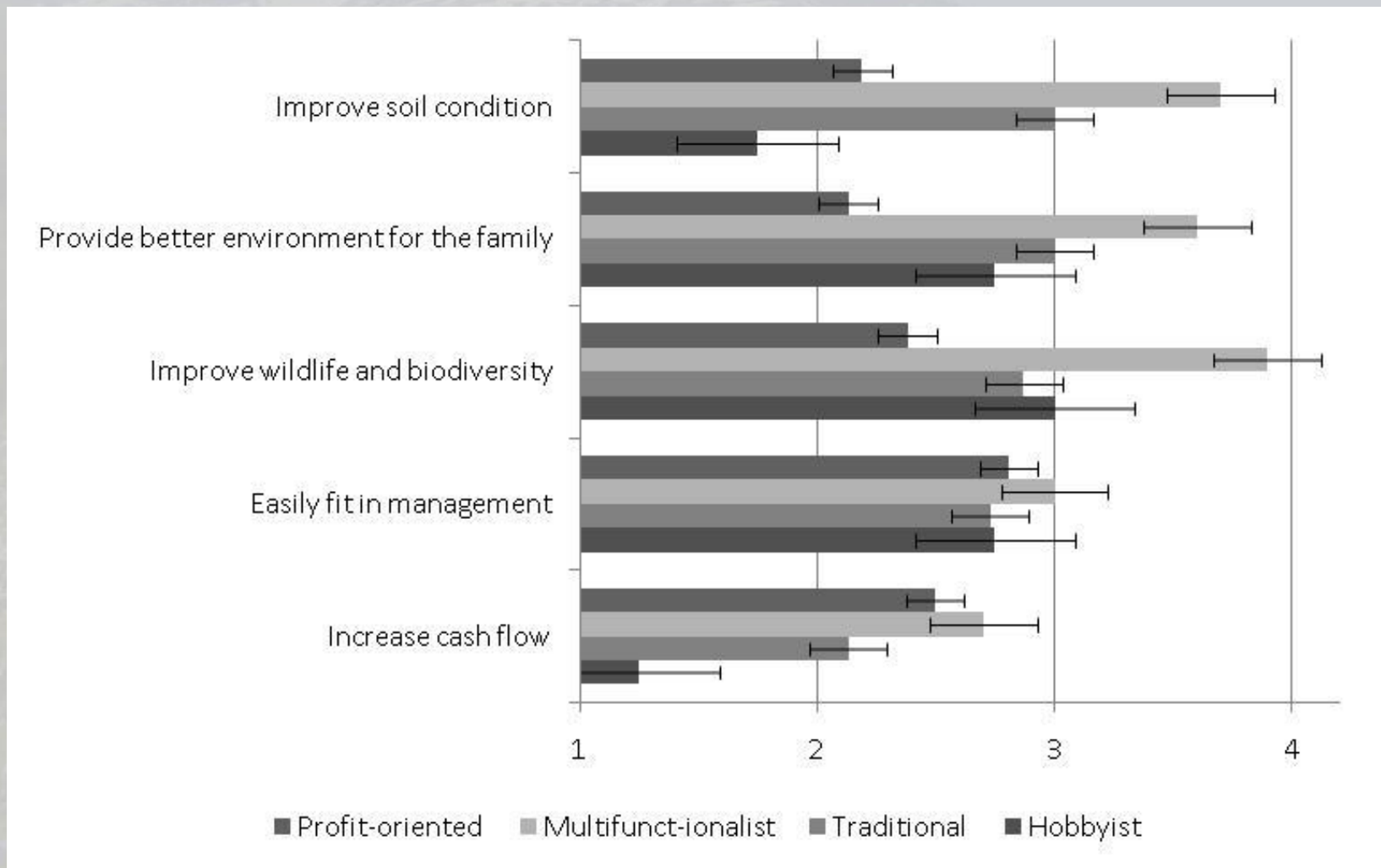
- Identify farmer agent typologies
- Establish choice preferences that underpin land use decisions
- Explore agent responses to policy change
- Empirical inputs to land use model development

Agent types and preferences



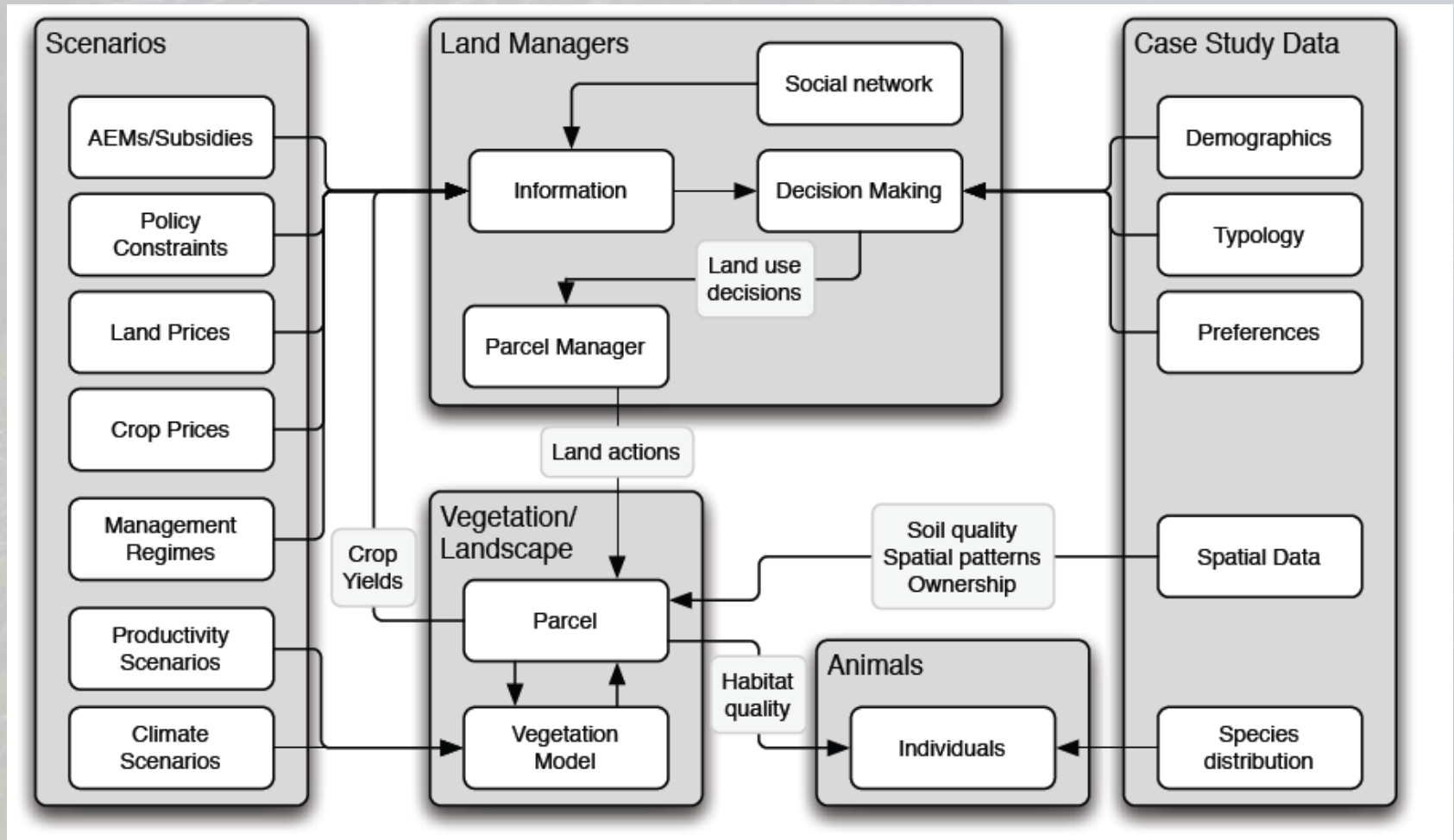
Relative importance of attributes included in the cluster analysis for the Aargau, Switzerland

Response to environmental policy



Mean responses for Motivations to agri-environmental scheme participation with standard deviations (1: no influence, 2: slight influence, 3: some influence, 4: big influence) – Lunan catchment, Scotland

The modelling framework Agent-Based Modelling (ABM)



After: Murray-Rust, D., Dendoncker, N., Dawson, T., Acosta-Michlik, L., Karali, E., Guillem, E. and Rounsevell, M.D.A. (2011). Conceptualising the analysis of socio-ecological systems through ecosystem services and agent based modelling. *Journal of Land Use Science*, 6, 83-99

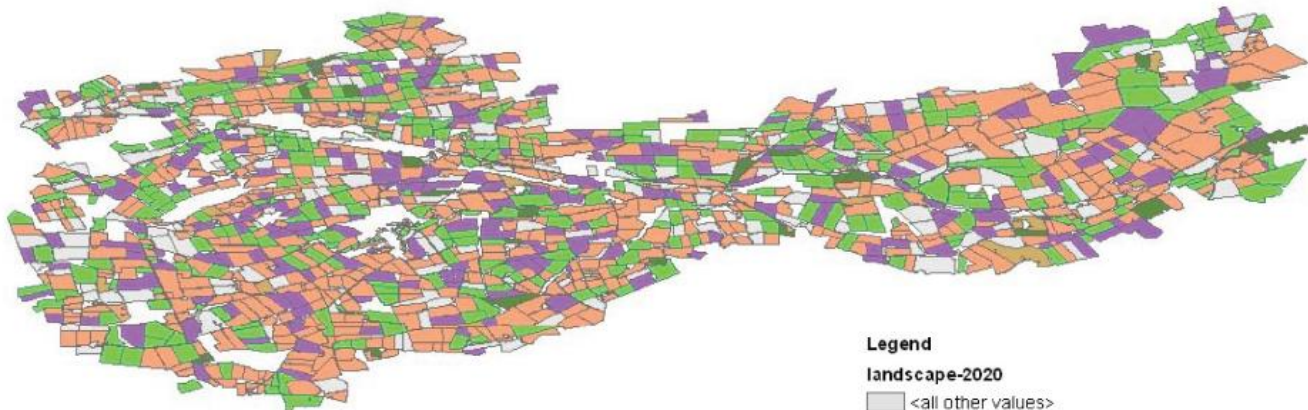
Example ABM simulation for Scotland

2020



GRAS Scenario

2050



Legend

landscape-2020

□ <all other values>

mainManage

■ Barley Spring Intensive; Wheat Spring Intensive

■ Barley Winter Intensive; Wheat Winter Intensive

■ Miscanthus; Miscanthus establishment

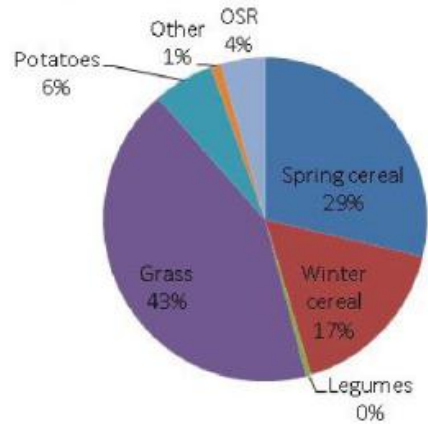
■ Oilseed Rape Winter Intensive

■ Peas Food

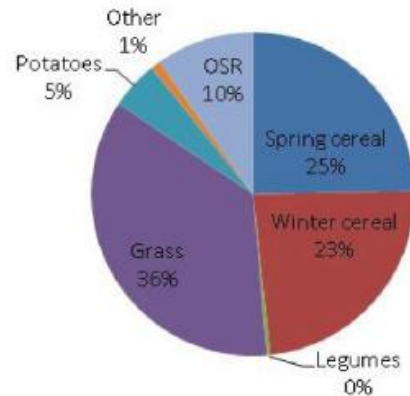
Results borrowed from Eleonore E. Guillem,
Ph.D. Student @ University of Edinburgh (3 slides)

... The role of farmer type in scenarios

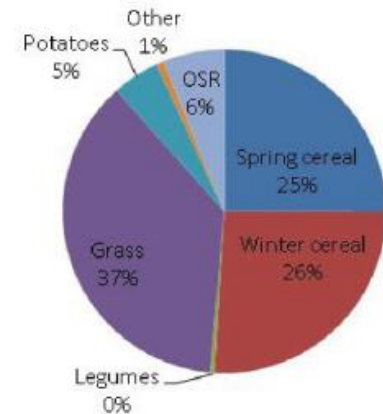
BAMBU-Multifunctionalist-2001



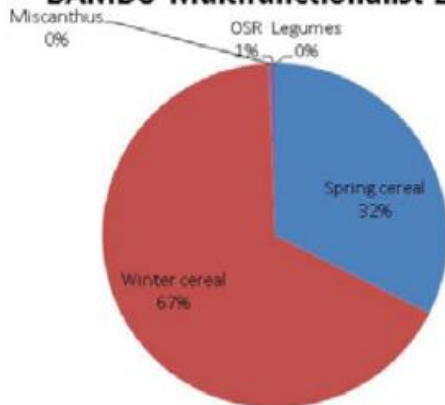
BAMBU-profit-oriented-2001



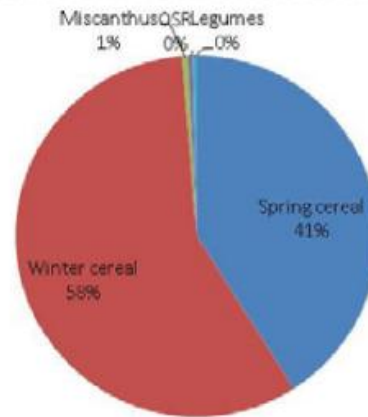
BAMBU-traditional-2001



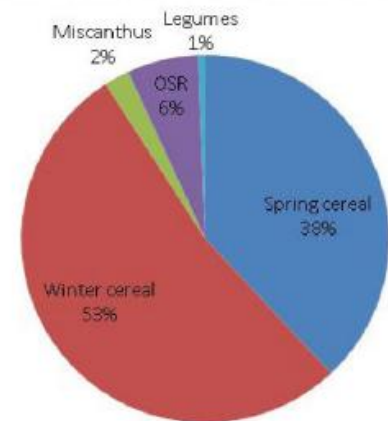
BAMBU-Multifunctionalist-2020



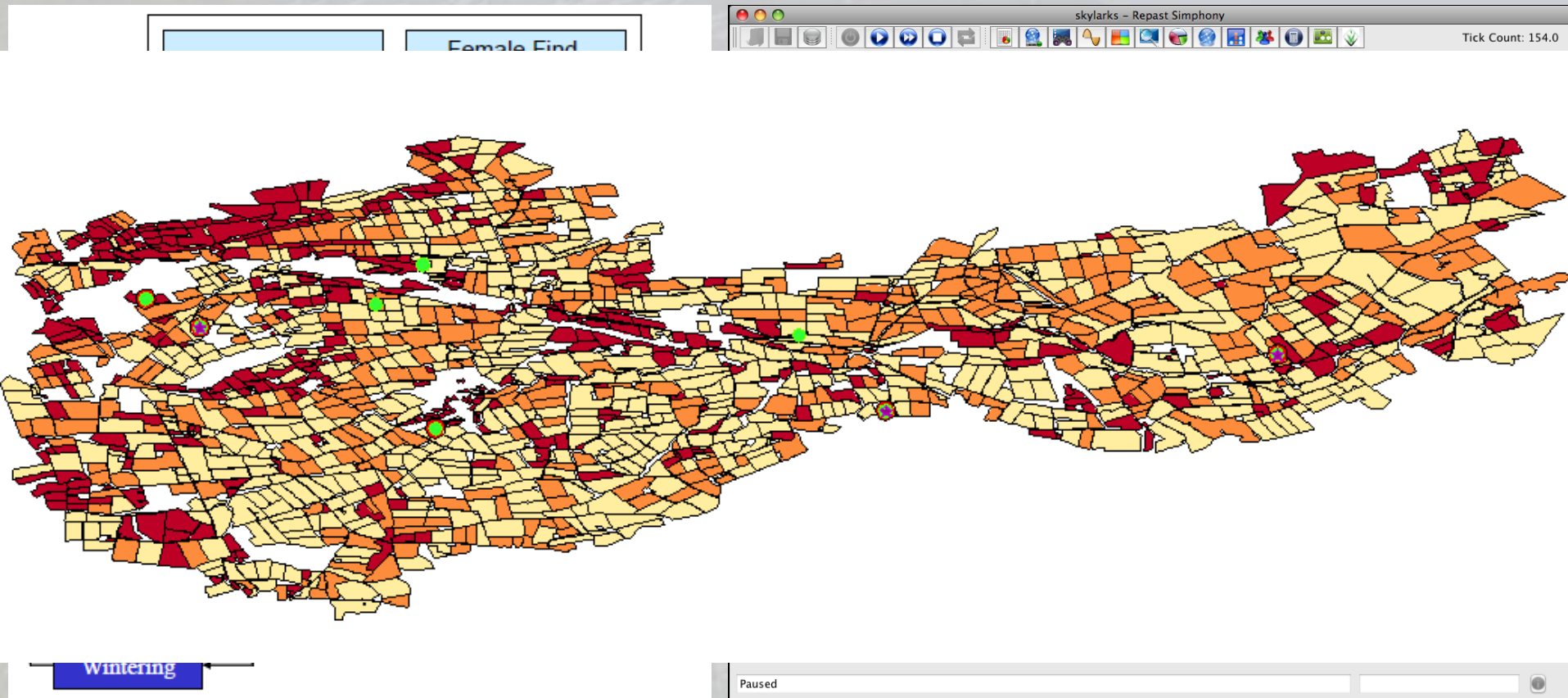
BAMBU-Profit-oriented-2020



BAMBU-Traditionalist-2020



Species modelling – Skylarks in Scotland



Links to policy

- Highlights the importance of understanding farmer behaviour in designing agri-environment policy
- Different farmer profiles and scenarios lead to different future land use and ES outcomes
- Farmer profiles may change in the future (and implications for CAP design)
- The social impact (acceptability) of different farm management strategies
- Expected outputs in terms of policy responses from on-going stakeholder process

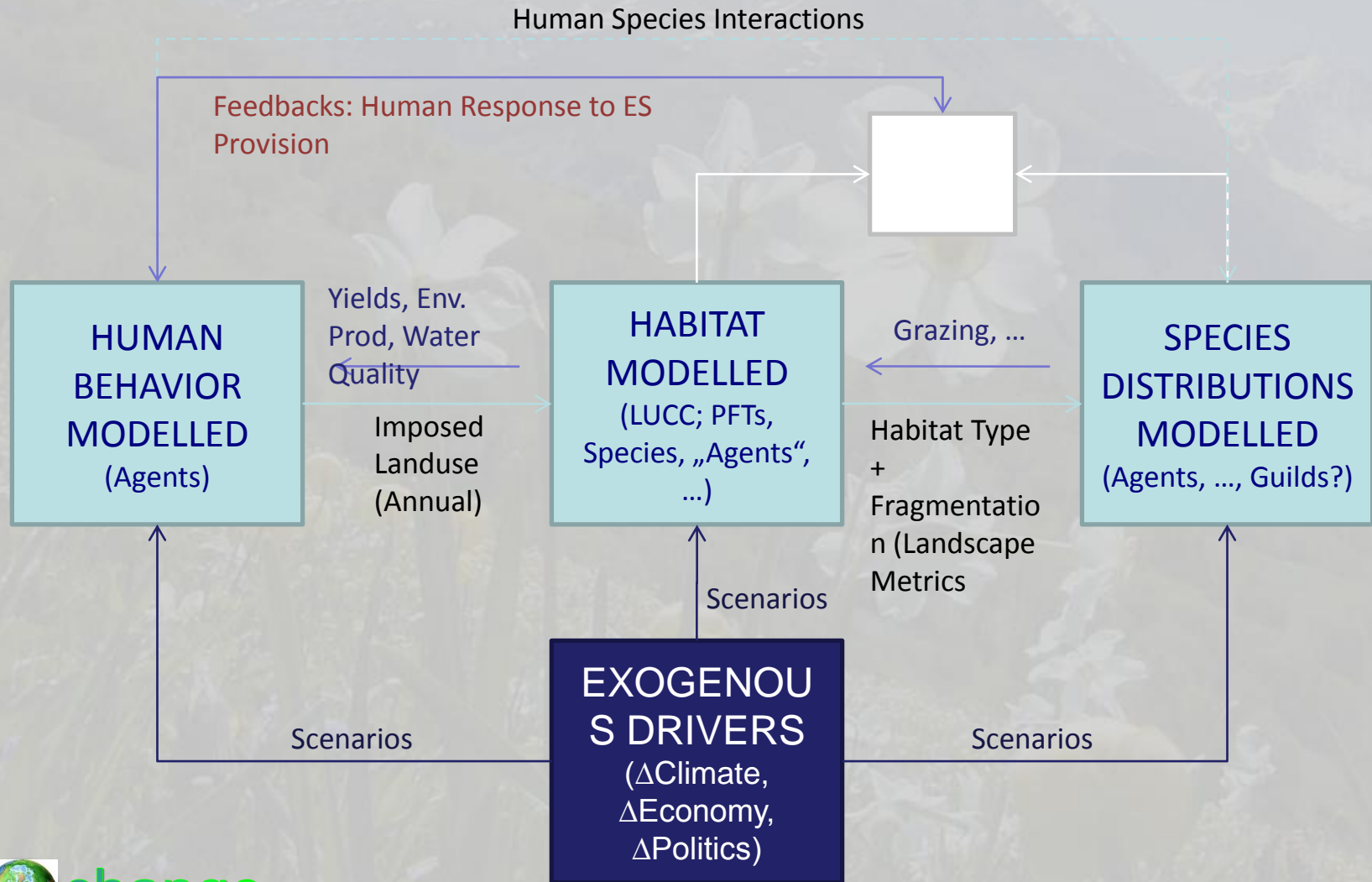
Some research publication outputs

- Rounsevell, M.D.A., Dawson, T.P. and Harrison, P.A. (2010). A conceptual framework to assess the effects of environmental change on ecosystem services. *Biodiversity and Conservation*, **19(10)**, 2823-2842
- Murray-Rust, D., Dendoncker, N., Dawson, T., Acosta-Michlik, L., Karali, E., Guillem, E. & Rounsevell, M.D.A. (2011). Conceptualising the analysis of socio-ecological systems through ecosystem services and agent based modelling. *Journal of Land Use Science*, **6**, 83-99
- Bohunovsky, L., I. Omann and J. Jäger (2011). Participatory scenario development for integrated sustainability assessment. *Regional Environmental Change* **11**, 271-284
- Rounsevell, M.D.A., Robinson, D. & Murray-Rust, D. (in press). From actors to agents in socio-ecological systems models. *Philosophical Transactions of the Royal Society B*, **00**, 000-000
- Karali, E., Brunner, B., Doherty, R., Hersperger, A.M. & Rounsevell, M.D.A. (in review). Identifying the factors that influence farmer participation in environmental management practices in Switzerland. *Land Use Policy*
- Karali, E., Brunner, B., Doherty, R., Hersperger, A.M. & Rounsevell, M.D.A. (in review). Assessing farmer preferences that influence land use decisions in a study area in Switzerland.
- Karali, E., Brunner, B., Doherty, R., Hersperger, A.M. & Rounsevell, M.D.A. (in review). Decoding the heterogeneity of farmer behaviour. Evidence from a case study in Switzerland. *Sociologia Ruralis*
- Guillem, E.E., Barnes, A., Rounsevell, M.D.A. & Renwick, A. (in review). Refining perception-based typologies with the analysis of past land use. *Journal of Rural Studies*

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**Thank you for your
attention**

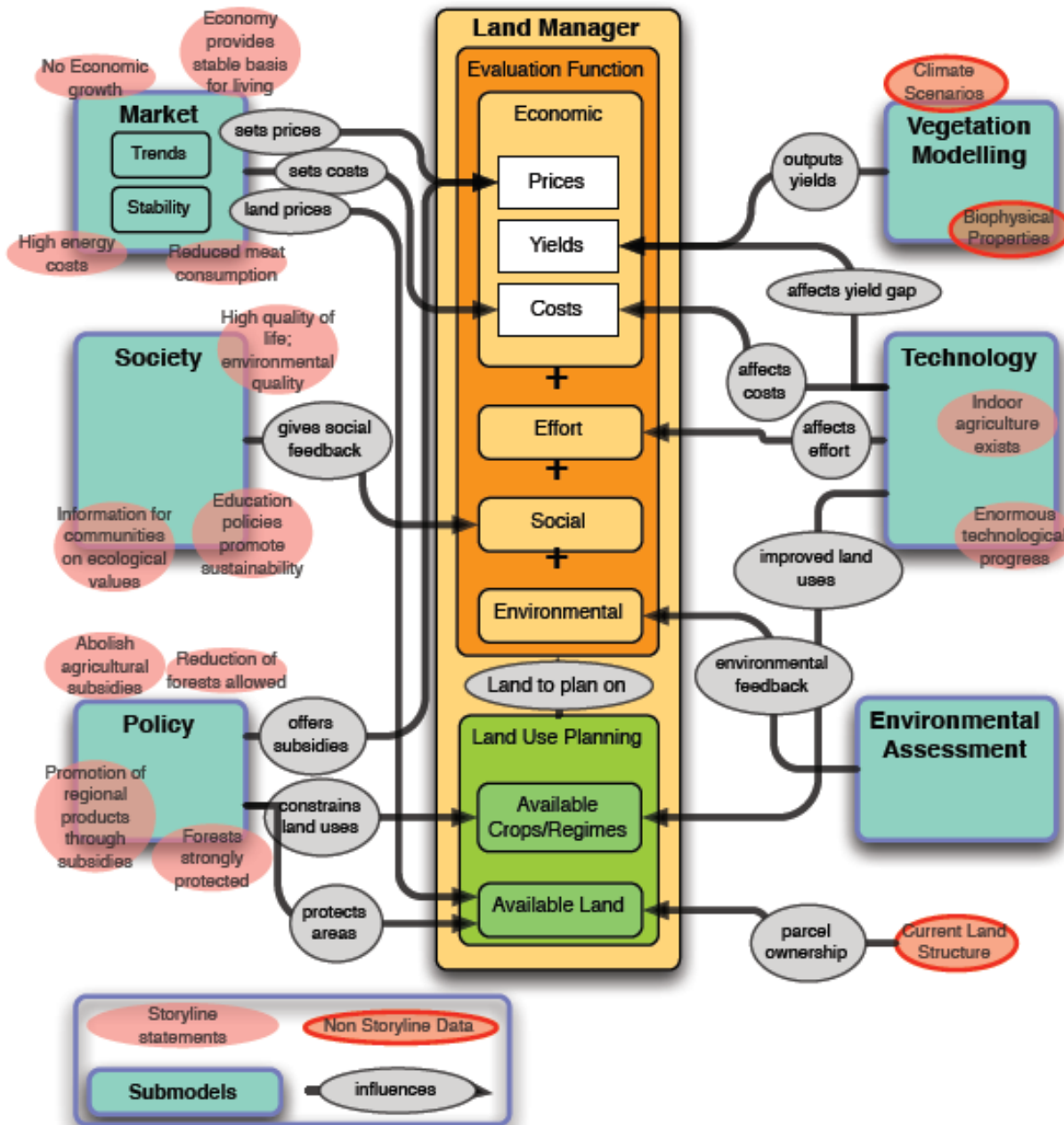
Conceptual model framework



Embedding human choices in scenarios

Dealing with exogenous drivers and endogenous pressures

Market and physical changes (e.g. climate) versus behavioural and attitudinal change



After: Murray-Rust, D., Dendoncker, N., Dawson, T., Acosta-Michlik, L., Karali, E., Guillem, E. and Rounsevell, M.D.A. (2011). Conceptualising the analysis of socio-ecological systems through ecosystem services and agent based modelling. *Journal of Land Use Science*, 6, 83-99

Figure 3. Scenario assumptions and their influences, through submodel behaviour, on Land Manager decision making.