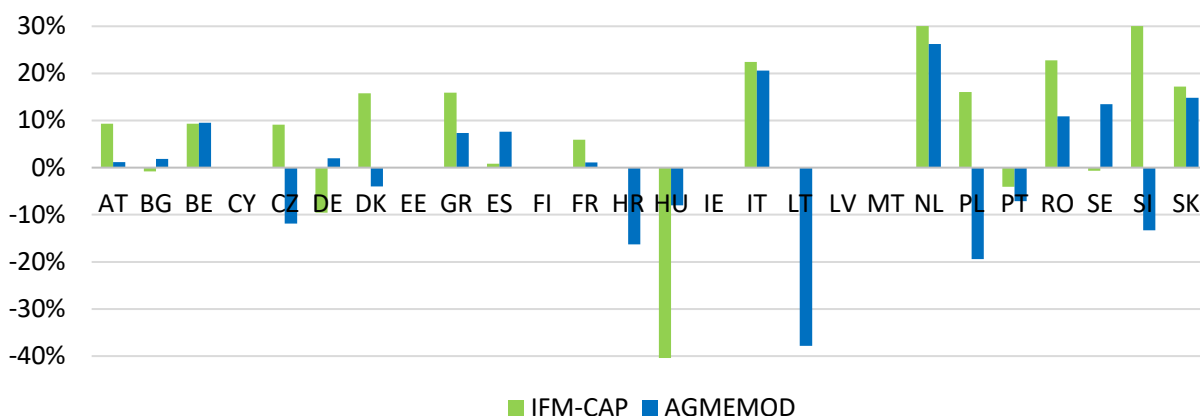

Inter-model baseline harmonization and comparison

Future impacts of public policies such as agricultural, trade and climate on land use, agricultural markets and environmental indicators are frequently analysed with economic simulation models. These models use different quantitative methods, data sets and economic assumptions. Thus, even if applied to a similar research question, they may not generate identical output. In the study conducted within the SUPREMA project, the team of researchers describe and analyse variations among the simulation outcomes of five economic models. They conclude that most of the differences are caused by the essential model characteristics, and that the models harmonization beyond the external variables should be performed cautiously.

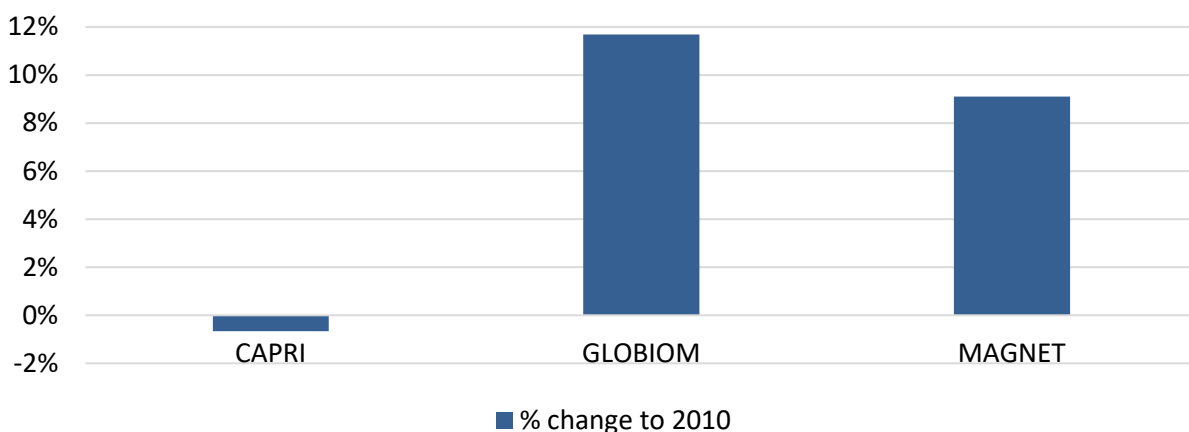
To identify the range of variation of the modelling outcomes, two sets of agricultural baselines were produced with five models of the SUPREMA family. The models AGMEMOD, CAPRI and IFM-CAP produced medium-term (2030) projections for the major agricultural markets of the EU and EU countries; and the models GLOBIOM, MAGNET and CAPRI produced long-term (2050) projections for the EU agricultural markets and GHG emissions. The baselines were produced with the latest available versions of the models. Furthermore, to produce comparable modelling outcomes, CAP, climate and trade policy assumptions, as well as key external factors such as projections of national GDP, GDP deflator, currency exchange rate, population, crude oil price, carbon price, plant and forest areas and the calibration baseline were harmonized among the models of the two groups.

The simulation results of the 2030 baselines have been reviewed from the market perspective for a group of selected commodities. The basis for comparison was the modelling results of CAPRI. The analysis showed that: (i) fluctuations of the modelling outcomes are rather commodity- and activity-specific, (ii) projections of domestic use, production, yields and crop areas at the EU level vary considerably less as compared to the country level, and (iii) the differences among the projections of trade variables are considerable. For example, the projected values for the total EU production of soft wheat and rapeseed seeds did not differ between the results of CAPRI and IFM-CAP by more than $\pm 6\%$, whereas the projections for production of the rest of the commodities were different by $\pm 11-23\%$. Because trade quantities were modelled as responses to domestic and export demands, production and world market prices, the differences in the respective projections varied from $\pm 50\%$ to more than $\pm 200\%$ depending on the regional aggregation level (i.e., EU or EU country) and commodity.



% differences in the mid-term (2030) projections of corn yield for selected countries by AGMEMOD and IFM-CAP models as compared to the projections by CAPRI model

The analysis of the long-term scenarios considered GHG emissions, agricultural land use and market balances. The comparison was conducted for the projected growth rates from the base year values. Thus, the projections for GHG emissions varied among the models, although they showed similar patterns in many cases. For example, CAPRI and MAGNET projected reduction in N₂O, CH₄ and in total GHG emissions from crops production, whereas GLOBIOM projected reduction only in CH₄ emissions. The projected changes for the total UAA were quite similar among the three models (5.2-6.3%). Overall, (i) the extent of the differences in the projections was commodity-specific, (ii) projected changes in trade varied considerably more than in other activities, and (iii) no conclusion could be made regarding the results of any two models being closer among each other as compared to the third one.



% differences in the total GHG emissions from agriculture projected by CAPRI, MAGNET and GLOBIOM as compared to their base year values in 2010

The study has demonstrated that homogenisation of the external drivers does not necessarily result in similar modelling outcomes among the models considered. A number of model-specific characteristics cause the differences. They can be aggregated into three groups. The first two groups include data sources, methodology and model specification. CAPRI uses Eurostat and FAOSTAT, MAGNET works with GTAP database, GLOBIOM uses, among else, data from various other models, AGMEMOD uses national databases and IFM-CAP works with FADN. The models are different in the economy coverage and the respective economic assumptions, level of details of agricultural and other sectors, regional coverage, model structure and simulation methods. By applying different sets of parameters, assumptions and information from varying data sources to different quantitative approaches, the models unavoidably produce non-similar outcomes.

The third group of characteristics that impedes resemblance of the modelling outcomes refers to representation of CAP and climate policies. These policies are built in the models in different ways. For example, in CAPRI the decoupled payments affect the decision of land expansion or contraction for agriculture, whereas they do not affect the land allocation in IFM-CAP. GLOBIOM represents mitigation targets for the land use via carbon prices and biomass demand, and MAGNET has a module for emission trading, renewable energy targets and biofuels mandates. Because implementation of these policies is restricted by model features, the impact of their alignment on the resemblance of the simulation outcomes is limited.

Different baselines produced by the models of SUPREMA family, unless stemming from non-harmonized commodity/activity definitions and exogenous variables, rather add value than devalue each other. As the models work with different levels of details of the agricultural and other sectors, consider different synergies between them, and are based on varying data and evidence as well, their modelling results demonstrate a possible span of the future developments. This allows for examination of the researched phenomenon from more perspectives and, thus, in a more complete and comprehensive way.

The complete study, Deliverable D3.1, is available for download here: <https://www.suprema-project.eu/>

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