

SUPREMA Policy Brief 1

The SUPREMA Roadmap - Exploring the future directions for agricultural modelling in the EU

Conclusions

An assessment has been made of recent policy documents, inputs from stakeholder workshops and expert opinions. Specific attention has been paid to the current and upcoming agricultural policy framework, and the notion of 'food system approach' as an overarching framework. Priorities shift from a traditional and successfully pursued productivity-paradigm to a sustainability-paradigm. Environmental and climate issues are becoming increasingly important and are expected subjects of future policy interventions. Social issues and farm income remain important, while the Covid-19 pandemic underscored the vital role of agriculture and related value chains to ensure adequate food provision. With respect to primary production modelling, a number of challenges have been identified that will require 'solutions' to better serve policy makers in their future policy design:

- Improved representation of production activities and sectors in particular with respect to fruits and vegetables and Mediterranean products;
- Refined representation of input use and cost where such costs can be attributed to proper production activities and disaggregated to levels needed to address current and future policy priorities with respect to farm input use (e.g. pesticides, fertilizers, antibiotics).
- The modelling of adoption of voluntary policy measures (e.g. eco-schemes, AEC-measures), farm management practices and technological innovations. This requires giving more attention to farmer individual decision making.
- Specific elements within the CAP that affect the sustainability of farming practices (e.g. eco-schemes) also have implications for land use modelling. Models that properly represent land use including forestry are increasingly important for assessments of the bio-economy.
- Environmental aspects are becoming increasingly important. A focus is currently already on enhancing biodiversity. However, biodiversity impacts are only to a rather limited extent included and often only indirect aspects are modelled, such as changes in land use or emissions, seen as proxies for losses in biodiversity. Direct impacts on e.g. number of red list species or on the population of key species, etc., are not captured.
- Within the EU Green Deal climate neutrality by 2050 is a key objective requiring a better representation of adaptation and mitigation measures, thus, to an adequate quantification of GHG emissions. Measures need appropriate modelling of their adoption and diffusion. CAPRI's experiences in the EcAMPA projects could provide a set of good practices.
- Supply chains are important parts of the food system and play a leading role in delivering inputs to and procuring products from farmers to serve consumers and other end-users. Their impact covers standards (e.g. food safety, animal welfare), contractual arrangements, to price formation and price transmission. The assessment in SUPREMA indicated a need for a better understanding. Models considered in SUPREMA have in general a very

poor representation of supply chains because they do not reflect individual firms, nor do they represent industry structure. Both may be important for the evolution of the farmer-retail price spread. Competition is an issue and often related questions of market power impacts arise. More efforts need to be invested in modelling supply chains, for example to develop special supply chain models for key supply chains (e.g. using EDM-modelling). A drawback is that supply chain analysis requires the availability of proper data. Here is a big limitation for research since such data are not generally and publically available. Moreover, competitive interests of supply chain players hinder compilation of reliable data.

- A number of key issues with respect to trade modelling need further considerations, including role of standards, other non-tariff measures (NTMs), and value added with a special focus on global value chains. Model refinements and validations require a better understanding and quantification of NTMs' impacts possibly gained by applying specific case studies. In SUPREMA models the global value chains are largely absent and even at a theoretical level there are issues how to incorporate global value chain. The current state of the art seems to combine separate value chain models with the large scale sector models.
- The Farm to Fork strategy pursues a farm and food policy, linking the consumer side to its food provision. Public health and environment could benefit from reduced consumption and associated production, e.g. meat. More plant-based diets are a multi-dimensional phenomenon embracing the public sector, all actors involved in the supply chain and consumers. Benefits will be reduced medical expenses but also lower emissions and acidification as well as a potential increase in income of arable farmers, all in need of further investigation. Therefore the consumer side in models requires a more refined treatment. For example, populations' age structure is not used to explain demand and changes in its patterns. Another important policy issue is reducing food waste to mitigate negative environmental consequences of food production. In achieving these objectives modellers often face huge challenges when looking for sufficient and robust data as input for such an assessment.

With respect to agricultural economic modelling in general, we concluded that the need for integrated model use is increasing, with the proposed food systems approach underlining this. Integrated model usage requires a clear strategy and a better recognition of ways to link models. Here within limits, the baseline harmonization between key models for policy assessments is important, for policy makers and for modellers alike. On the one hand harmonization contributes to the comparability of modelling results; while on the other limits in harmonization provide insights into differences between models and their boundaries, and the different approaches enable to understand economic phenomena.

Model maintenance is considered crucial to ensure a good model performance, but it is time demanding and costly, an activity difficult to be funded. Aside from the regular improvements made to fulfil client demands, care has to be taken that investments are made to address 'larger maintenance' issues (e.g. re-estimating parameters, adding/extending specific modules).

Model cross-validation is important to assess the credibility of results whereas different ways are possible (e.g. market expert assessments, statistical tests, client feedback, academic and professional review processes). It is an important input for 'learning' and a stimulus for model improvements. For calibrated models it is important that the base year, to which the model is calibrated, becomes not too 'distant' from the current reality.

With respect to their governance, the models considered have each their own approach, which reflect their origin, history and current institutional embeddedness. In particular, when many researchers at different institutions and countries are working with the same model a clear direction is needed, which usually is provided by a 'leading' institute, e.g. MAGNET, a concise core team, e.g. AGMEMOD, or the 'owning' institute, e.g. GLOBIOM, IFM-CAP. Data are the core of models and their proper management is a crucial but maybe sometimes a bit neglected element in modelling activities. The modelling platform initiative of the EU (iMAP) has been important as a stimulus to improve the data management, including issues like data storage (together with metadata), and also to the interoperability and re-use of data. The FAIR (findable, accessible, interoperable and re-usable) data principles provide a good guideline for data management and could be used as a basis for model-specific data management plans.

Moreover, a SUPREMA governance structure is needed beyond the level of individual models to enable enhanced and broader assessments of the increasing complexity of questions addressed and the requested coverage of all sustainability dimensions and SDGs. Analyses of these issues require a deeper going level of cooperation and integration. SUPREMA needs to meet the challenge to secure long-term impact beyond the limited duration of this project in a flexible manner. Together with stakeholders a plan for the coming 5 years will be developed, including open access release of model runs, some model improvements and networking.

In short, SUPREMA has allowed the different modelling teams involved to conclude that there is an urgent need for an integrated model use in view of the complexity of the assessments that are required for the current and upcoming CAP discussions. Another important lesson from this project is the necessity for additional efforts to harmonise and improve the realism of the baselines that are used as starting point of the policy assessments conducted by the different models. Linked to the previous items, SUPREMA has also highlighted the importance of having solid basis underlying the modelling tools. This goes beyond data and estimation issues and includes the need of having a good understanding of the theoretical bases of the models that work together, e.g. CAPRI and AGMEMOD-MITERRA. As a result, then, different modelling teams can deliver robust analyses and proper justification of the differences in model outcomes.

Reference

Jongeneel, R., Gonzalez-Martinez, A., Lesschen, J.P., van Meijl, H., Heckeley, T., Salamon, P., (2020) Deliverable 1.10 The SUPREMA Roadmap exploring future directions for agricultural modelling in the EU. Project Support for Policy Relevant Modelling of Agriculture (SUPREMA). Online: <https://www.suprema-project.eu>.