D4.6: INTERNAL PROGRESS REPORT AND MINUTES OF THE THIRD MEETING OF THE EAB

LEAD AUTHOR: Floor Brouwer (WR)

OTHER AUTHORS: Mariia Bogonos (JRC), Petr Havlik (IIASA), Alexander Gocht (Thuenen), Roel Jongeneel (WR), Peter Witzke (EUROCARE)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA

PROJECT	Support for Policy Relevant Modelling of Agriculture (SUPREMA)
PROJECT NUMBER	773499
TYPE OF FUNDING	Coordination and Support Action
DELIVERABLE	D.4.6 Internal progress report and minutes of the third meeting of the EAB
WP NAME/WP NUMBER	Project coordination and management / WP4
TASK	Task 4.2 (Coordination)
VERSION	Final
DISSEMINATION LEVEL	Public
DATE	07/08/2020 (Date of this version) – 30/06/2020 (Due date)
LEAD BENEFICIARY	WR
RESPONSIBLE AUTHOR	Floor Brouwer (WR)
AUTHOR(S)	Mariia Bogonos (JRC), Petr Havlik (IIASA), Alexander Gocht (Thuenen), Roel Jongeneel (WR), Peter Witzke (EUROCARE)
INTERNAL REVIEWER	Approval by WP leader

DOCUMENT HISTORY

Version	Initials/NAME	DATE	COMMENTS-DESCRIPTION OF ACTIONS
1	D4.6 v0.1	13 July 2020	Outline deliverable with meeting 25 June 2020
2	D4.6 v0.2	30 July 2020	First draft
3	D4.6 v1	4 August 2020	Draft final

Table of Contents

Executive summary

Changes with respect to the DoA

No changes.

Dissemination and uptake

This report has been written to support the work in SUPREMA for the roadmap, discuss a draft with the External Advisory Board (26 June 2020) and seek for their advice for any updating. The deliverable is public and will be released through the website of SUPREMA.

Short Summary of results

This deliverable reports on the progress in SUPREMA and discussed during the project meeting (25 June 2020). A draft of the Roadmap is presented and discussed during the third meeting of the External Advisory Board (26 June 2020).

Evidence of accomplishment

The deliverable itself can act as the evidence of accomplishment.

Glossary / Acronyms

AGMEMOD	AGRICULTURE MEMBERSTATES MODELLING
AGRICORE	AGENT-BASED SUPPORT TOOL FOR THE DEVELOPMENT OF AGRICULTURE POLICIES
BESTMAP	BEHAVIOURAL, ECOLOGICAL & SOCIO-ECONOMIC TOOLS FOR MODELLING AGRICULTURAL POLICY
CAPRI	COMMON AGRICULTURAL POLICY REGIONALISED IMPACT MODELLING SYSTEM
EUROCARE	EUROPEAN CENTER FOR AGRICULTURAL, REGIONAL AND ENVIRONMENTAL POLICY RESEARCH
EUROSTAT	STATISTICAL OFFICE OF THE EUROPEAN UNION
FADN	FARM ACCOUNTANCY DATA NETWORK
FAO	FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
GLOBIOM	GLOBAL BIOSPHERE MANAGEMENT MODEL
IFM-CAP	INDIVIDUAL FARM MODEL FOR COMMON AGRICULTURAL POLICY
IIASA	INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
JRC	JOINT RESEARCH CENTRE
MAGNET	MODULAR APPLIED GENERAL EQUILIBRIUM TOOL
MIND STEP	MODELLING INDIVIDUAL DECISIONS TO SUPPORT THE EUROPEAN POLICIES RELATED TO AGRICULTURE (MIND STEP)
SDG	SUSTAINABLE DEVELOPMENT GOAL
SLU	SVERIGES LANTBRUKSUNIVERSITET
SUPREMA	SUPPORT FOR POLICY RELEVANT MODELLING OF AGRICULTURE
THUENEN	JOHANN HEINRICH VON THÜNEN INSTITUTE
UPM	UNIVERSIDAD POLITECNICA DE MADRID
WR	WAGENINGEN RESEARCH

1 Introduction

This deliverable reports on progress in SUPREMA, with the agenda of the project meeting (25 June 2020) and a summary of the topics discussed during this meeting (Chapter 2). Chapter 3 presents the agenda and a summary of the findings from the second meeting of the External Advisory Board (EAB) in SUPREMA (meeting on 12 February 2020).

2 Project meeting (25 June 2020)

2.1 Participants and topics discussed

The SUPREMA consortium met June 25, to speak about pending topics. Participants: Maria Blanco (UPM), Mariia Bogonos (JRC), Floor Brouwer (WR), Arnaldo Caivano (JRC), Andre Deppermann (IIASA), Alexander Gocht (THUENEN), Ana Gonzalez-Martinez (WR), Petr Havlik (IIASA), Torbjörn Jansson (SLU), Roel Jongeneel (WR), Jan Peter Lesschen (WR), Ignacio Perez-Dominguez (JRC), Petra Salamon (THUENEN), Marianne Selten (WR), Hans van Meijl (WR), Peter Witzke (EUROCARE). The following topics are discussed.

- Data management report

Deliverable D4.8 (Data management report) is the final data report and due for June 2020. The model runs presented in WP3 will be released through DataM. See example from previous work: https://datam.jrc.ec.europa.eu/datam/public/pages/previousFilters.xhtml?dataset=dfe58f9f-0609-4cac-a139-efff80eecf83&rdr=1591613354838. Model runs from WP3 will be released open access and be consistent with the content of the three deliverables in this work package:

Deliverable D3.1 – Baseline data for several models, including:
- AgMEMOD
- CAPRI
- IFM-CAP
- MAGNET
- GLOBIOM

All models will be released open access in DataM. Mariia Bogonos to provide the data files to Arnaldo Caivano.

Deliverable D3.2 – CAP policy scenario (for 2030), including:
- AgMEMOD-MITERRA
- CAPRI

The two models will be released open access in DataM and Roel Jongeneel to provide the data files to Arnaldo Caivano.

Deliverable D3.3 – Long-term climate scenario (for 2050), including:
- CAPRI
- GLOBIOM
- MAGNET

The three models will be released open access in DataM and Petr Havlik to provide the data files to Arnaldo Caivano.

- Governance structure

Deliverable D4.7 (Future governance structures of the models) is due for M30 (June 2020) and Torbjörn Jansson does present the initial findings. SUPREMA is a Coordination and Support Action, and has benefited from previous efforts for model comparison. Deliverable will be available for submission in the participant portal by July 15.

- Lessons from SUPREMA

We plan for a separate talk on this topic in the next couple of weeks.

3 Meeting with the EAB

3.1 Outline of the meeting

The consortium met with the External Advisory Board (EAB) on 26 June 2020. The meeting was originally planned to be held in the Hague, but is cancelled on due to the Coronavirus (COVID-19), and is held remotely, using Go to Meeting, and which allows to share screen, for presentations and chat. Both functions are used.

Consortium partners joining the meeting include Maria Blanco (UPM), Mariia Bogonos (JRC), Floor Brouwer (WR), Andre Dappermann (IIASA), Alexander Gocht (THUENEN), Ana Gonzalez-Martinez (WR), Petr Havlik (IIASA), Torbjörn Jansson (SLU), Roel Jongeneel (WR), Tamás Krisztin (IIASA), Ignacio Perez-Dominguez (JRC), Petra Salamon (THUENEN), Marianne Selten (WR), Hans van Meijl (WR) and Peter Witzke (EUROCARE)

External partners joining the meeting include Francesca Bignami (FoodDrinkEurope) (member EAB), Natalia Brzezina (European Commission, DG AGRI) (Member EAB), Emil Erjavec (University of Ljubljana) (Member EAB), John Helming (WR) (MIND STEP), Carlos Leyva Guerrero (IDENER) (AGRICORE), Alan Matthews (Trinity College) (Member EAB), Marc Müller (WR) (MIND STEP), Michail Tsagris (AUTH) (AGRICORE), Ben VanDoorslaer (European Commission, DG AGRI), Mario Veneziani (AGRICORE), Christof Weissteiner (European Commission, REA), Henk Westhoek (PBL), Guy Ziv (University of Leeds) (BESTMAP).

The agenda of the meeting includes the following topics.

9.30 Welcome and tour-de-table of external participants (Hans van Meijl, WR)

9.45 Update on WP3

Three deliverables have been finalised since the previous meeting of the EAB on February 12. The principal authors of the deliverables will summarize the main findings, and present main challenges for modelling baselines, mid-term policy assessments and long-term policy assessments).

- 9.45 – 10.05 Task 3.1 (Mariia Bogonos, JRC)
- 10.05 – 10.25 Task 3.2 (Roel Jongeneel, WR)
- 10.25 – 10.45 Task 3.3 (Petr Havlik, IIASA)

10.45 Update on WP2 (Peter Witzke, EUROCARE)

A deliverable (Deliverable D2.2) on model linkages is completed and the main challenges for model linkages are summarized.

11.15 Break

11.30 Roadmap (Roel Jongeneel)

A draft version is available (The SUPREMA Roadmap exploring future directions for agricultural modelling in the EU).

13.00 Break

14.00 Roadmap (continued)

15.30 Follow-up and closure of meeting

Hans van Meijl does introduce there are many targets to cover (e.g. New Green Deal; Farm to Fork Strategy; CAP after 2020) and they are all important for European agriculture. There is no single model that could cover them all and there is a need for alignment and harmonisation of modelling, comparison of model and improvements, as well as model linking and model integration. Model integration is likely to increase in the future.

3.2 Update on WP3

3.2.1 Baseline scenario

Mariia Bogonos (JRC) presents outcomes of the baseline work in SUPREMA. A selection of results of the baseline for 2030 is presented, including producer prices at the country level, which mostly are in the range of about 30% difference. Projections of crop areas are usually closer than that of yields.

SUPREMA does deliver a report on the future governance structures of the models (Deliverable D4.7). The EAB also expressed the important of this and recommends SUPREMA takes some steps on this. Related to this, there are comments regarding the costs of improving models versus the relative importance of using different databases (e.g. FAO and EUROSTAT). Differences in databases are important. Data requirements might be different for models, even if they use the same data sources. Food losses, for example, could be presented at farm level or, alternatively, at national level.

EAB comments there are costs of improving models and more specifically refers to the relative importance of using different databases (e.g. FAO versus Eurostat). It is acknowledged differences in databases are important, even if models use same data sources, their data needs might still differ. Food losses might be measures at farm level, while other models might include food losses at national level. Engagement with different statistical offices might be beneficial for the future modelling work. It is concluded the project benefited from some improvements and revisited methodology for model linking, including a measure of its impact. Such a measure is important for integrated modelling approaches.

3.2.2 CAP scenario for 2030

Roel Jongeneel (WR) presents the medium-term assessment of CAP policies.

Following a comment regarding the negative impact of the CAP scenario on incomes, there is a question what kind of feedback mechanisms are to be expected which will mitigate this. The consortium comments this is mainly from a reduction of the CAP budget.

There is a comment regarding the cumulative impact of CAP and sustainable diet scenarios. For example, would less meat consumption be replaced by vegetable proteins consumption, hence the need to put more land into production. The consortium comments the models allow to look at them together. Other studies also indicate that less land is needed and imports decline from a reduction in meat and dairy. Related to this, vegetables and fruits and their nutrients are covered in CAPRI, even though not in deep disaggregation (only tomatoes, other vegetables, apples, citrus, other fruits).

Following a discussion on taxing agricultural emissions, it is mentioned that subsidising emission reductions in European agriculture will lead to lower leakage for similar reductions in the EU. In case mitigation technologies is not subsidised, it could heavily impact production in the EU.

3.2.3 Climate modelling for 2050

The dimension of trade could potentially bring more realism in the climate modelling, for example to explore the cheapest ways to achieve certain emission reduction targets. This is important, but remains difficult to disentangle. A tax on emissions as imposed on the models are just a proxy of different mitigation policies.

3.2.4 Model linking in WP2

An econometric approach is adopted to estimate the coefficient of variation (CV). It is a sort of convergence indicator, being a step forward in an integrated model analysis. The CV results for convergence after linkage are quite weak, which seems to indicate linkages might still be too weak or not correctly implemented. This analysis is about convergence of results when we explicitly want them to converge (through linking). If this does not happen it means that the link does not work. It is confirmed divergent prices need to be analysed a bit deeper. It seems some variables converge and others do not, and the different mechanisms also require further elaboration.
The EAB comments the topic is how linking models could influence results compared to results from individual models. It also seems important to be more explicit on what the additionality of the linkage is. For example, PE model does not model input markets, so one linkage can be to take input market shocks from CGE model. The specific linkages being discussed perhaps need to be highlighted more when discussing the results.
The EAB also comments different methodologies might lead to different results; this might reflect uncertainty of modelling to some extent. Having said this, continued efforts to harmonise definitions of common model variables and data regarding production, consumptions, costs and revenues would be helpful.

3.2.5 Roadmap

There is support for the food systems approach, as well as efforts towards modelling supply chains. The EAB comments that from a food systems perspective, more efforts are needed into supply chain modelling.

A question does arise whether the roadmap does address water. This resource is not presented in the roadmap yet, and it is indeed a critical resource. The Water Framework Directive is still important regarding water quality. Also, there is no section of land use intensity and adoption of different practices at field level, nor adoption of agri-environmental measures and their impacts on the environment. Also, adoption of Pillar II measure not mentioned yet. The BESTMAP project is trying to look explicitly at the adoption of agri-environmental schemes. The potential of agent-based modelling is not fully covered yet. BESTMAP, for example, does address the importance of behavioural theory and using agent-based modelling.

It is advised by the EAB to make a link with the societal challenges outlined in Horizon Europe, emphasizing that the agricultural-economic modelling community has a good track-record in interdisciplinary and transdisciplinary research.

A comment is made regarding complexity of modelling tools. Complex problems might need complex models, but complexity could arise from linking models. Generic ways to ensure linking seems sensible, like matching baselines. The approaches presented by SUPREMA would be key, as well as standardization of data sharing formats to exchange between models.

The social dimension of sustainability (e.g. employment) and distribution aspects are not fully addressed yet in the roadmap, but will be taken on board. Important distributional issues include, among others, small farms, farm structure developments and distribution of payments. Regarding the distributional aspects, the Farm to Fork strategy aims for a 'fair' transition. Another dimension are distributional effects on consumption (e.g. effects on food prices and poverty). The SDGs also relate to the social dimension of food production and food consumption. Distribution of farm incomes, for example, could be achieved by a combination of household modelling and segmented factor markets that enable different income developments across types of labour. Modelling also does address the dimensions of food security, including the links between food availability, access to food and food utilization.

Regarding the modelling of environmental aspects, the EAB comments the proposal of the EC to develop FADN (Farm Accountancy Data Network) into the Farm Sustainability Development Network will help with some of the deficiencies in data.

Fragmentation, economies of scale and footloose activities are key issues by global value chains. The food processing sector may expand in regions across the globe where the value added is created. The need to get more insight into supply chains is confirmed. Some supply chains offer a bonus for certain practices and there are more dedicated supply chains (e.g. sustainability and animal welfare). Examples are presented for the dairy industry in the Netherlands (e.g. quality standards for primary milk producers). Global value chains are considered in a new H2020 project (BATModel - Better Agri-food Trade Modelling for Policy Analysis). The Farm to Fork Strategy has much attention for the resilience and robustness of the EU (and global) food chain. Also, a contingency plan will be elaborated to be better prepared for potential crises. Trade is therefore not only about averages, but also about shocks. Moreover, an ABM representation of food system dynamics is foreseen to be provided from the H2020 VALUMIS project (Raising awareness about food system network dynamics) (https://valumics.eu/). This should be a remarkable modelling advance of the organisation of food supply chains and/or food systems. It is advised to consider topics like 'functional trade', e.g. the contribution of trade to gross value added or to the environment.

Following a request to clarify the economics of climate modelling, the consortium responds the analysis is mainly drawn from an estimate of the average or typical cost of a particular mitigation option at the country level. Heterogeneity is largely assumed rather than estimated. While some work has been done on the cost of mitigation, there seems to be less systematic bottom-up costing of the adaptation options.

Following the discussions in the morning on dietary shifts, there is a comment to introduce plant-based meat substitutes as a separate sector into the models, using pea protein or some other crop product as input and competing with meat as output. JRC already investigated this new protein sources in AGLINK model (presented during the previous EU Outlook conference). It seems there is potential for growth, but limited. These plant-based meat substitutes have a high processing level (e.g. about 'getting the taste' right) making them less healthy than a pure demand shift.

The EAB comments the issue in modelling meat substitutes might be how they respond to demand shifts. CAPRI might have peas with high substitutability with other legumes, but low or zero substitutability with meat consumption. So identifying a separate 'product' would seem to be helpful.

The EAB does comment on the prospect for new data sources (e.g. administrative data, satellite data, scanner data). Consider for example the potential of access to shipment level data rather than just HS6 level. Many of these new data sources may be less relevant for economic models, but a road map looking ahead at how to integrate these new data sources in the models could be an important value added.

Regarding governance, the EAB opens up discussion in developing a governance framework with opportunities for ‘new entrants’, encouraging new modelling teams, bearing in mind the huge costs in developing and maintaining these large-scale models. The modelling work at member state level could be strengthened. GLOBIOM, for example, has ‘entered’ the agricultural market during the past 5 years, And IFM-CAP is a recent new entrant as an answer to the farm-orientation of the CAP policies. The intention of a governance structure is to pursue an open approach. Support on CAP policy requires (i) integrated assessment models for the complex CAP reform, (ii) harmonization of input and baseline data to increase credibility and (iii) understanding the empirical foundation of the modelling and ability to clarify them.

There is a comment in the EAB whether there is enough capacity in the modelling community to address all questions. It becomes clear there is a wide range of topics that still require development of new tools and approaches, and there is potential for new tools to enter the market. Also, policy changes might be fairly rapid and the modelling capacity needs to keep up with the increasing requirements. Environmental indicators, ecosystem services and biodiversity gain importance, as well as societal issues (e.g. SDGs and rural topics). In addition, it is noted the roadmap could offer several ‘quick wins’ and prioritising the topics will take some time. Also, it might be worth to indicate which issues need to be elaborated at European level and what models could cover this. The EAB is thanks for their advice, which all are important in finalising the project.

Appendix: Presentations

The following presentations are added:

- Inter-model baseline harmonization and comparison (Mariia Bogonos)
- Agricultural policy scenario description and divergence analysis (Roel Jongeneel)
- Long-term climate mitigation: selected results (Petr Havlik)
- Model linkages (Alexander Gocht and Peter Witzke)
- Statistical tests of linkage effects (Petr Havlik)
- A roadmap for agricultural modelling (Roel Jongeneel)

D 3.1: Inter-model baseline harmonization and comparison

Lead author and presenter: Mariia Bogonos

Other authors: Maria Blanco, Pavel Ciaian, Andre Deppermann, Stefan Frank, Petr Havlik, Roel Jongeneel, Dimitris Kremmydas, Ignacio Perez-Dominguez, Athanasios Petsakos, Andrzej Tabeau, Hans-Peter Witzke

26 June 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

Content

1. Background information: purpose, models, harmonization
2. Selected results & summary
3. Key findings
4. Conclusions: models linking

1. Background

Purpose

- Discover the limitations of the SUPREMA models to produce harmonized baseline after aligning the key exogenous variables

- Knowledge foundation for successful linking of the models

1. Background

Models

	IFM-CAP	AGMEMOD	CAPRI	MAGNET	GLOBIOM
Main sectors	EU agriculture	EU agriculture	EU agriculture	Agriculture Global economy	Agriculture Forestry
Highest disaggregation for EU	Individual farms	Countries	Countries – markets, NUTS2 - activities	EU	Countries – demand and trade, NUTS2 - production
Trade	-	Total imports & exports	Bilateral trade	Bilateral trade	Bilateral trade
Main methodology	Math. opt.	PE & Econometrics	PE & Math. opt.	CGE	Spatially explicit PE
Time-step	Static: base year -> sim. year	Dynamic: annual	Static: base year -> sim. year	Static: base year -> sim. year	Recursive-dynamic

suprema

1. Background

Harmonization

2030 baselines – CAPRI, AGMEMOD and IFM-CAP:

- common external baseline
- CAP policy
- population and macroeconomic variables

2050 baselines – CAPRI, GLOBIOM and MAGNET:

- population and GDP projections
- climate policy
- globally uniform carbon price (CAPRI)
- energy prices
- energy plant and forest areas
- CAPRI uses the 2050 GLOBIOM baseline for the land use projections

2. Selected results & summary

2030 baselines

Commodities: soft wheat, corn, rapeseed, rapeseed oil, beef, pork, milk

Comparison: levels projected for 2030 as compared to CAPRI

Production, yields and areas (crops) at the EU level
- up to 20% (exceptions are pork and beef production)
- projections of crop areas are usually (!) closer, than of the yields

Use and net-trade at the EU level
- use levels differ by up to 10%
- net-trade may differ by up to abs[92%]

Producer prices at the country level
- mostly within the range of ±40% difference

suprema

2. Selected results & summary

2050 baselines

Market balances for commodities: wheat, rice, oilseeds, ruminant and non-ruminant meats

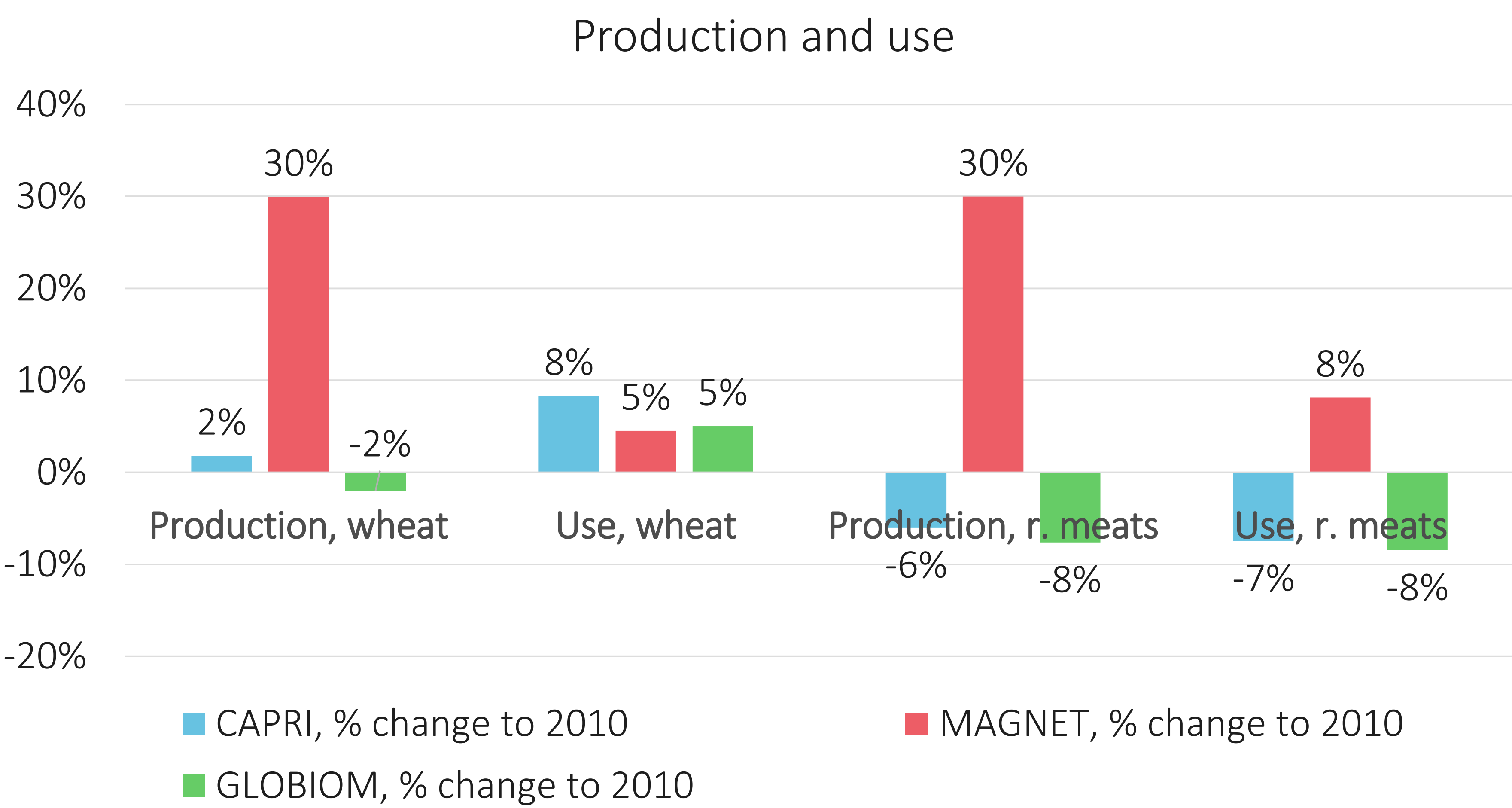
Items: UAA, total GHG, N2O and CH4 emissions from agricultural activities, crops and livestock production

Growth rates 2010-2050

suprema

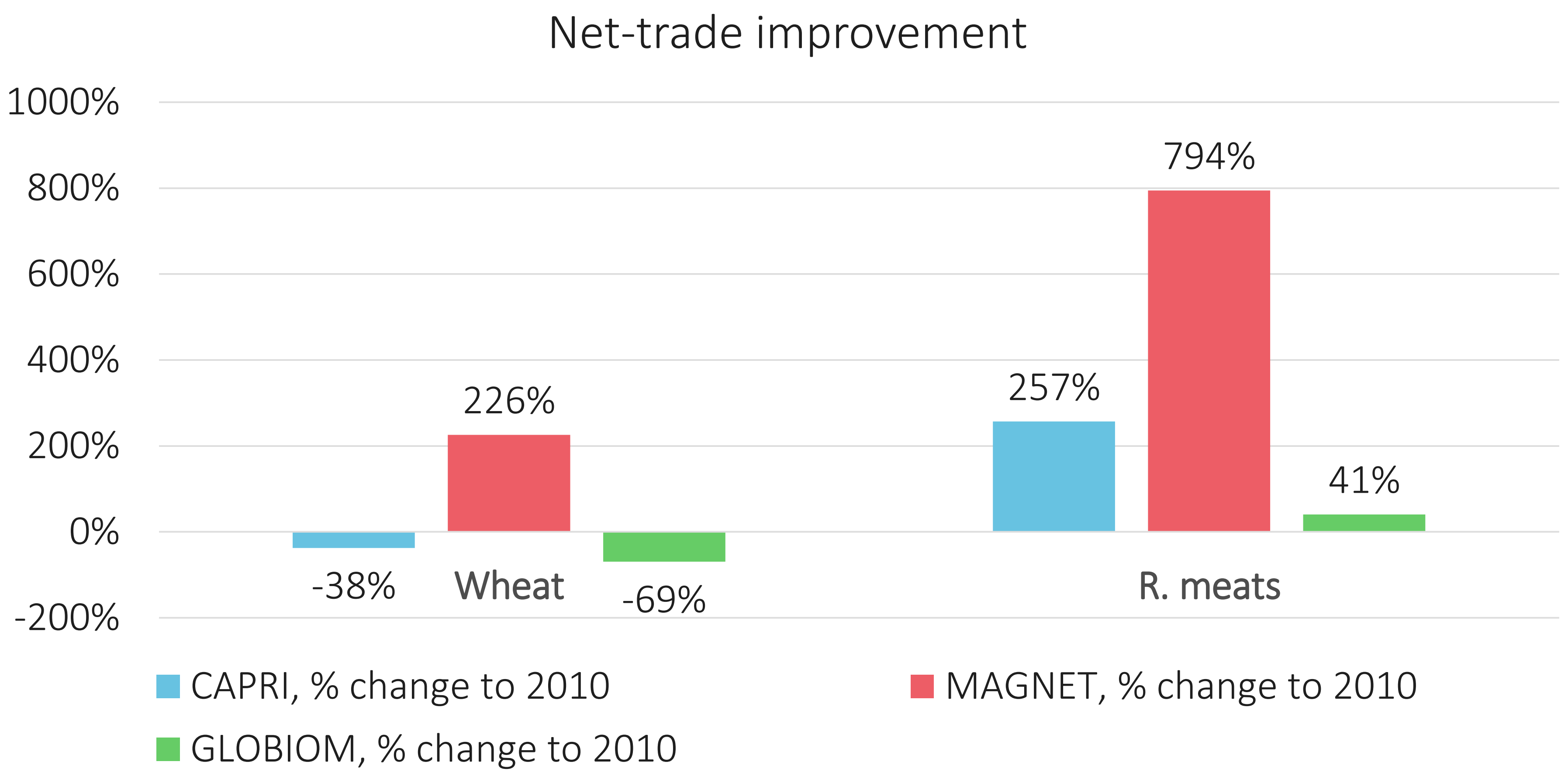
2. Selected results & summary

2050 baselines



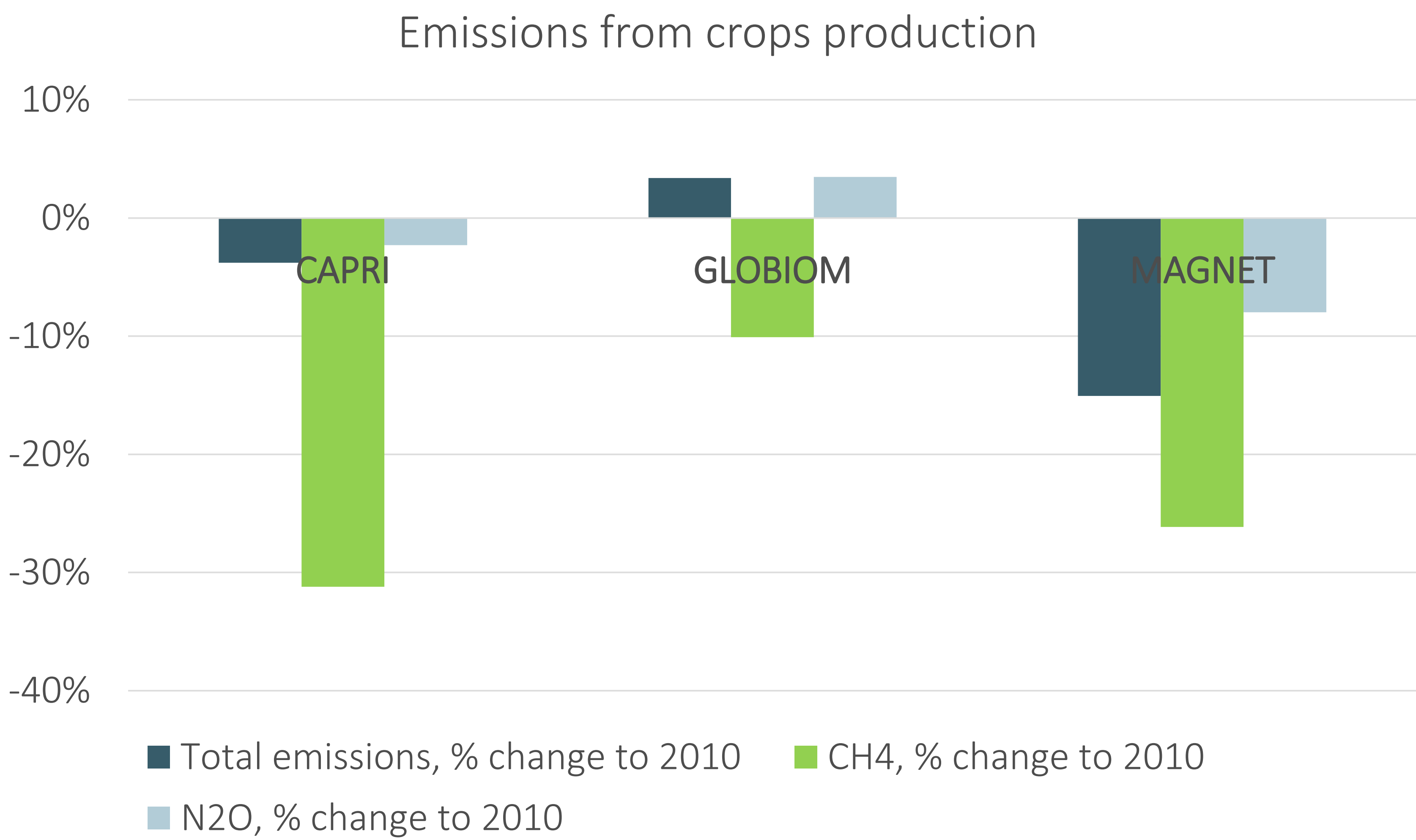
2. Selected results & summary

2050 baselines



2. Selected results & summary

2050 baselines



2. Selected results & summary

Summary

- The closeness of the results vary among the models
- In general, the projections for cereals are closer, than for livestock and oilseeds
- The projections for trade are less uniform among the models as compared with production, prices and use
- The projections for areas of crops are closer than for yields
- For the models of 2030 baseline: the projections for the EU are considerably closer as compared to the projections for the countries

3. Key findings

Despite harmonization of the exogenous variables and external baselines (2030 baselines), the models produce varying results. The reasons identified are:

- data (sources and type)
- model specifications (structure and methodologies)
- policies implementation
- 2030 baseline models group: approach to scaling/calibration to the external baseline

4. Conclusions: models linking

Differences among the simulation results of the models, unless stemming from different commodity/activity definitions or exogenous variables, add value to these results rather than devaluate them.

- Model linking should elaborate on the strengths of each of the models involved
  - Selective use of the (results of the) model blocks
  - Considerate use of large aggregates when linking the models
- Correct concordance tables between activities and commodities
- Adjustment for UoM and definitions of commodities
- Alignment of conversion factors, elasticities, if possible

THANK YOU FOR YOUR ATTENTION

I

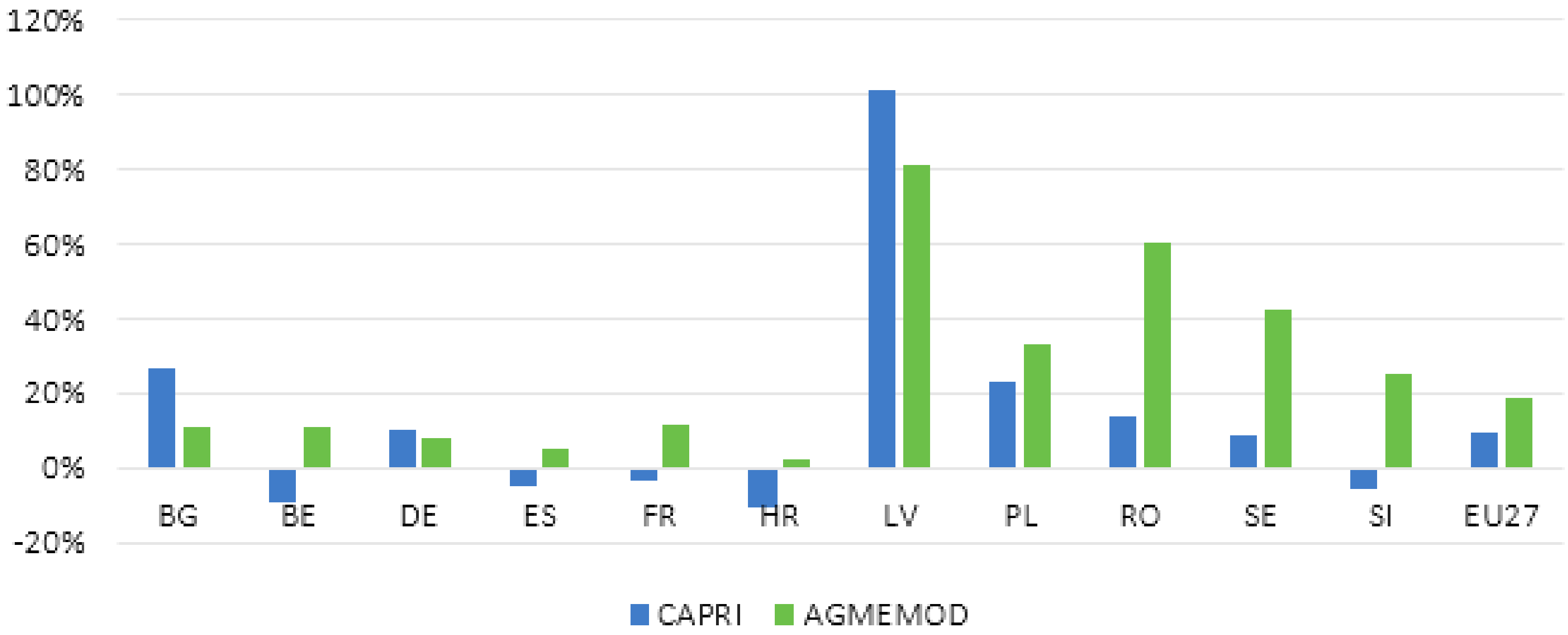


Figure A1: Growth rates of soft wheat production projected by CAPRI and AGMEMOD with respect to the base year values.

suprema

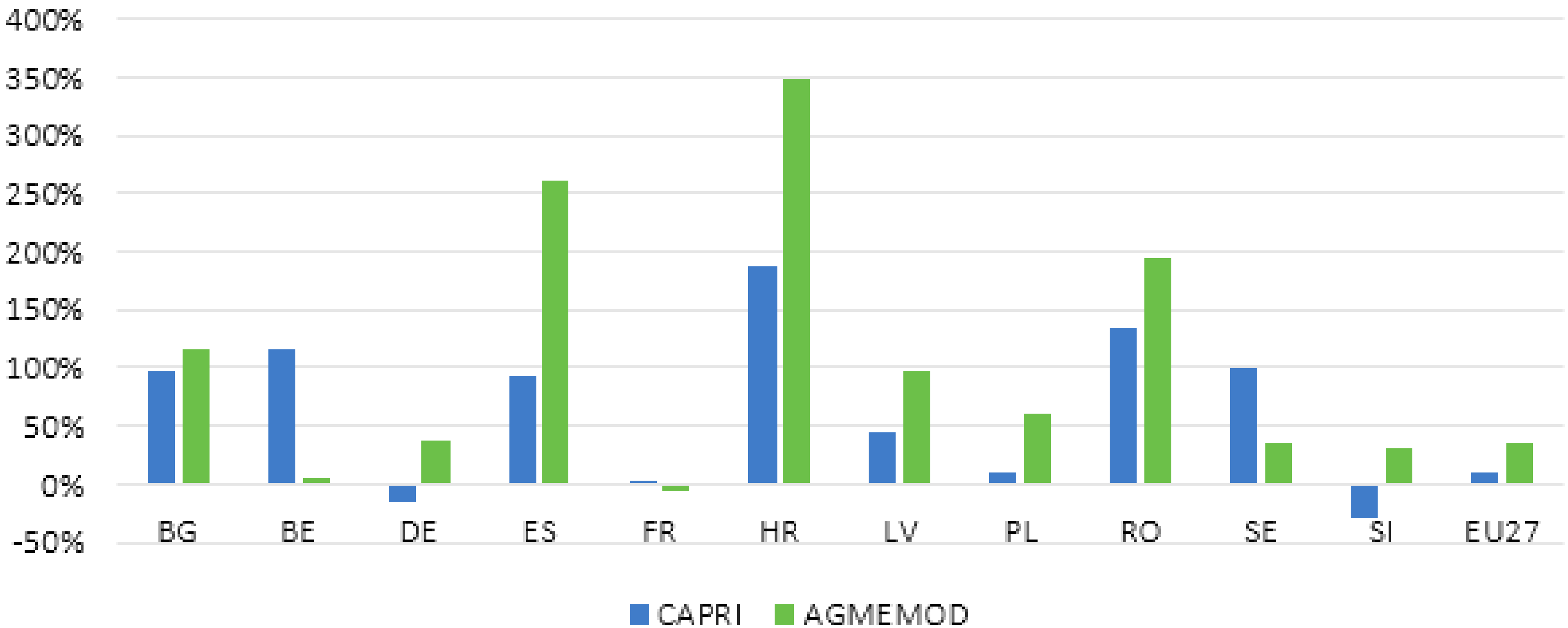


Figure A3: Growth rates of rapeseed production projected by CAPRI and AGMEMOD with respect to the base year values.

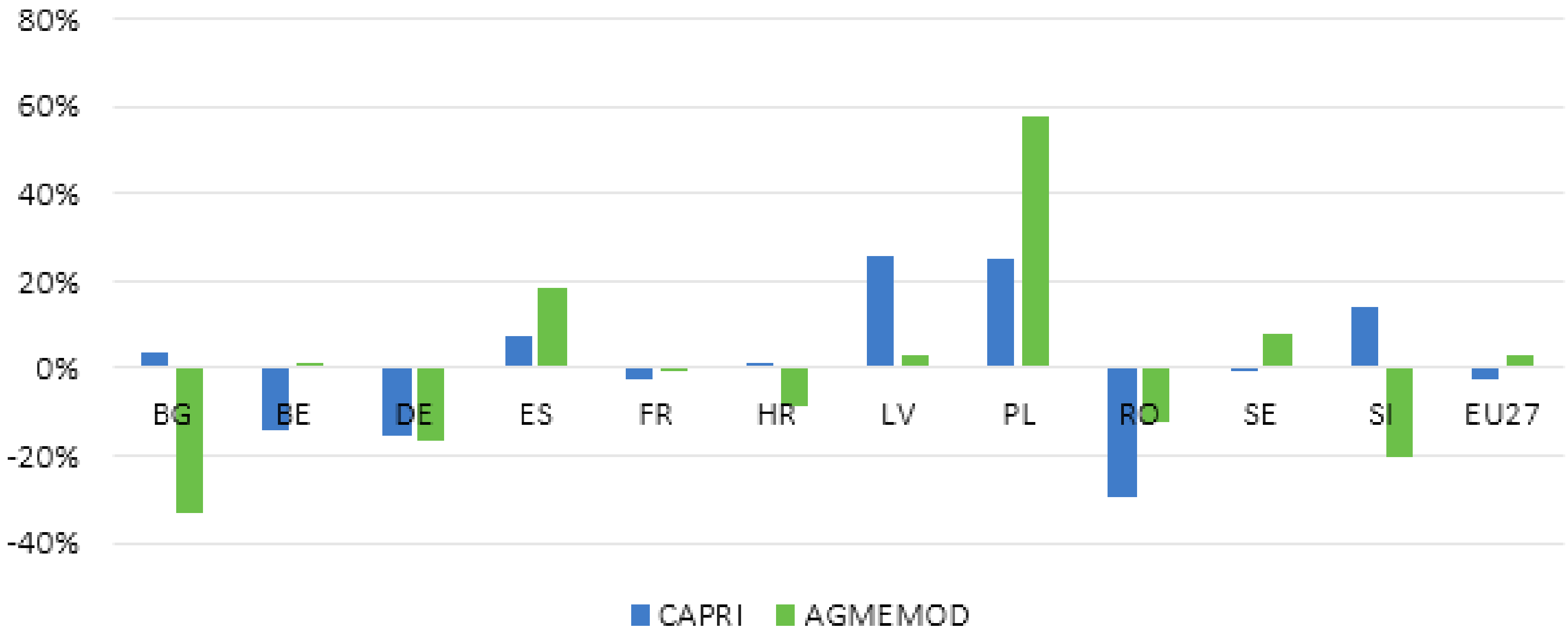


Figure A5: Growth rates of beef production projected by CAPRI and AGMEMOD with respect to the base year values.

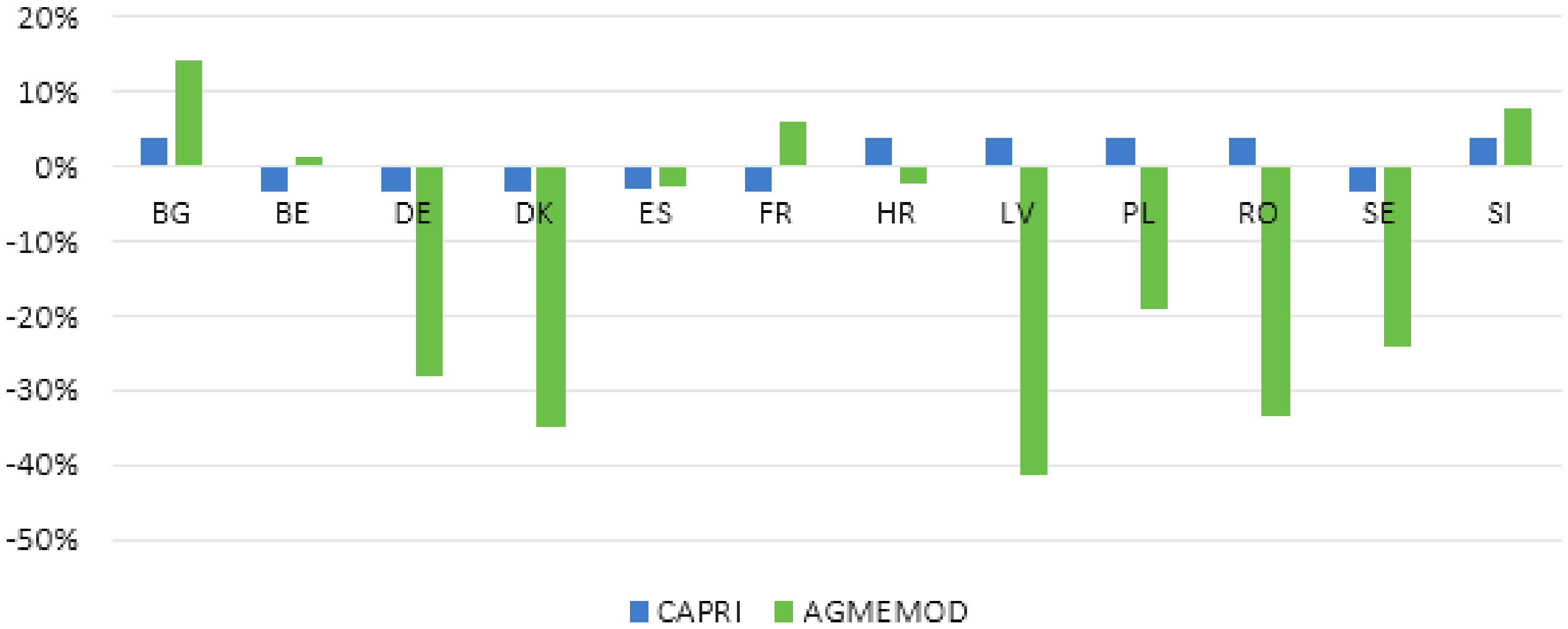


Figure A8: Growth rates of producer prices of soft wheat projected by CAPRI and AGMEMOD with respect to the base year values.

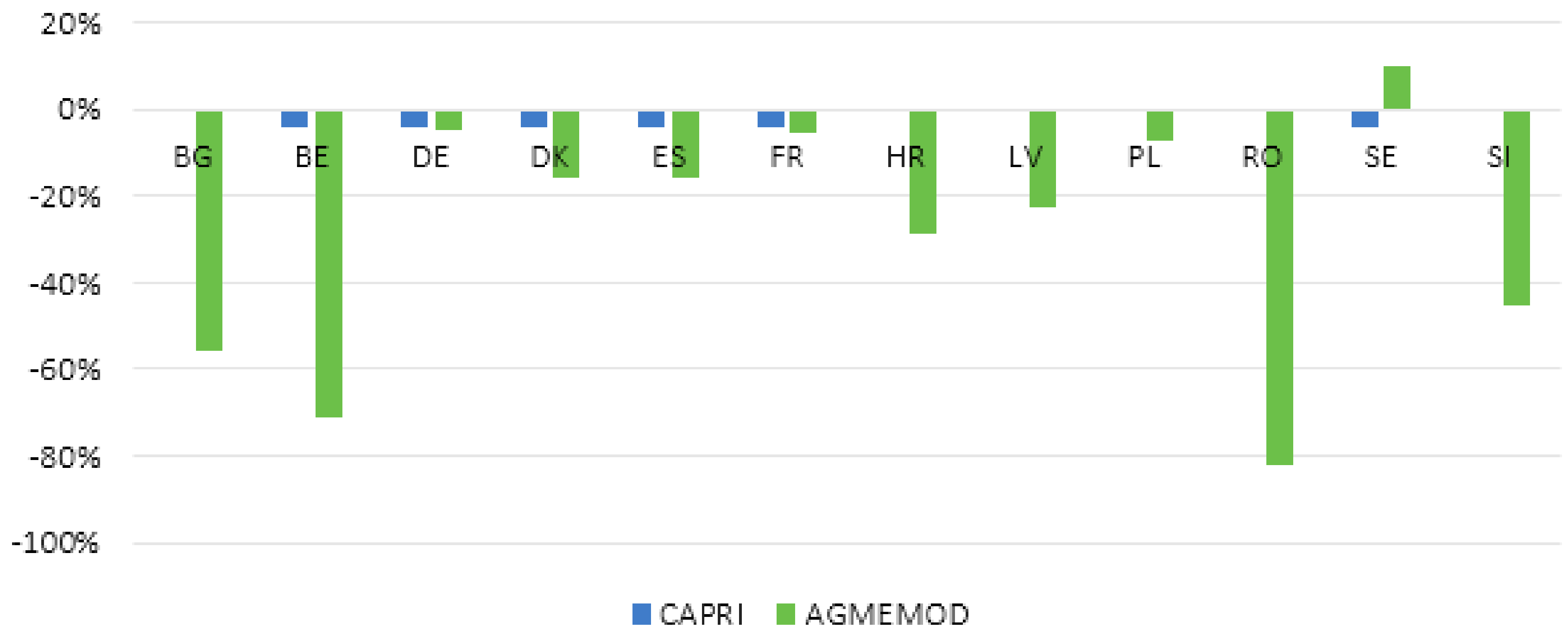


Figure A10: Growth rates of producer prices of rapeseed projected by CAPRI and AGMEMOD with respect to the base year values.

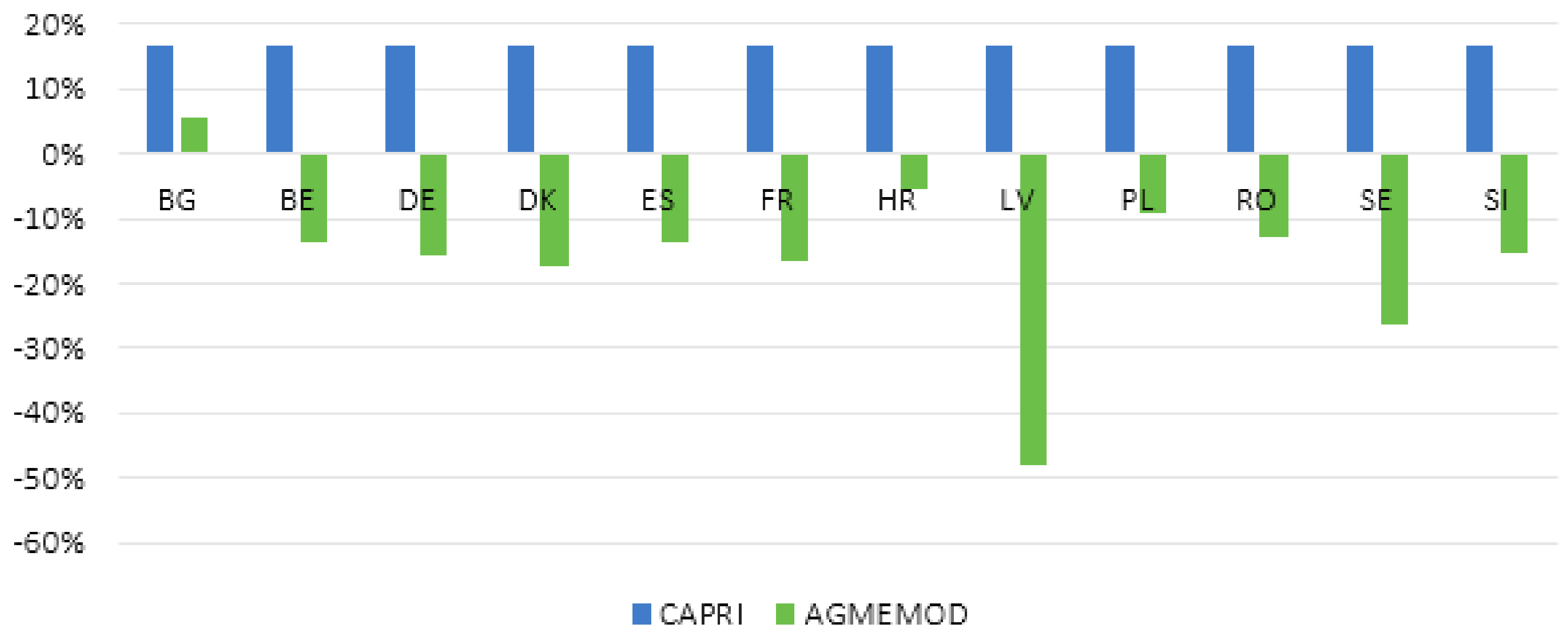


Figure A12: Growth rates of producer prices of beef projected by CAPRI and AGMEMOD with respect to the base year values.

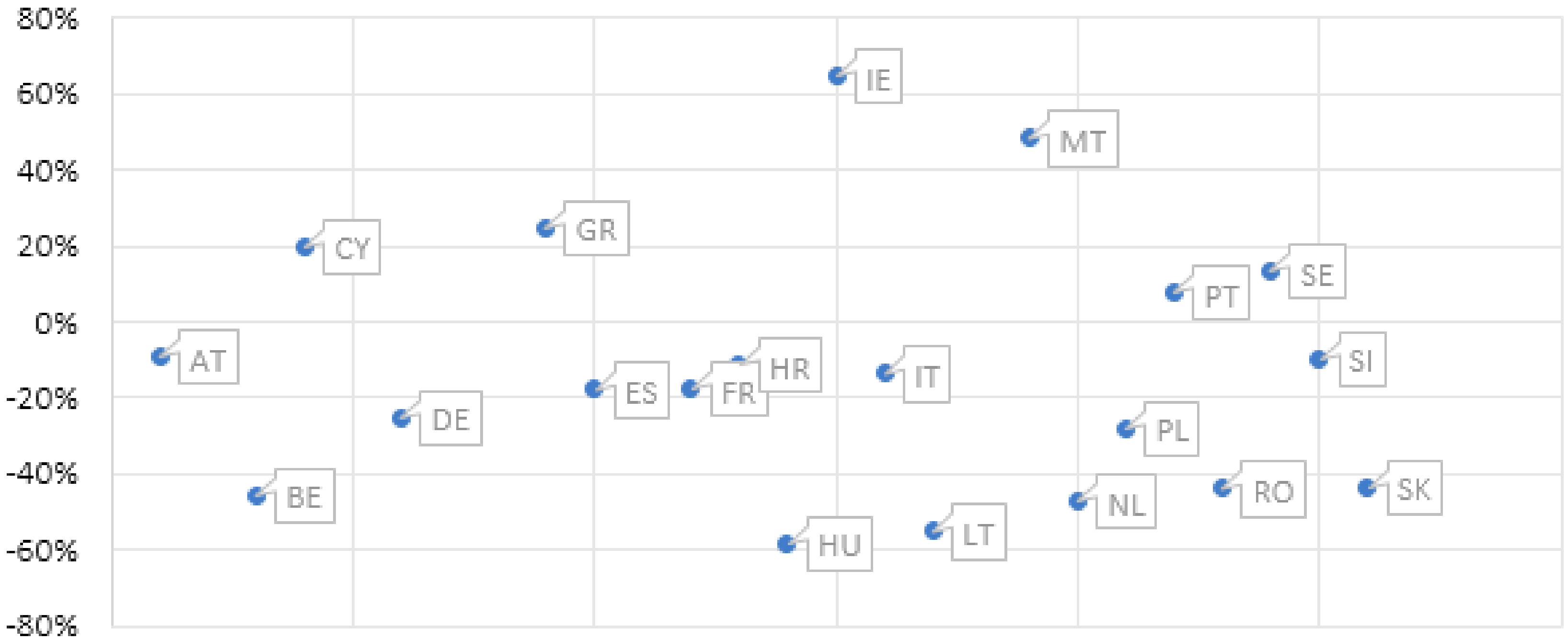


Figure A15: % differences between the projections of per capita soft wheat consumption in 2030 by AGMEMOD as compared to the projections by CAPRI.

suprema

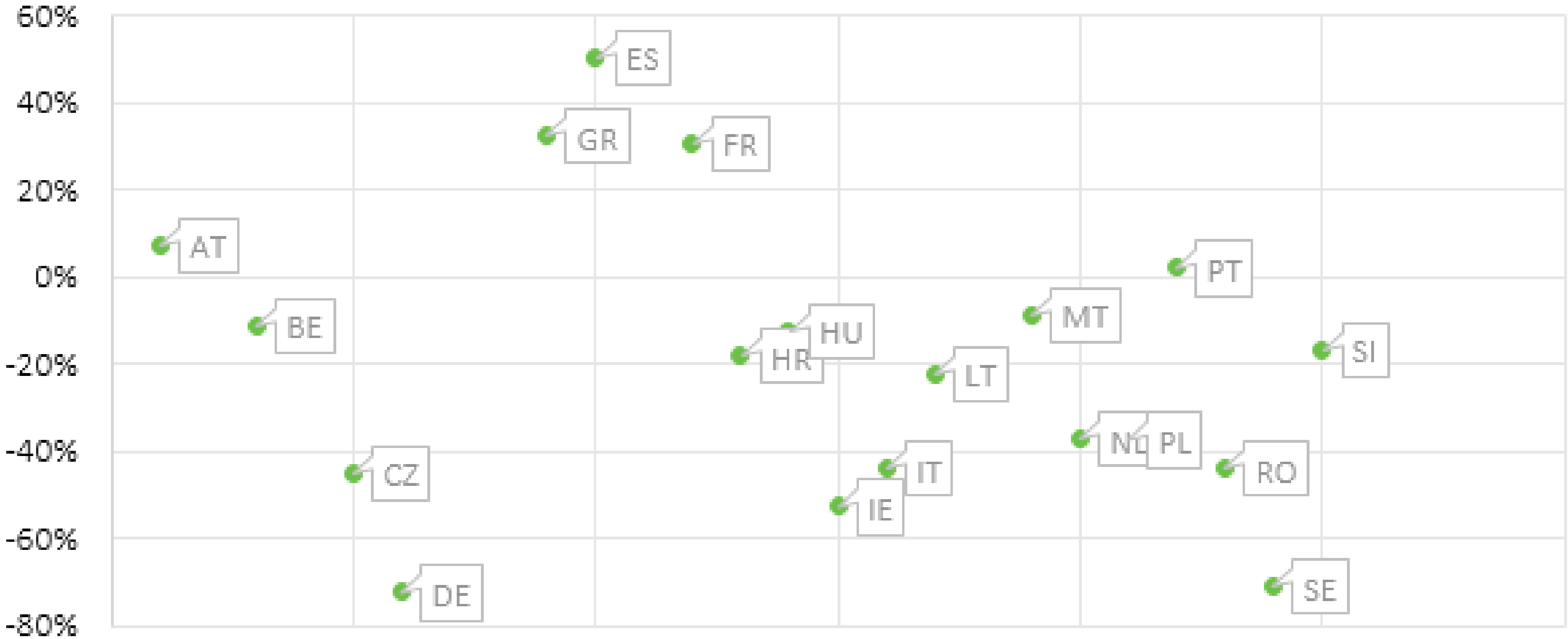


Figure A16: % differences between the projections of per capita corn consumption in 2030 by AGMEMOD as compared to the projections by CAPRI.

D3.2: AGRICULTURAL POLICY SCENARIO DESCRIPTION AND DIVERGENCE ANALYSIS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

suprema

Outline

- Scope and objective
- Overview of the modelling exercise
- CAP scenario
- Sustainable diets scenario
- Key insights
- Challenges

Scope and objective

- D3.2 focuses on
  - The outcomes of the modelling of the agricultural policy scenario
  - The time frame of this scenario is a medium-term horizon
  - the comparison AGMEMOD-MITERRA (combined) modelling tool versus CAPRI
    - Looking at the economic and agronomic or biophysical domains
- Limitations
  - The focus of Task 3.2 is to provide a proof of principle of the model combinations and their use for agri modelling
  - It was not possible to model a detailed CAP scenario since national strategic plans are not fully developed
    - Focus on understanding differences in outcomes of models

Overview of the modelling exercise (I)

Two scenarios

CAP

More value for less money

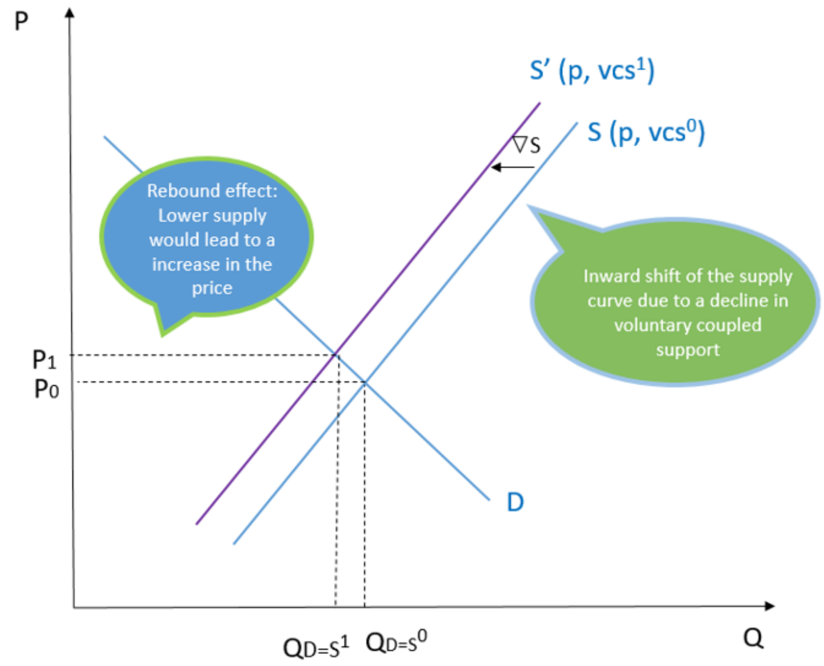
Sustainable diets

More healthy and modern

Overview of the modelling exercise (II)

Two scenarios

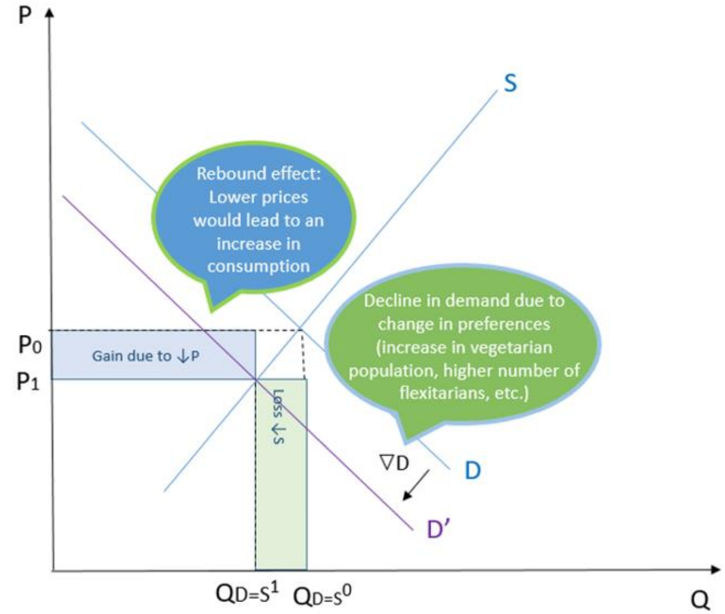
- CAP scenario
  - A budget reduction causing a reduction of payments, including the production-incentive related voluntary income support
    - Change in 'effective prices' farmers receive for products subject to voluntary coupled support, by causing a shift along the supply curve
  - A change in the ecological focus area, which will imply a change in one of the key inputs (available land) for agricultural production
    - Effect on supply that translates into a shift to the left of supply curves of land-based productions



Overview of the modelling exercise (II)

Two scenarios

- Sustainable diets scenario
  - impacts are mainly coming from the demand side
    - preference shifts with respect to red meat, will have a negative impact on the meat demand (inward shifts of the demand curves)

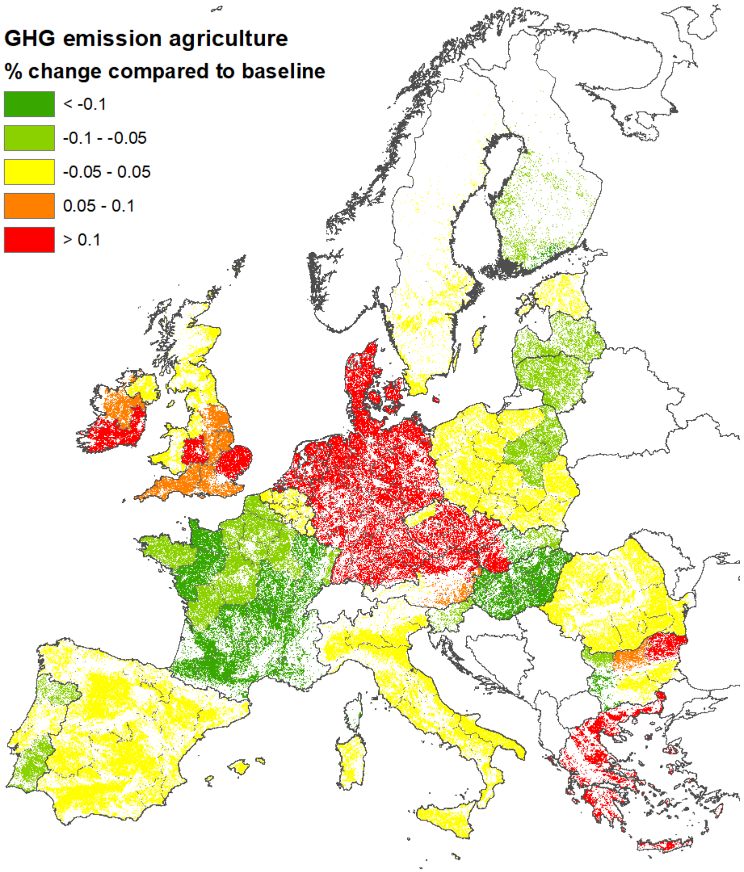


suprema

CAP (I)

- Area and income effects
  - Negative effects of CAP scenario on income indicators
  - Small negative effects on agricultural area
  - Higher effects for activities with VCS
- Market reactions are mainly driven by (limited) prices changes
- Climate and environment
  - Very small, but positive effects of CAP scenario on environmental indicators / Larger EFA can be positive for biodiversity
  - Only changes in activity data from AGMEMOD, no specific environmental measures applied yet

CAP (II)

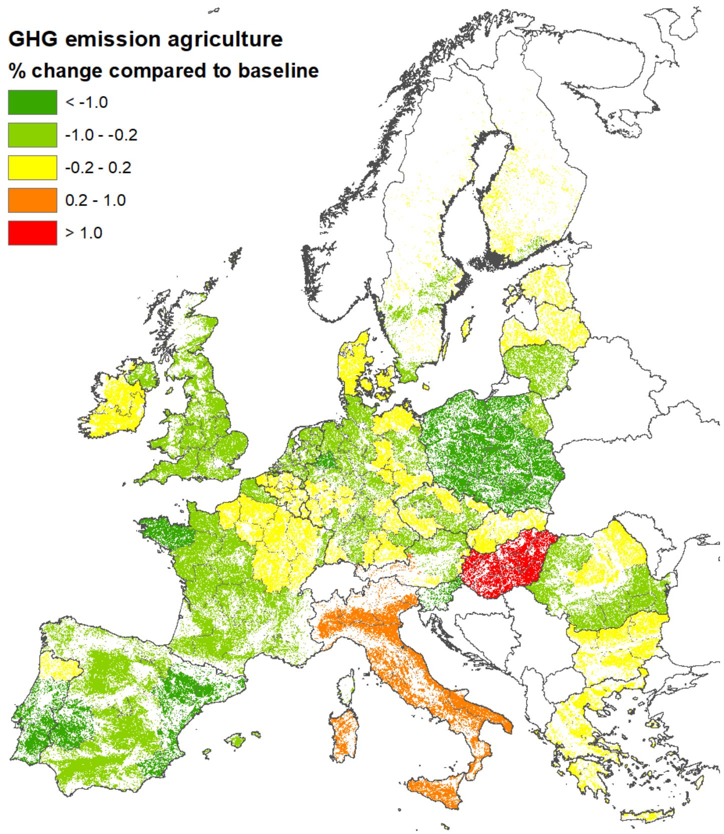


Source: MITERRA.

Sustainable diets scenario (I)

- Impacts on EU production are small but larger on prices and farm income (both decline)
- Area and income effects
  - Negative effects of scenario on income indicators
  - Small negative effects on agricultural area
  - Higher effects for cereals
- Climate and environment
  - Consumption scenario decreases emissions in livestock sector
  - But decline less than proportional w.r.t. the reduction in consumption
  - Regional impacts vary and can even go in different directions (due to substitution effects)

Sustainable diets scenario (II)



Source: MITERRA.

Key insights (I)

- There is a trade-off in both models with respect to greening and agricultural production
  - CAP scenario: Impacts of 'policy shocks' that were simulated indicated that this trade-off was limited (shocks were also limited)
  - simultaneous realization of farm income (as related to agricultural production) and sustainability objectives is feasible
- Emissions are coupled to production (CAP and DIETS)
- CAP scenario emphasize the importance of pursuing environmental, biodiversity and climate policies
- CAP scenario is a rather stylized one
  - Lack of information about the National Strategic Plans

Key insights (II)

- Sustainable diets scenario
  - Increase in market orientation of CAP has contributed to a certain extent of 'disconnection' of producer and consumer prices.
    - Changes in consumer behaviour not lead to fully parallel changes in producer behaviour (leakage-effects!)
  - Consumers and producers are still 'connected' because the EU's competitiveness may be limited for specific products
    - Small changes in consumption may create challenges with respect to the competition for particular sectors
  - AGMEMOD-MITERRA main decrease in pig numbers and emissions
  - CAPRI also decrease in cattle and related emissions

Challenges

- To account for a proper level of 'spatial disaggregation' when implementing policies and assessing their impacts
  - The CAP scenario showed that substitution and spill-over effects can at regional level create 'differences in direction' of policy impacts
- Representation of the new Eco-scheme
  - Models should be updated/extended to provide a good representation of the new Eco-scheme
- Better modelling of consumer preferences and price transmission
  - For delivering relevant insights on the protein transition

Thanks for your attention.

Any questions?

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

suprema

Annex

- Additional indicators -

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

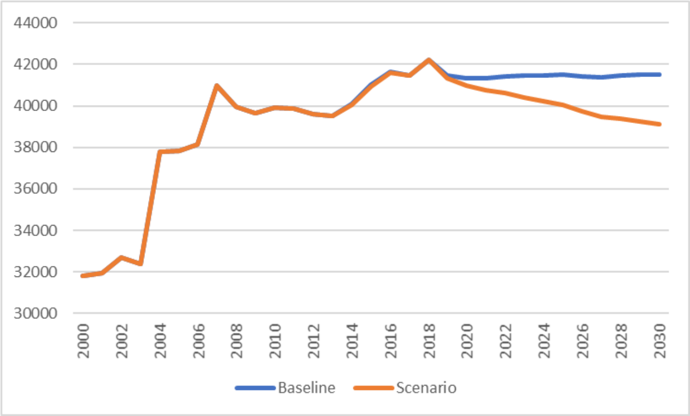
CAP (I)

- There is some substitution with poultry meat
- Stronger diff for pork
- Market reactions are mainly driven by prices changes

	AGMEMOD		CAPRI	
Product	Production	Price	Production	Price
Beef	-0.324	-1.566	-3.44	-12.44
Pork	-4.981	-20.796	-3.80	-5.64
Poultry	0.044	-2.315	-0.30	-0.99

Percentage deviation from baseline in 2030 (at EU level)

Total consumption at EU28 level (1000t), including beef, pork and poultry



CAP (II)

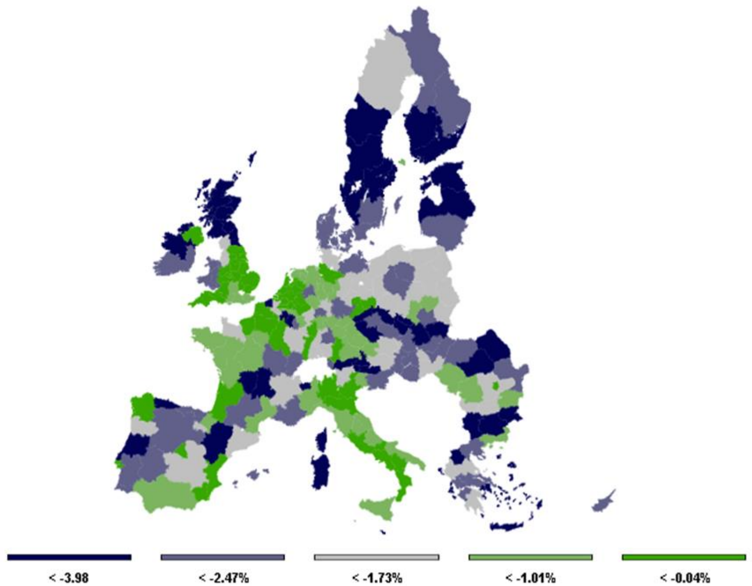
- Area and income effects
  - Negative effects of CAP scenario on income indicators
  - Small negative effects on agricultural area
  - Higher effects for activities with VCS

Change (in %) compared to baseline scenario

	CAPRI	
	Income per ha	**Area**
Utilized agricultural area	-2.07%	-0.40%
Cereals	-2.04%	-0.76%
Oilseeds	-1.83%	-0.42%
Pulses	-2.57%	-0.33%
Potatoes	-0.75%	-0.09%
Sugar beet	-19.87%	-1.04%
Vegetables & permanent crops	-0.36%	-0.09%

Source: CAPRI.

Income per hectare (% change from baseline 2030)



Source: CAPRI.

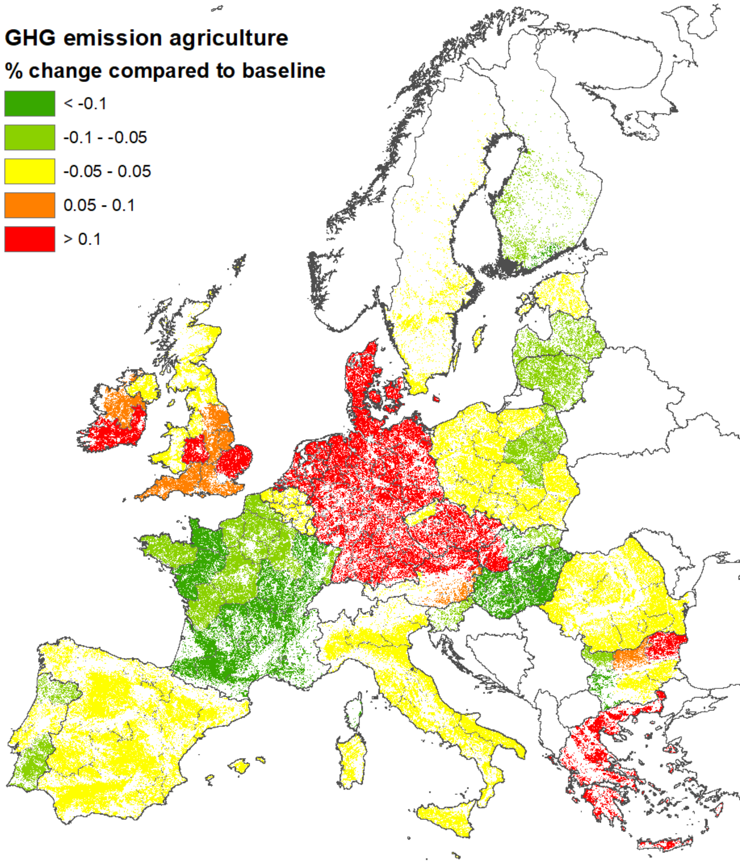
CAP (III)

- Climate and environment
  - Very small, but positive effects of CAP scenario on environmental indicators
  - Only changes in activity data from AGMEMOD, no specific environmental measures applied yet
  - Larger EFA area can be positively for biodiversity

Change (in %) compared to baseline scenario

	MITERRA-Europe	CAPRI
CH_4 emissions	-0.06%	-0.20%
N_2O emissions	-0.20%	-0.33%
GHG emissions	-0.14%	-0.24%
NH_3 emissions	-0.09%	-0.19%
N leaching	-0.22%	-0.20%

Source: MITERRA and CAPRI.



Source: MITERRA.

Sustainable diets scenario (I)

- Impacts are marginal
- In general the (small) reductions in production should lead to a (small) lowering of the EU's self-sufficiency rates.
- The impact of a change in coupled support on product supply depends on the effective price elasticities
  - In AGMEMOD these are much smaller than in CAPRI

	AGMEMOD		CAPRI	
Product	Production	Price	Production	Price
Beef	-0.016	-0.005	-0.220	0.410
Dairy	-0.035	0.025	-0.010	0.070
Sugar	-0.012	-0.075	-0.920	0.070

Percentage deviation from baseline in 2030 (at EU level)

Sustainable diets scenario (II)

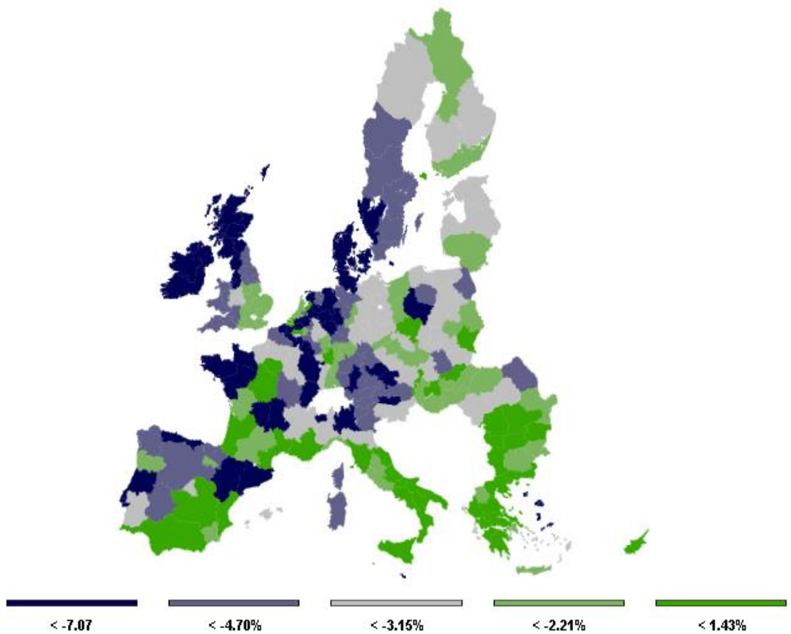
- Area and income effects
  - Negative effects of MHM scenario on income indicators
  - Small negative effects on agricultural area
  - Higher effects for cereals

Change (in %) compared to baseline scenario

	CAPRI	
	Income per ha	**Area**
Utilized agricultural area	-4.86%	-0.17%
Cereals	-2.28%	-0.58%
Oilseeds	-0.61%	0.04%
Pulses	-2.39%	2.41%
Potatoes	-0.61%	-0.13%
Sugar beet	-1.86%	0.83%
Vegetables & permanent crops	-0.26%	-0.11%

Source: CAPRI.

Income per hectare (% change from baseline 2030)



Source: CAPRI.

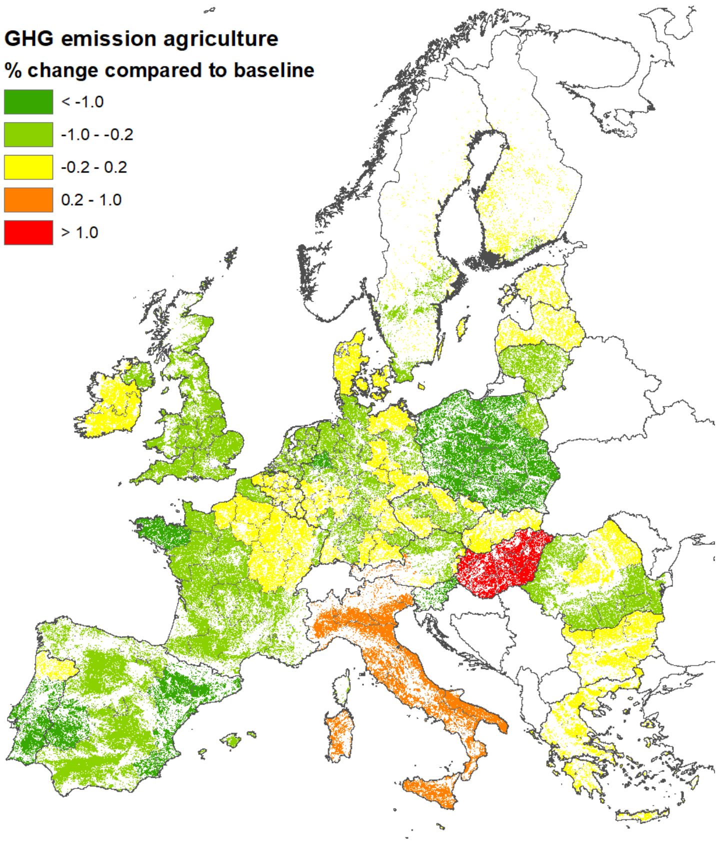
Sustainable diets scenario (III)

- Climate and environment
  - Consumption scenario decreases emissions in livestock sector
  - AGMEMOD-MITERRA main decrease in pig numbers, and associated emissions
  - CAPRI also decrease in cattle and related emissions

Change (in %) compared to baseline scenario

	MITERRA-Europe	CAPRI
CH_4 emissions	-0.70%	-2.01%
N_2O emissions	-0.27%	-1.31%
GHG emissions	-0.47%	-1.70%
NH_3 emissions	-1.18%	-2.07%
N leaching	-0.31%	-1.65%

Source: MITERRA and CAPRI.



Source: MITERRA.

Long-term climate mitigation: Selected results

Stefan Frank, Petr HAVLIK, Andrzej Tabeau, Heinz Peter Witzke, Hans van Meijl, Michiel van Dijk, Tamas Krisztin, Hugo Valin

IIASA

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

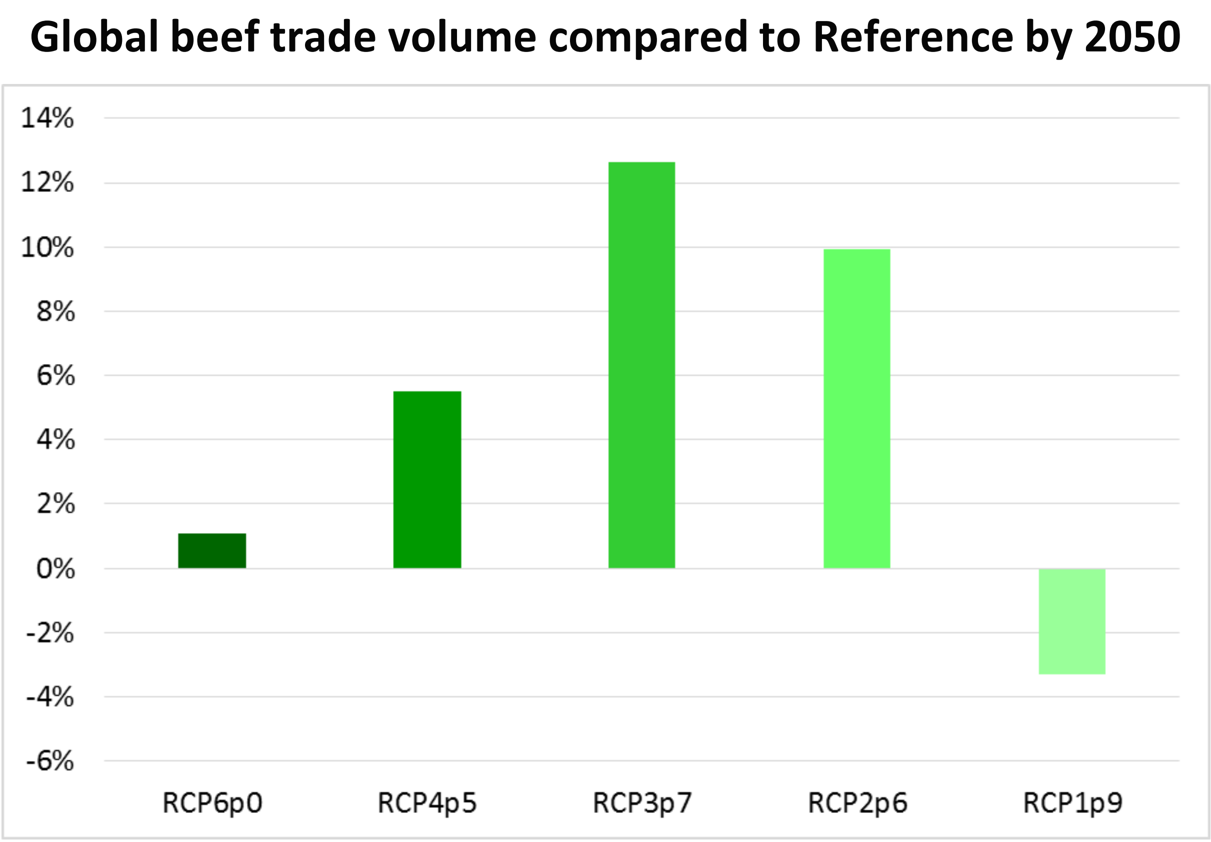
suprema

EU climate mitigation policies

- <u>2030 targets/NDC:</u> 40% GHG reduction
  - -43% ETS: covering power plants and large industrial installations
  - -30% non-ETS covering smaller industries, transport, ag. non-CO_2 …
  - Limited access to LULUCF credits
    No specific target for agriculture yet
- European Green Deal: 50-55% GHG reduction by 2030
- <u>2050 climate strategy:</u> GHG neutral by 2050
  - Long-Term Strategy “A clean planet for all”

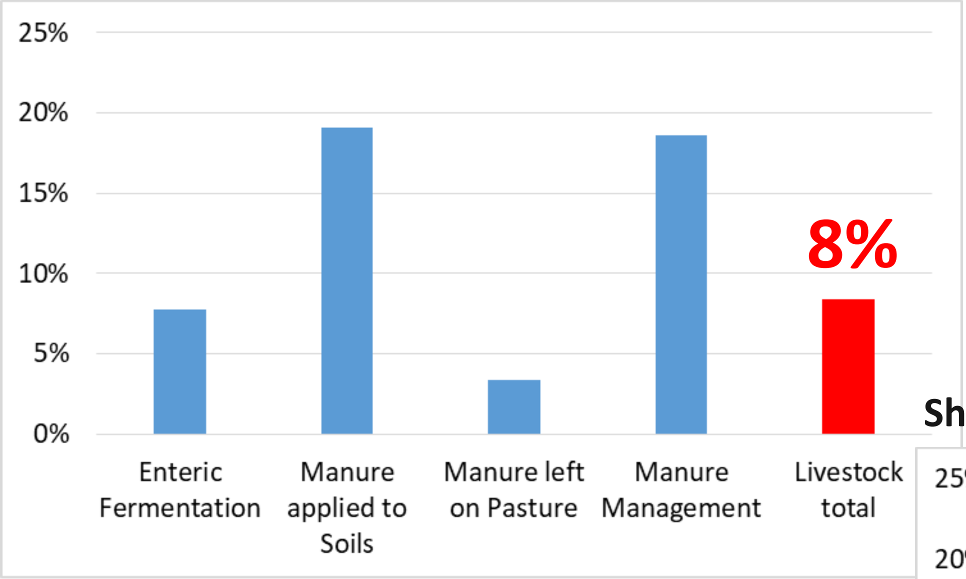
Trade as means of mitigation

- Under a coordinated climate policy – uniform carbon tax



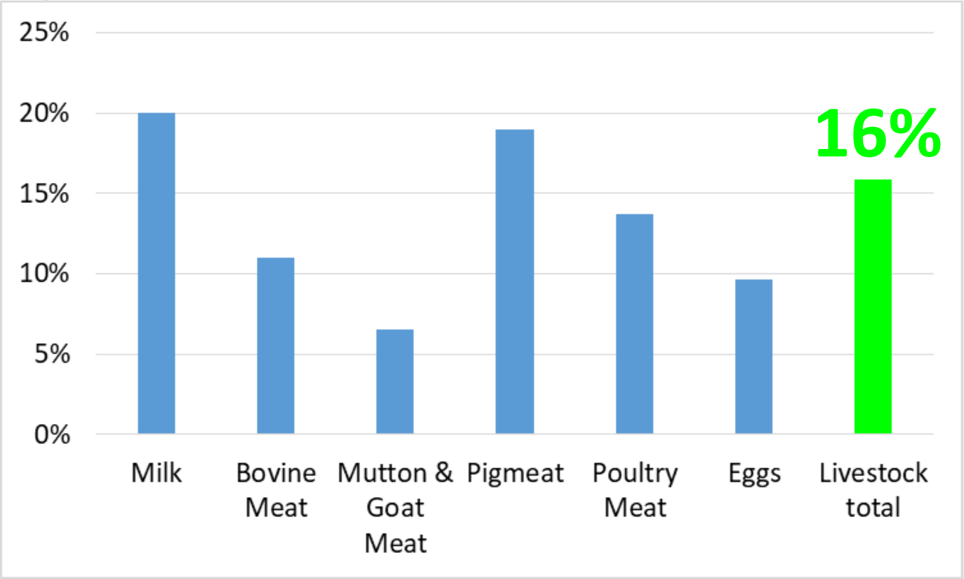
Highly GHG efficient EU agricultural sector

Share of EU livestock emissions in Global emissions



Source: FAOSTAT

Share of EU livestock production in Global production



suprema

“the Commission will propose a **carbon border adjustment mechanism**, for selected sectors, to reduce the risk of carbon leakage”

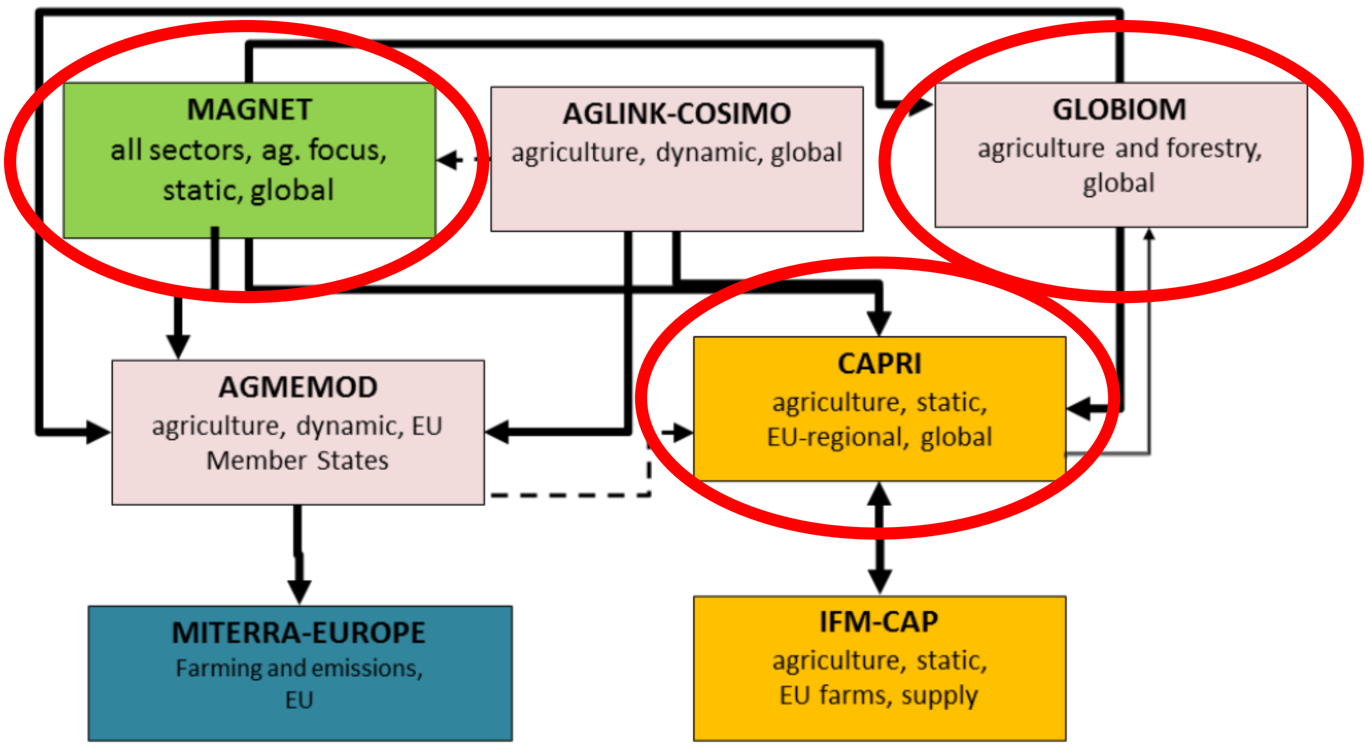
Narratives and SUPREMA Toolbox

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

SUPREMA Long-term Narratives: Final

- Focus on 1.5°C target (1p5deg)
- Focus on non-CO2 emissions from agriculture (AG)
- Nuanced assumptions on Buy-In from the Rest of the World
  - RoW carbon price a fraction of EU carbon price implemented on non-CO2 emissions from agriculture (0%, 5%, 10%, 25%, 50%, 100%)
- Trade policy assumptions
  1. Current trade policies
  2. Trade liberalization – tariffs on agricultural commodities eliminated by 2030

SUPREMA Toolbox



GLOBIOM → Forest and energy plantations areas → CAPRI & MAGNET
MAGNET → Energy prices and GDP → CAPRI & GLOBIOM

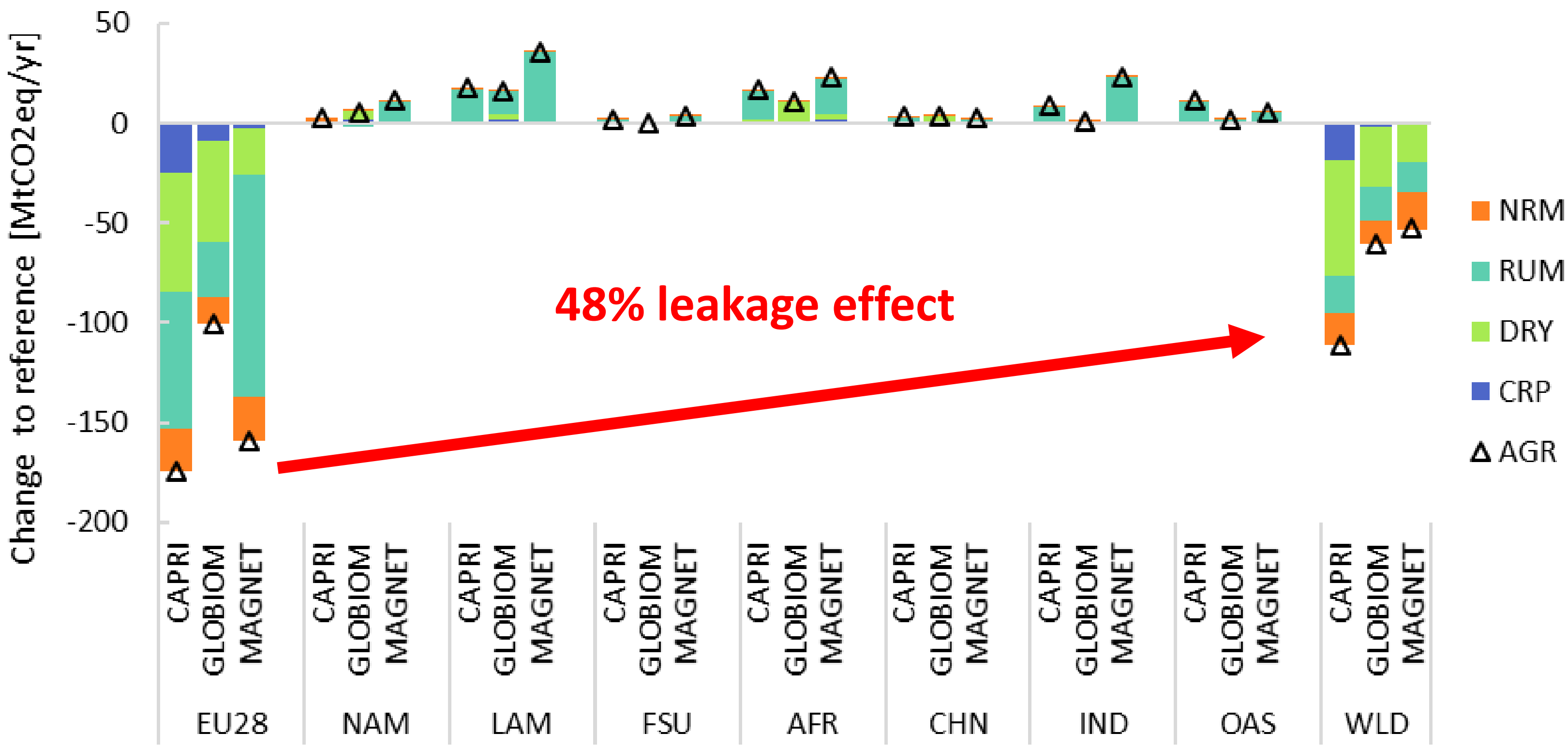
~~Preliminary~~ Results

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

suprema

Even unilateral climate action is beneficial

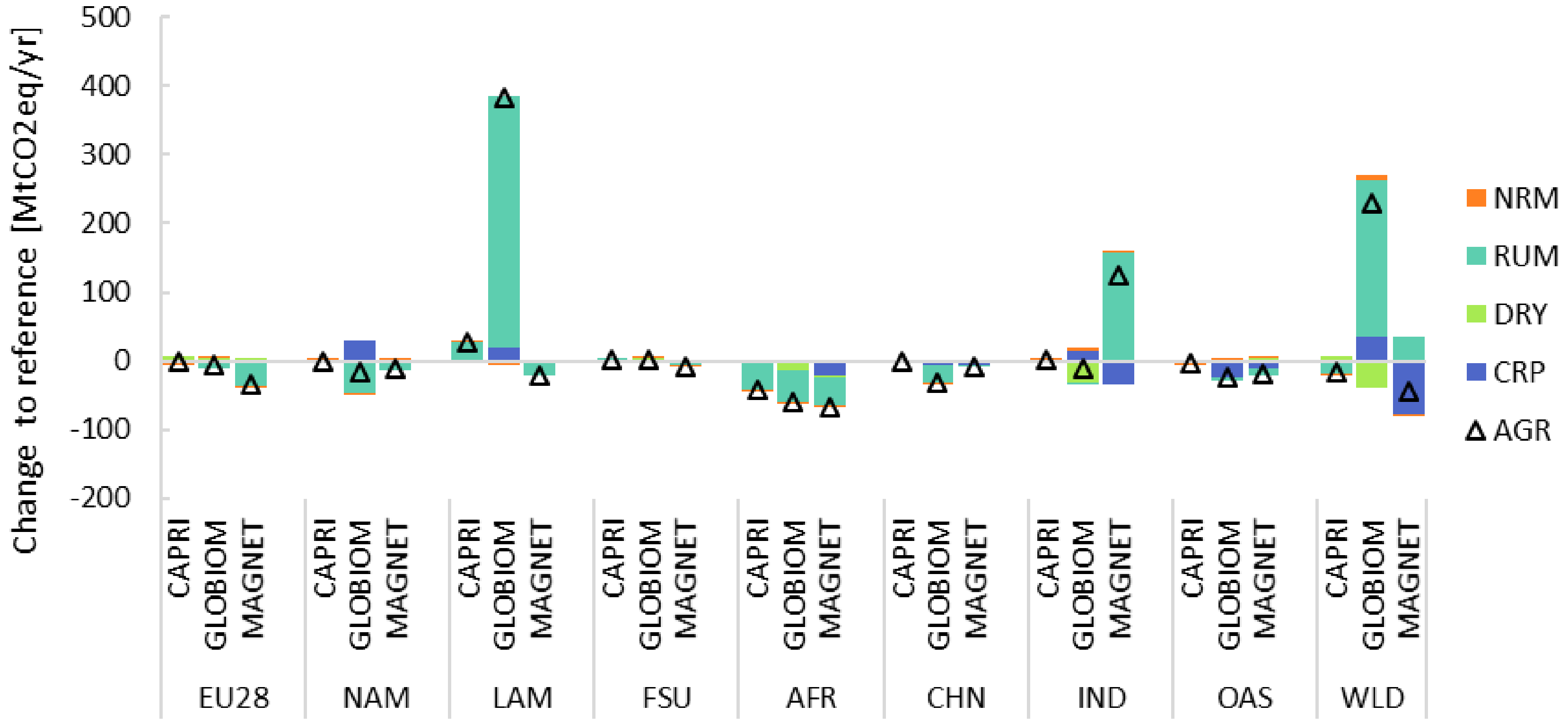
- Unilateral action: Beef & dairy emissions down in EU, for beef largely compensated by increases outside



suprema

Trade liberalization

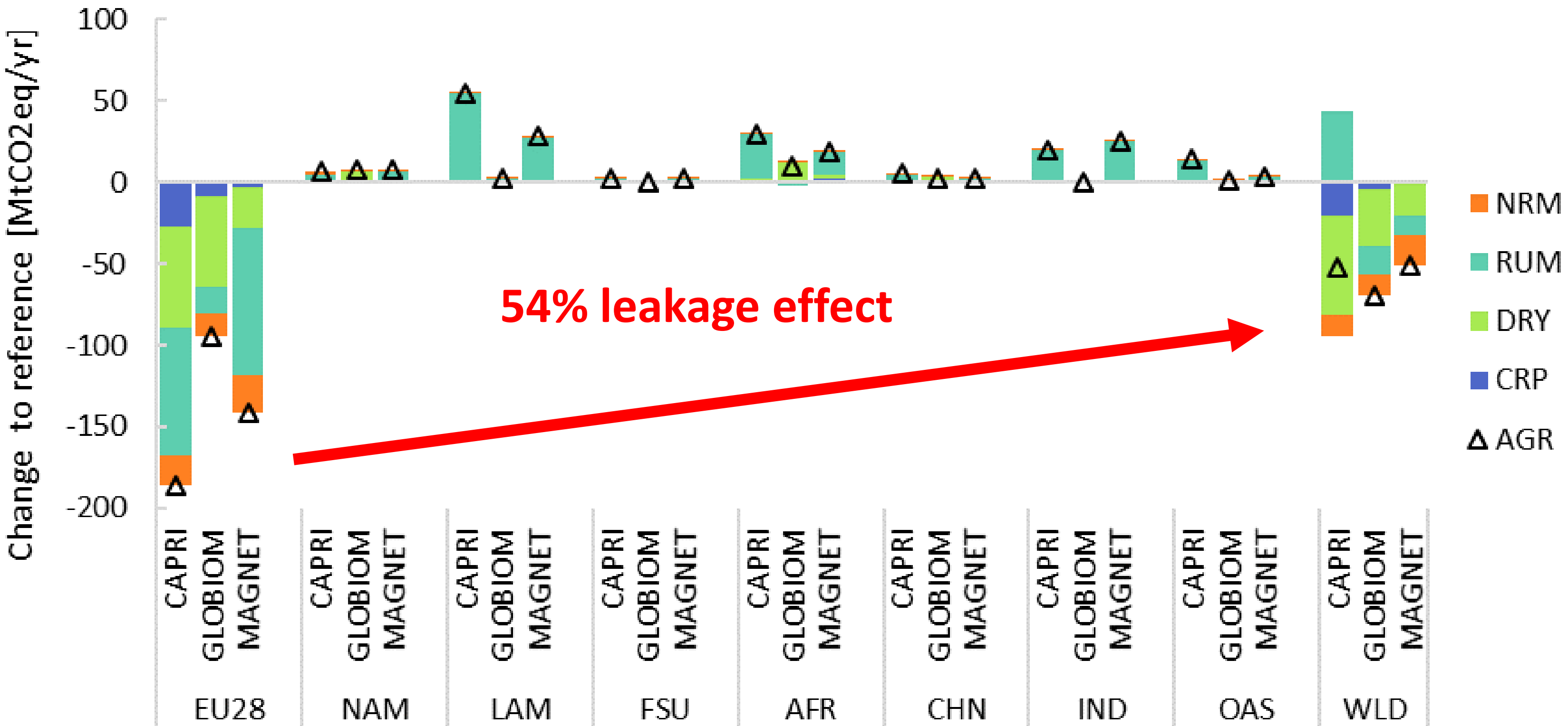
- Trade liberalization alone may lead to increased GHG emissions



suprema

Unilateral action with liberalized trade

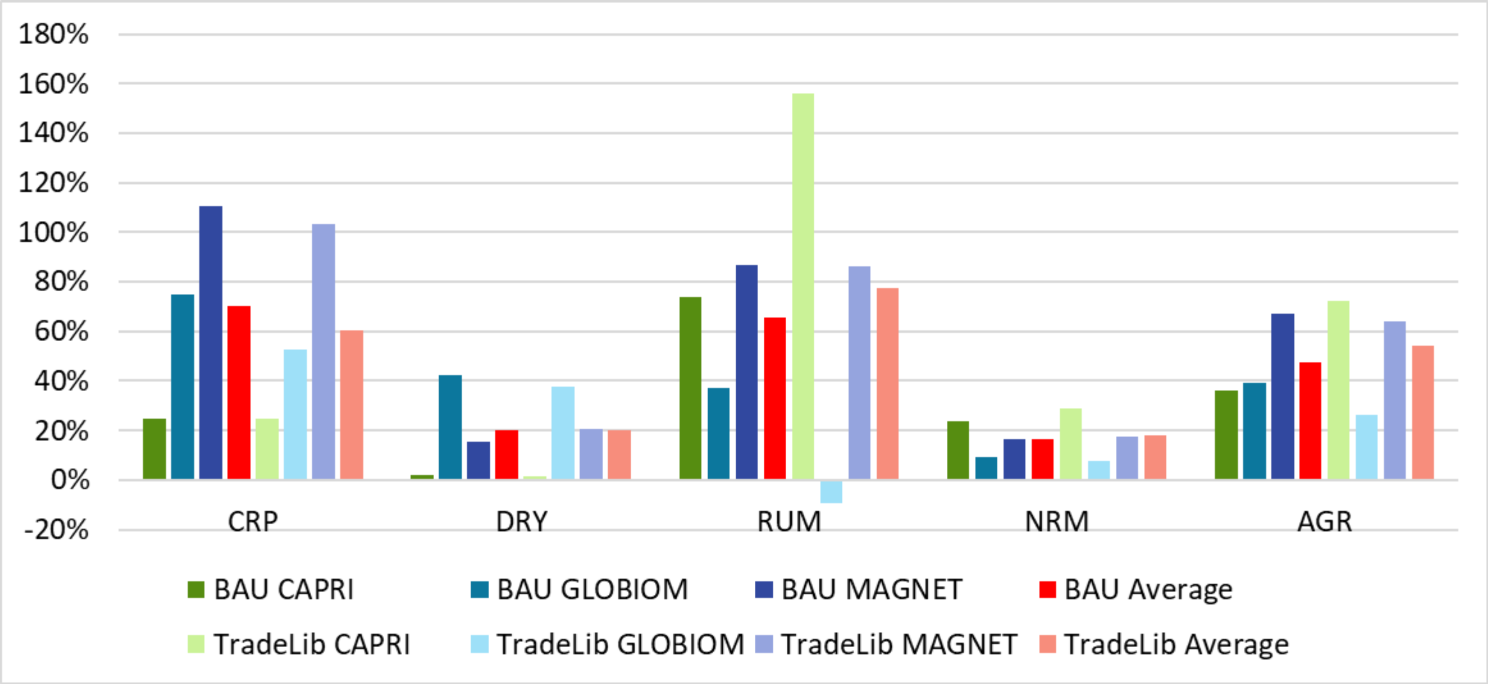
- With liberalized trade, on average slightly higher leakage effect



suprema

Relative leakage overview

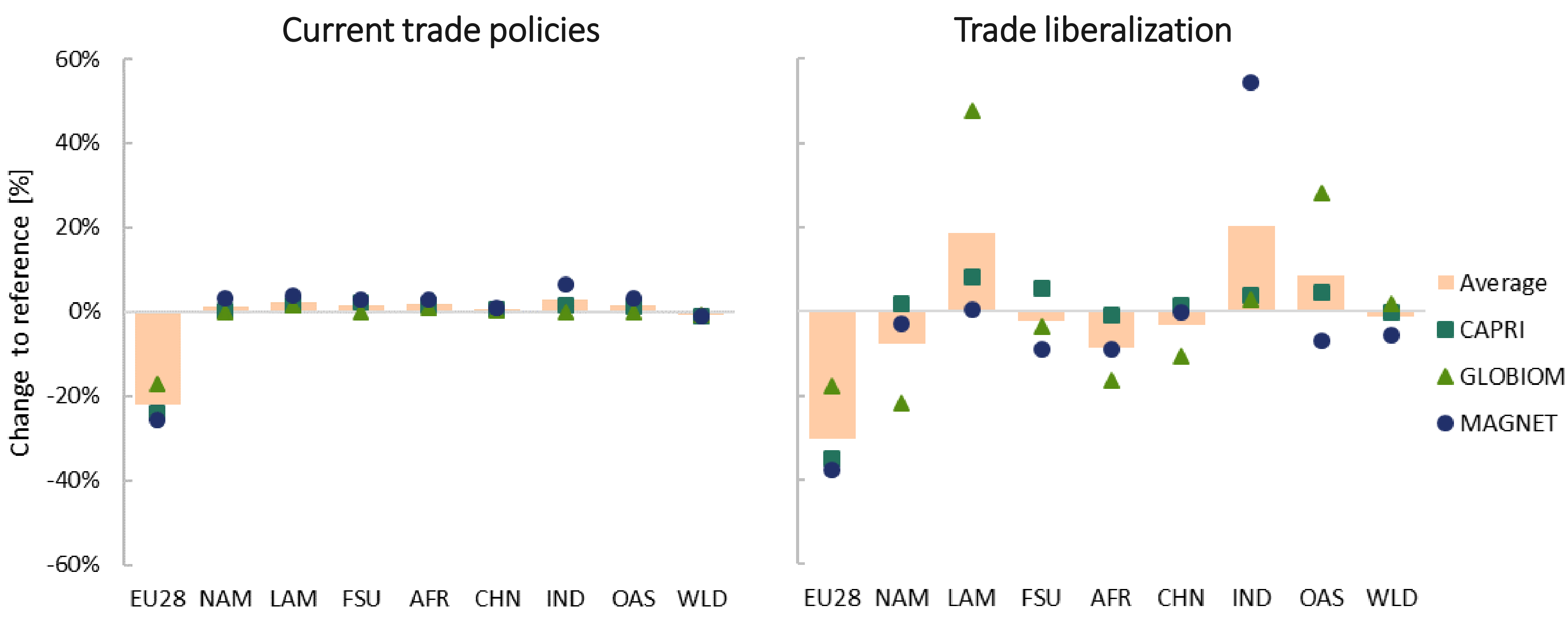
+ Agreement on overall benefits of an unilateral action
- Leakage effect for crops 20-110%
- Under liberalized trade baseline – beef -10-150%



suprema

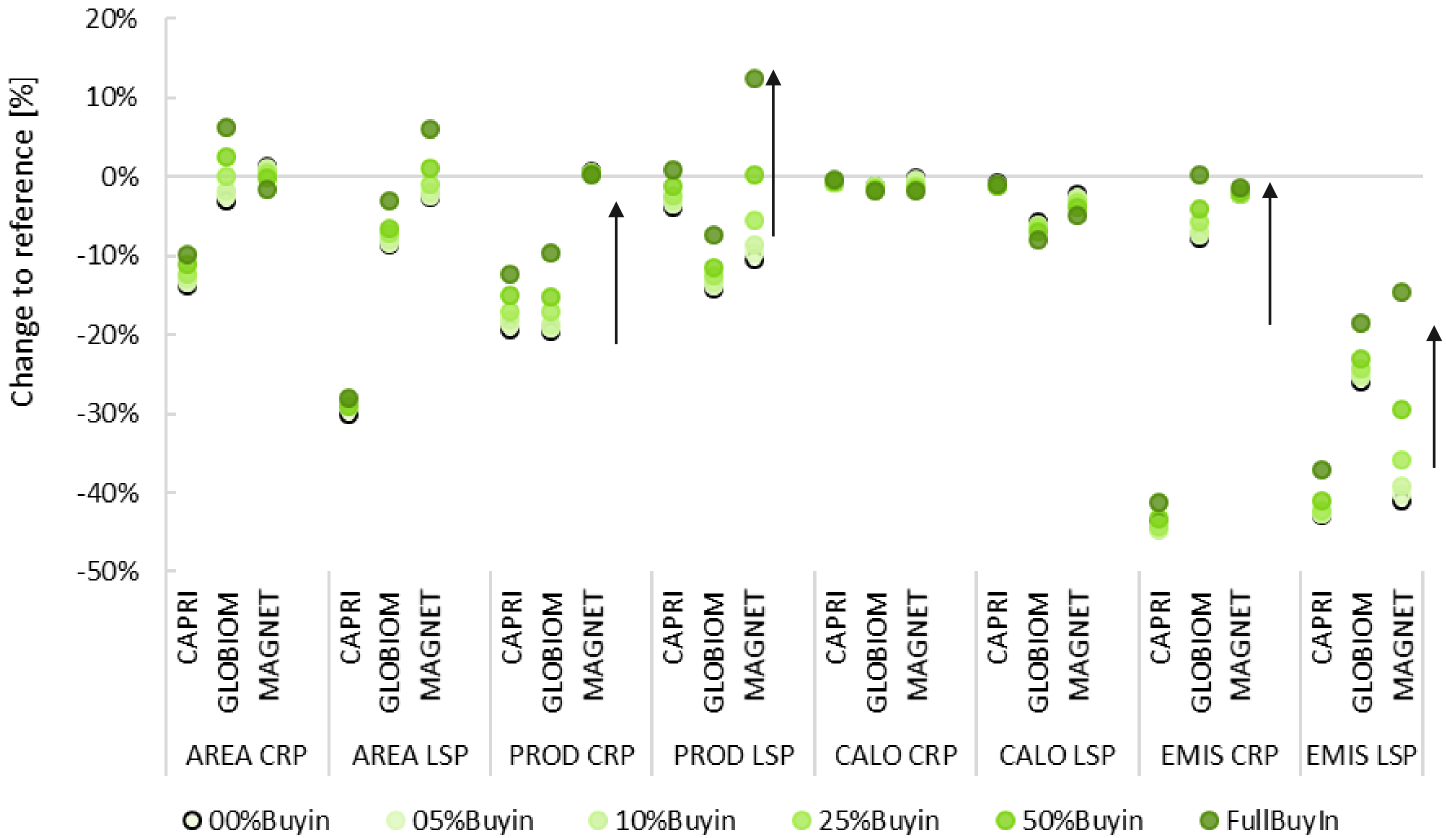
Ruminant production across regions

- Substantial impact on EU ruminant production (-22%)
- Farmers outside the EU benefit from a unilateral policy



EU impacts with increasing ROW efforts

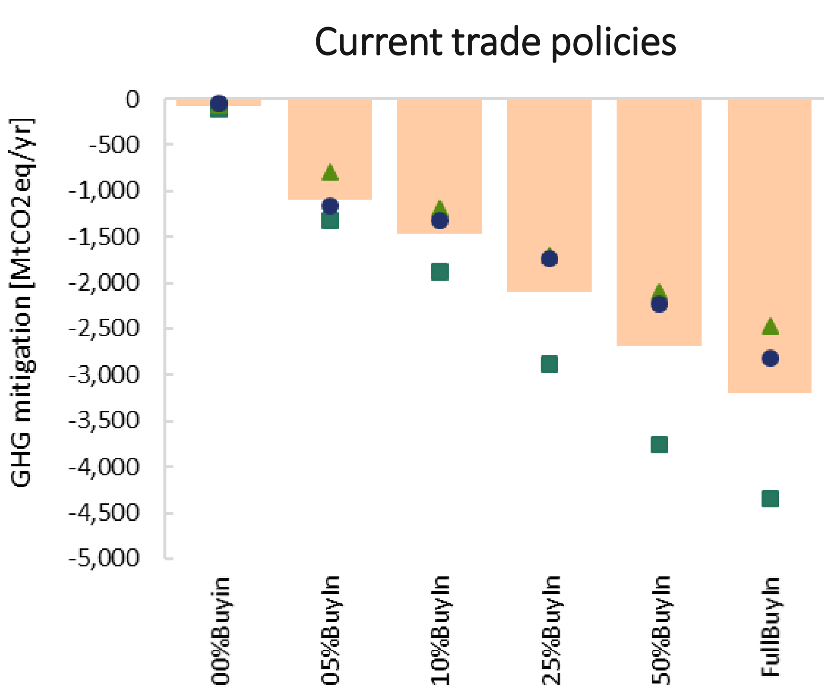
- With increasing ROW efforts, EU farmers benefit due to their GHG efficiency and EU emissions reduction decreases

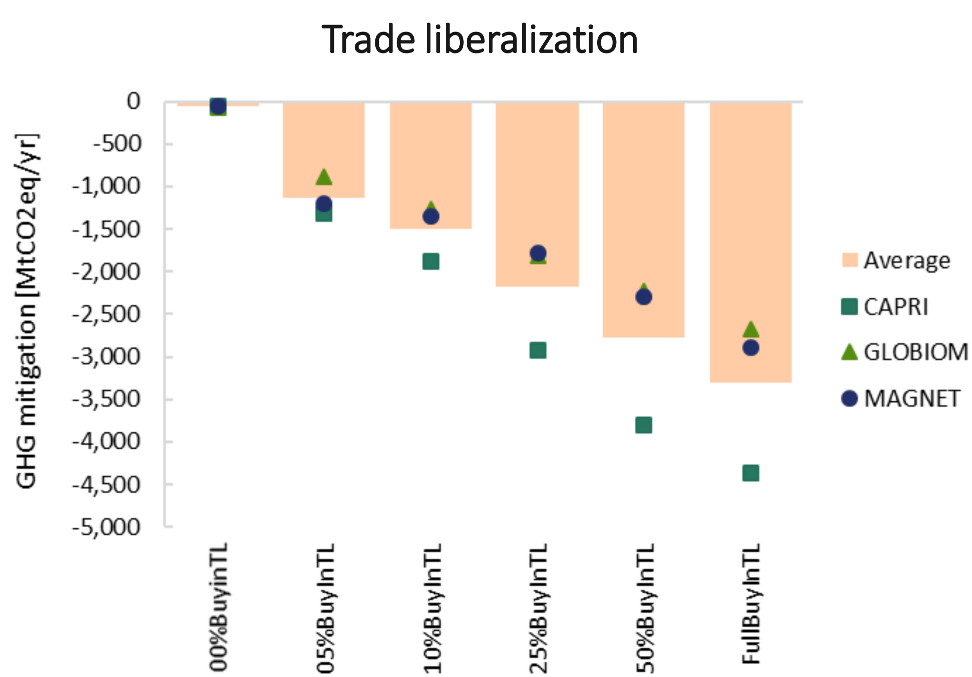


suprema

Coordinated action needed for the ambitious target

- The 10% buy-in scenario achieves already half of the total GHG mitigation potential
- Trade liberalization – small impact on global GHG reduction





Remaining challenges…

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

- Review greenhouse gas emission intensities across models
- Review base year prices and tariffs
- **Re-think how to model international trade in long-term scenarios**

WP 2.2: Model linkages

Alexander Gocht, Sebastian Neuenfeldt, Peter Witzke, Hans van Meijl, Andrzej Tabeau, Roel Jongeneel, Petr Havlík, Stefan Frank, Andre Deppermann et al.

26 June 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

WP 2.2 methods for modelling linkage

- Model chains **without calibration** of the interlinked models (soft linkage)
  - shocks a model with data from another model without considering any further feedback between the interlinked models
  - AGLINK-AGMEMOD, MAGNET-GLOBIOM-CAPRI
- Models with **one-way calibration** (“semi” hard linkage)
  - One model is calibrated to results generated by another model
  - AGLINK-AGMEMOD, MITERRA-AGMEMOD, GLOBIOM-CAPRI
- **Sequential calibration** (hard linkage)
  - Each model uses and produces its own results, there is iterative feedback among the models, e.g. IFM-CAP - CAPRI market Model

suprema

CAPRI-IFM-CAP Linkage

A. Goch, S. Neuenfeldt (A. Petsakos, D. Kremmydas, E. Baldoni, P. Ciaian)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

CAPRI-IFM-CAP link established by …

1. Reducing IFM-CAP execution time by parallel processing & restructuring the simulation
   - IFM-CAP runs in 24 minutes for all regions at a computer HPC
2. Building a new interface for both models based on GAMS Graphical Interface Generator batch facilities
   - pass arguments e.g. iteration or the scenario to the GGIG script
3. Re-establish link between CAPRI Market model with IFM-CAP
   - including animal products and feed demand
4. Testing a scenario for selected countries which assumes to convert non-organic into organic farms (extreme scenario)

suprema

Scenario assumption: costs and yields from FADN analysis

% change in costs comparing non-organic to organic farms in FADN and absolute per hectare over all activities

Country	Mineral fertilizer	Seeding	Plant protection	Other costs including machinery
Belgium	-37%	-37%	-44%	-30%
Denmark	-50%	-15%	-45%	-38%
Germany	-32%	-11%	-40%	0.7%
Ireland	-59%	38%	-52%	11%

% change organic to non-organic farms in FADN & abs per hectare by products (selection) by Nuts2

Crops	Belgium	Denmark	Germany	Ireland
Soft wheat	5.48	4.09	4.27	4.71
	-43%	-40%	-44%	-53%
Rape	2.14	2.63	1.69	2.07
	-52%	-43%	-58%	-48%
Pulses	6.1	3.65	3.13	6.99
	1%	7%	1%	-4%
Potatoes	47.49	36.35	40.46	27.72
	-1%	-1%	-3%	-14%
Sugar Beet	104.86	60.8	80.23	...

Scenario Results: Market Balance EU27

% & abs changes between baseline and conversion scenario at EU level (no intra trade)

	Production - [1000 t]	Human consumption [1000 t]	Imports [1000 t]	Exports [1000 t]
Wheat	134323	64963	3189	17863
	-10%	0%	26%	-25%
Barley	58298	11630	385	8345
	0%	0%	12%	-6%
Oats	10766	1360	478	431
	5%	0%	5%	1%
Grain maize	66516	7460	10984	2753
	3%	0%	6%	-8%
Other cereals	16587	1302	6278	35
	5%	0%	3%	-12%
Pulses	3492	1598	1839	399
	6%	1%	-3%	8%
Beef	6977	8130	1161	10
	-2%	-1%	6%	-11%
Pork meat	23904	20710	181	3186
	-2%	0%	10%	-7%

Price changes with and without the linkages

	Price changes without linkage compared to the baseline		Price changes with linkage compared to the baseline	
	max	min	max	min
Soft wheat	0%	-1%	10%	9%
Rye	-1%	-3%	20%	15%
Barley	0%	-1%	12%	11%
Oats	1%	-1%	16%	13%
Grain maize	4%	0%	7%	6%
Other cereals	9%	0%	20%	10%
Rape seed	-1%	-4%	13%	11%
Sunflower seed	8%	8%	15%	15%
Soya seed	-3%	-3%	6%	6%
Pulses	3%	-1%	6%	-1%
Tomatoes	5%	5%	6%	1%
Apples pears and peaches	2%	2%	8%	6%
Other fruits	2%	-9%	4%	-8%
Other industrial crops	5%	-5%	5%	-5%
Fodder maize	3%	0%	8%	4%
Beef	2%	-2%	9%	7%
Pork meat	1%	1%	20%	3%
Sheep and goat meat	-7%	-7%	8%	7%

Conclusion

- Linkage is **operational** and **applicable**
- Current application is still a **didactic approach**, rather than a proof the concept, and needs further elaboration
- More **indicators** for income and environmental analysis derived from IFM-CAP are required
- Extend to **all** region in EU

GLOBIOM - CAPRI
GLOBIOM - MAGNET- CAPRI

H.P. Witzke et al.

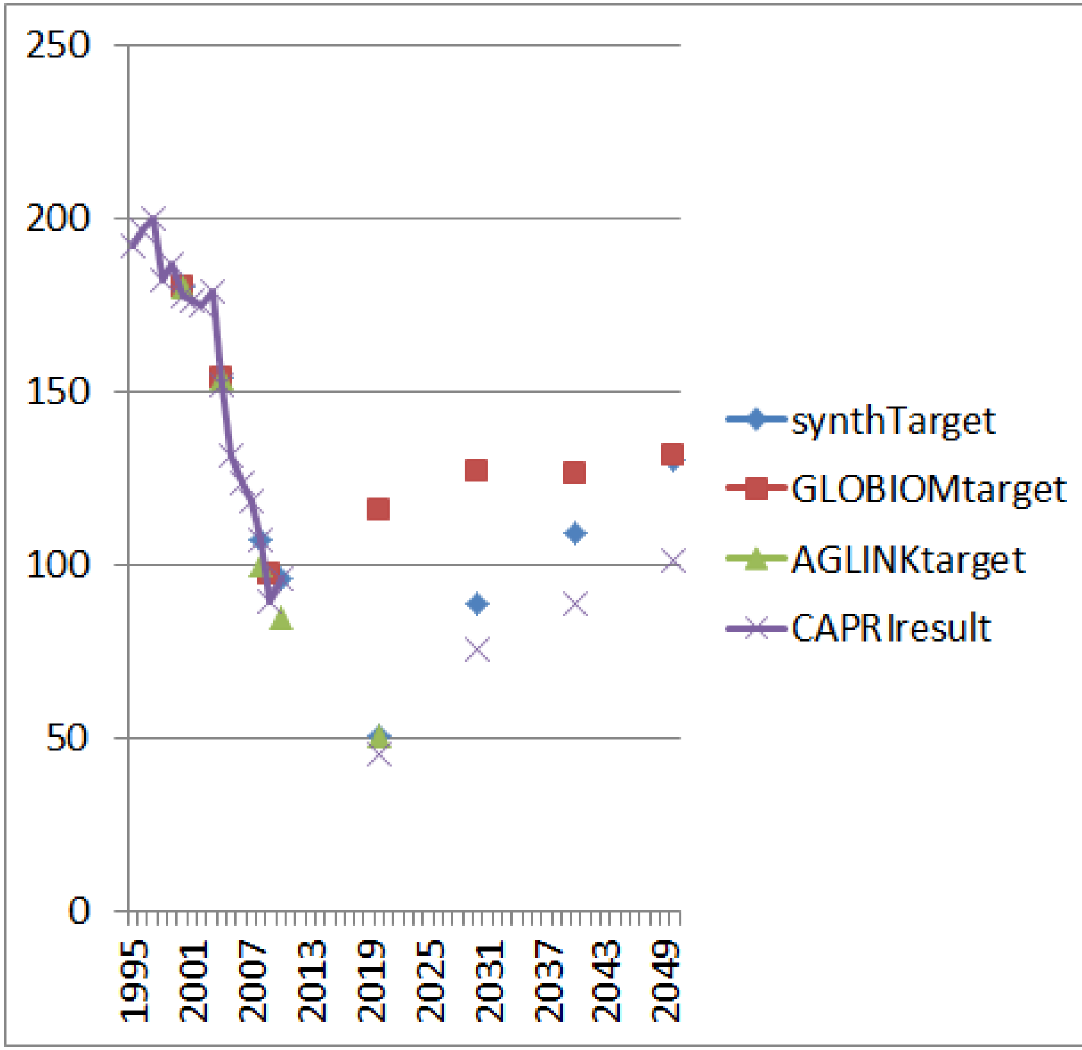
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

AGLINK-GLOBIOM to CAPRI linkage (1)

- **Context**: CAPRI has abandoned stand alone **baseline** work since about 2005 in view of consistency with DG Agri outlook
- External projections are required inputs for baseline
  - AGLINK-COSIMO with estimated parameters and model review process, tailored to medium run horizon (2030)
  - GLOBIOM with detailed technology representation in LP framework and long run projections (2050 and beyond) partly aligned with FAO
- Supplemented with trends (constrained to meet technical requirements) for disaggregation of key variables or sectors not covered in AGLINK/GLOBIOM like F&V

AGLINK-GLOBIOM to CAPRI linkage (2)

- Pork production in example country trending downward
- Same for AGLINK outlook
- In long run: global demand growth => GLOBIOM sees some expansion
- Smooth transition expected => synthetic (ad hoc) target
- Integration of information is contrained by model, but weights = judgement
- Robust and flexible procedure



GLOBIOM – MAGNET- CAPRI linkage (1)

1. Independent carbon price scenarios by GLOBIOM, MAGNET, CAPRI
2. GLOBIOM (presumably best model for land use) provides effects on forest and bioenergy plantation areas to MAGNET + CAPRI
3. MAGNET reruns scenario with exogenous area information from GLOBIOM and provides adjusted effects on GDP and energy (and other input) prices to CAPRI+GLOBIOM
4. CAPRI+GLOBIOM rerun scenarios with MAGNET information on GDP and energy prices (and forest/plantation areas for CAPRI)
5. A statistical analysis (of #1 vs. #4) with investigate if linked results are more consistent than independent results (=> ppt Tamas)

suprema

GLOBIOM – MAGNET- CAPRI linkage (2):
GLOBIOM to MAGNET

- Baseline: Additional energy crop areas (from GLOBIOM) are translated into additional exogenous demand for land suitable for agriculture
  - No shift of agricultural land supply (alternative option)
- Scenario : Afforestation plus additional energy crop areas (from GLOBIOM) are translated into exogenous shift of agricultural land demand
  - No shift for afforestation, if agri_land(GLOBIOM)> agri_land(MAGNET)
- Results in scenario (2040):
  - Agric land use: -13.7%
  - Agric production: -5.8%
  - Agric Price: +53.6%

suprema

GLOBIOM – MAGNET- CAPRI linkage (3):
GLOBIOM to CAPRI

- Absolute changes in GLOBIOM area shares of forestry are applied to CAPRI
- Current method: “closure swap” in multinomial logit land supply system (“forestry constant” becomes variable)
- Energy crop area is currently exogenous and hence easy to shock
- For EU regions we implement shifts in cropland + grassland
  - Required to due to current area allocation mechanism for non-agri land
- Results of partial linkage are heterogenous (for cropland):
  - Non-EU (~World): with linkage : -1.7%, without: -2.1%
  - Russia : with linkage : +46%, without: -1.3%
  - EU: with linkage: -4.3%, without: -54%

suprema

GLOBIOM – MAGNET- CAPRI linkage (3): MAGNET to CAPRI

- MAGNET provided price changes for nonagricultural prices and cost shares (labour, capital, petrol, electricity, other energy, fertilizer, services, other) separate for crop and animal sectors and EU/non-EU
  - In non-EU +172% increase in input prices for crops and + 28% for livestock
  - In EU supply models input price changes were mapped to activities
- Results from partial linkage (for production)
  - EU F&V, with : -1.6%, without -10%
  - Non-EU F&V, with : -6.2% witout +2.2%
  - EU meat, with : +3%, without -0.8%
  - Non-EU meat, with : -8%, without -5.7%

suprema

GLOBIOM – MAGNET- CAPRI linkage (5): MAGNET to GLOBIOM

- GDP changes from MAGNET are considered as demand shifters for agriculture and forestry
- Energy cost per activity unit are identified, checked, and shocked according to MAGNET energy price changes
- Fertiliser cost per activity level is also identified, checked, and shocked according to the change in energy prices * 55%
- Results
  - Energy cost shares increase by about 10 percentage points
  - WLD, PROD, cereals, with : -12.8%, without -11.4%
  - WLD, PROD, meat, with : -14.8%, without -13.2%

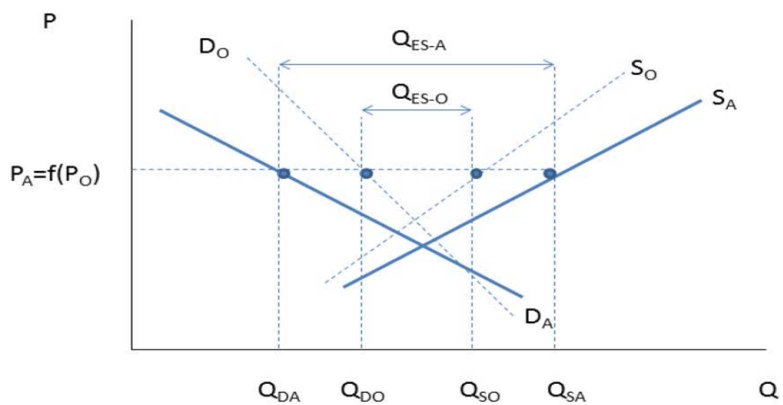
AGLINK-AGMEMOD

Petra Salamon, Martin Banse, Max Zirngibl

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

Linkage AGLINK-AGMEMOD

- AGMEMOD from AGLINK
  - Marco data & policies EU Mid-term-Outlook (MTO) & world market prices
  - EU15(EU14) / EU13 aggregates of relevant variables (for example area)
  - “scaling” down or up of AGLINK results at MS-level to match AGLINK with coefficients for EU15 (EU14) und EU13
- Validating outcomes by national market experts and respectively re-estimation

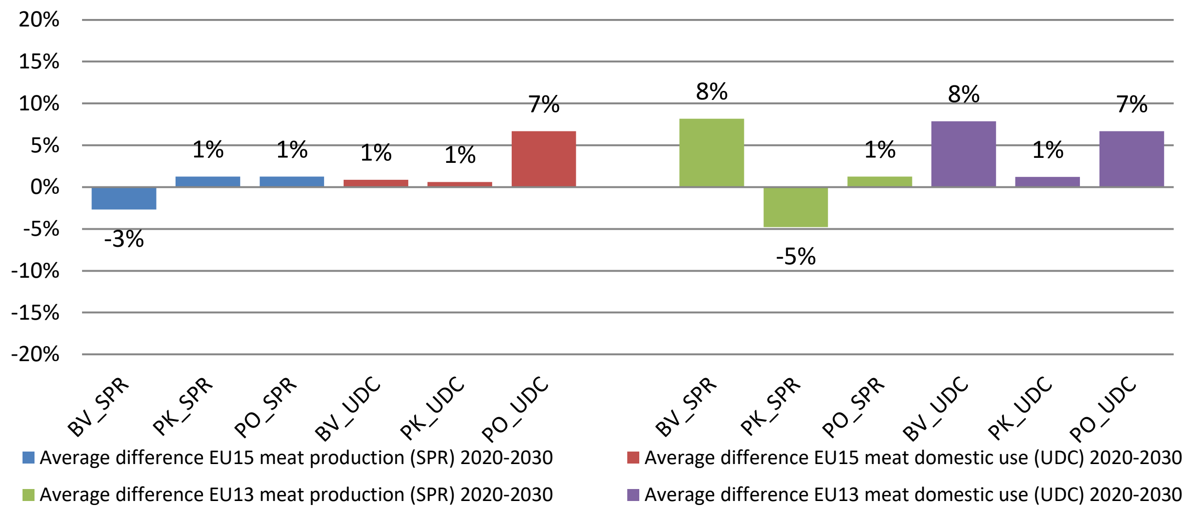


Source: own elaboration.

- Comparison of AGMEMOD (superscript A) with external outlook of AGLINK (superscript O)
- Endogenous equilibria likely to be different:
  - Compared with AGLINK, AGMEMOD model over- or under estimates EU use
  - $Q_{ES\text{-}A} > Q_{ES\text{-}O}$ or $Q_{ES\text{-}A} > Q_{ES\text{-}O}$

Outcomes

Average differences in meat production (SPR) and meat domestic use (UDC) in the EU-15 and EU-13



- Conclusions
  - Workable approach
  - Improvements possible
    - Considering quality of MS outcomes in scaling
    - Entropy approach
    - Feedback loops
  - Problem: Regional market expert validation on top with very detailed information (example poultry or pork in EU13)

AGMEMOD-MITERRA

Ana Gonzalez Martinez, Roel Jongeneel, Jan Peter Lesschen

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

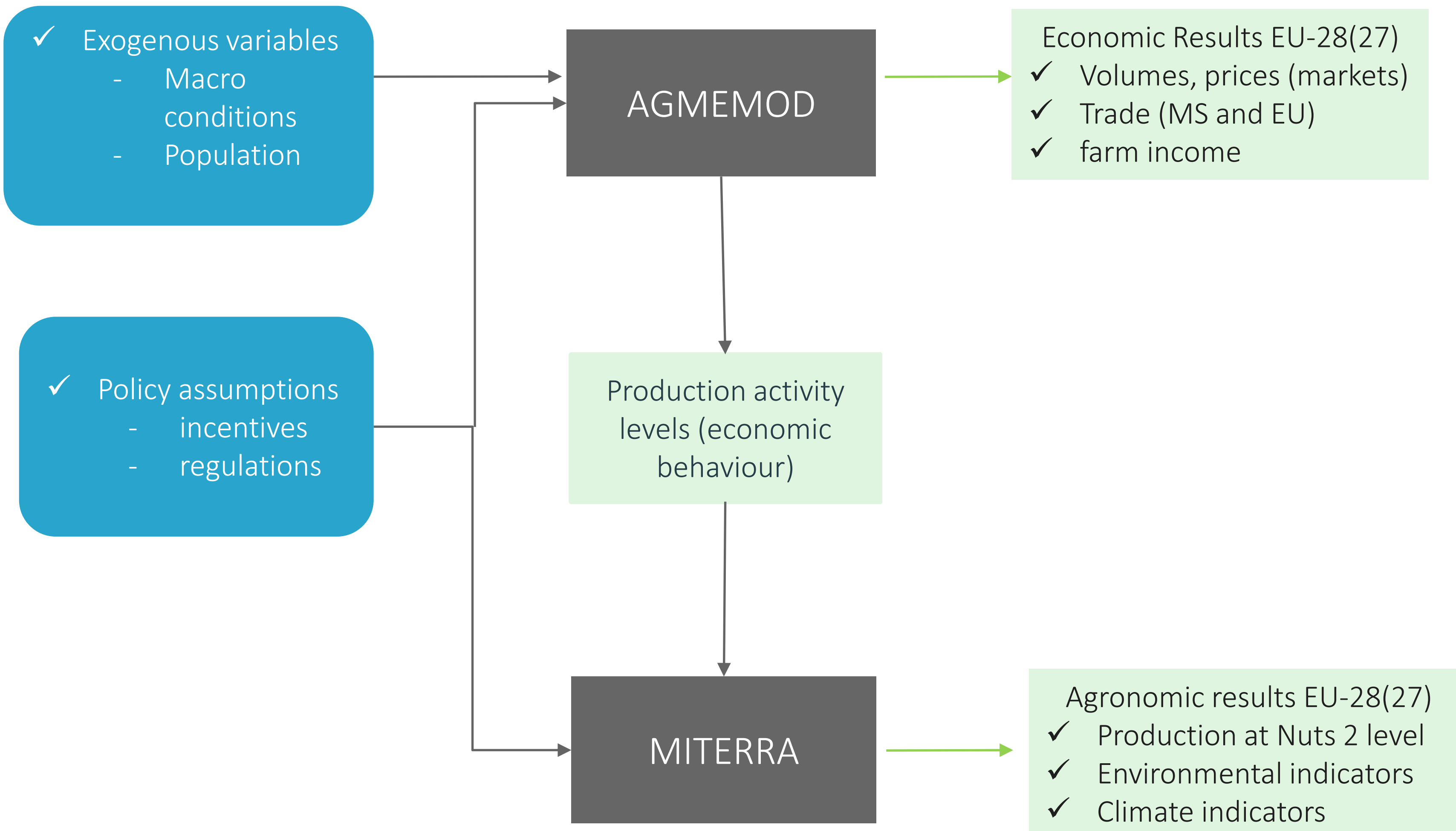
Linkage AGMEMOD-MITERRA

CONCEPT

- By linking AGMEMOD and MITERRA
  - We develop a tool that can support policy makers with providing scenario analysis and (ex-ante and ex-post) impact assessments with respect to climate action and nutrient flow related policy measures

- Within this system
  - Farmer behaviour is represented by AGMEMOD (which drives activity choice and levels)
  - Environmental and bio-diversity indicators are delivered by MITERRA

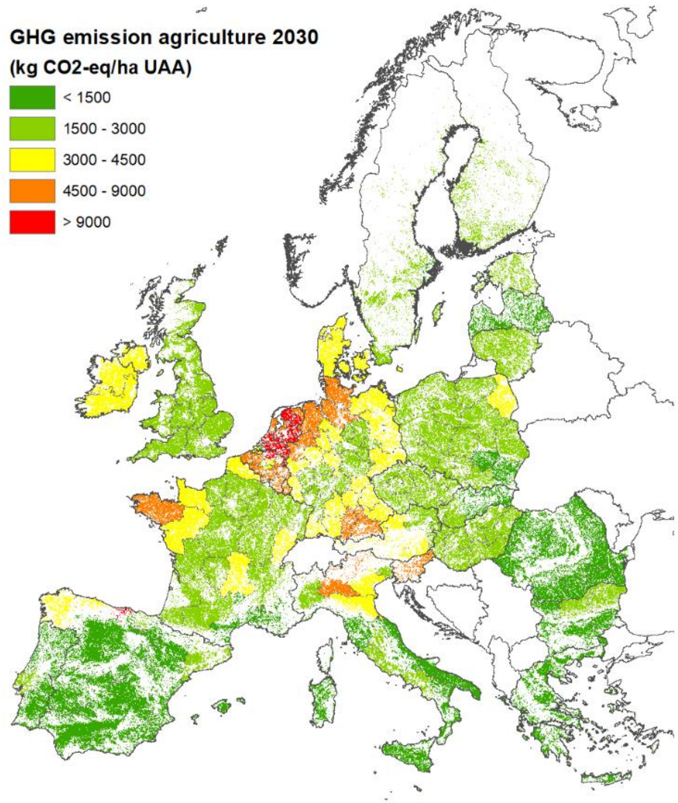
Linkage AGMEMOD-MITERRA



suprema

Linkage AGMEMOD-MITERRA

OUTPUT



AGMEMOD-MITERRA linkage – results for GHG emissions from agriculture

Linkage AGMEMOD-MITERRA

WAY FORWARD

- OBJECTIVE: Further development of the existing linkage
  - Develop a refined model-linkage methodology which accounts for potential interaction and feed-back effects between both models
  - Improve the linkage of the feed part of both models
    - Feed use (more detailed in MITERRA)
    - Feed market (represented in AGMEMOD)
  - Use of a policy optimization tool to represent interactions and overlapping legislation => hybrid tool to steer both models

MAGNET-AGMEMOD

Ana Gonzalez Martinez, Roel Jongeneel

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

suprema

Linkage MAGNET-AGMEMOD

RATIONALE

- Most agricultural models assume:
  - Representative farms
  - Perfect competition
  - Price transmission is: econometrically estimated/exogenously determined
- Deviations from perfect competition may significantly alter the modelling results with respect to:
  - Price transmission between the various stages of the supply chain,
  - Responses of market actors (suppliers, processors, retailers, consumers)
  - The effects on producer and consumer surplus resulting from changes in agricultural policies

Linkage MAGNET-AGMEMOD

ASSESSMENT MAGNET & AGMEMOD

- MAGNET: whole economy (and supply chains) are presented by adding ‘services’ to a primary product to create a transformed final consumer product.
- AGMEMOD: sometimes include selected processing stages (e.g. dairy processing, slaughterhouses, sugar beet processing, oilseed crushing) but omit others (e.g. retail sector)
- No industry structure-variables, such as concentration ratio’s or the share of cooperatives are included as explanatory variables in price transmission equations
- Price transmission equations in both models are symmetric

Linkage MAGNET-AGMEMOD

<u>WAY FORWARD</u>

- When focusing on
  - Specific policy measures aimed at influencing industry behavior or the position of farmers within the supply chain, e.g. CAP measures with respect to producer groups, leakage of support, impact of certain ways of contracting or integration along supply chains on farmer earnings
    - **Sector models are insufficient**

- Supply chain models
  - targeted equilibrium displacement models should be developed and combined with large scale models

End

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

Statistical test of linkage effects

Petr Havlík, Tamás Krisztin, IIASA

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

A statistical model to evaluate linkage

We measure dispersion of model results pre- and post-linkage.

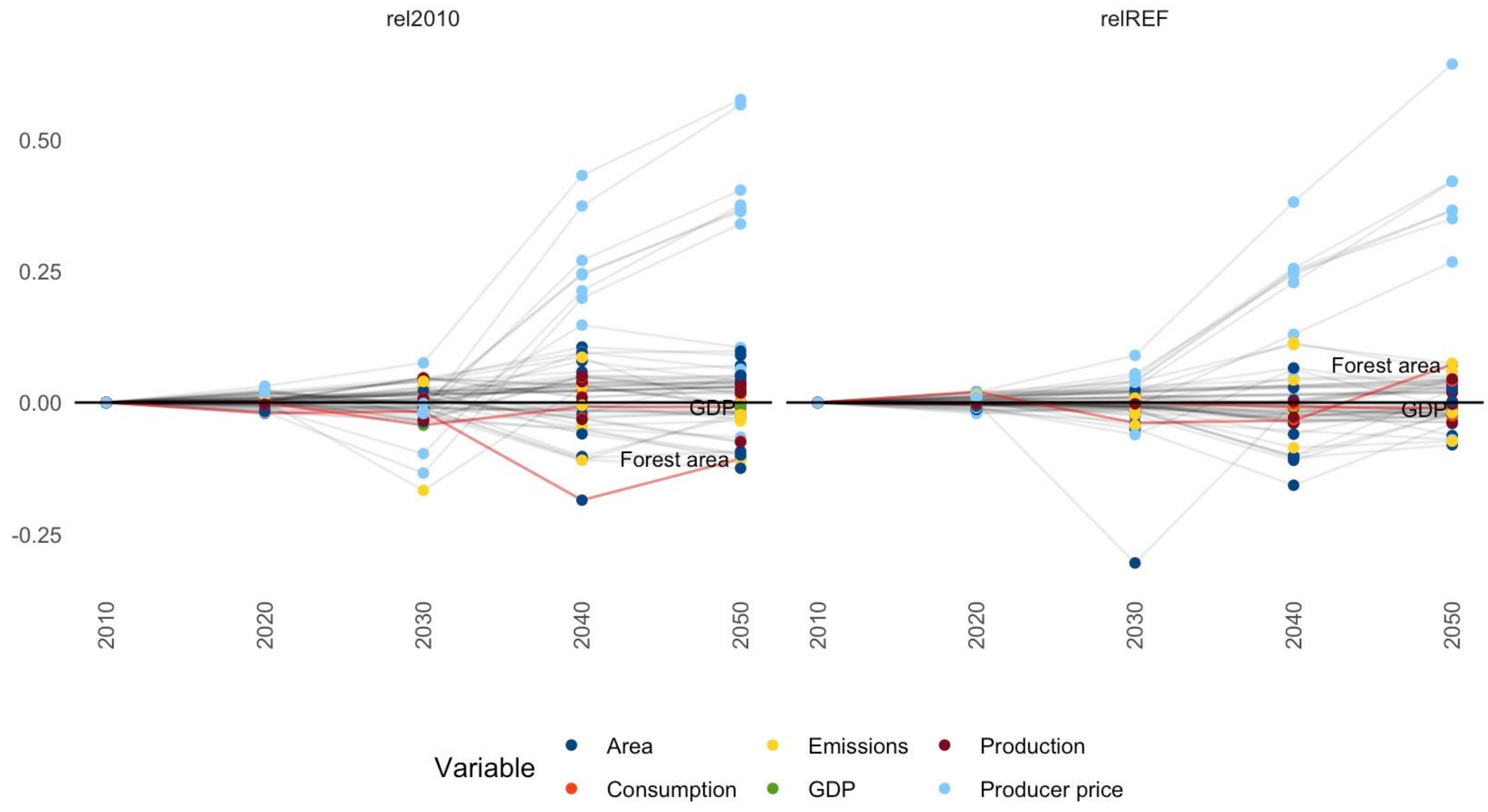
Our measure of dispersion is the coefficient of variation (CV) across models

$$y_i = X_i'\beta + \varepsilon_i$$

- y_i … difference between CV pre- and post-linkage
- X_i' vector of binary variables for each item, region, etc
- ε_i Gaussian error with zero mean and heteroscedastic variances

Due to the number of items/regions, model is overspecified; we use Bayesian shrinkage

Global results



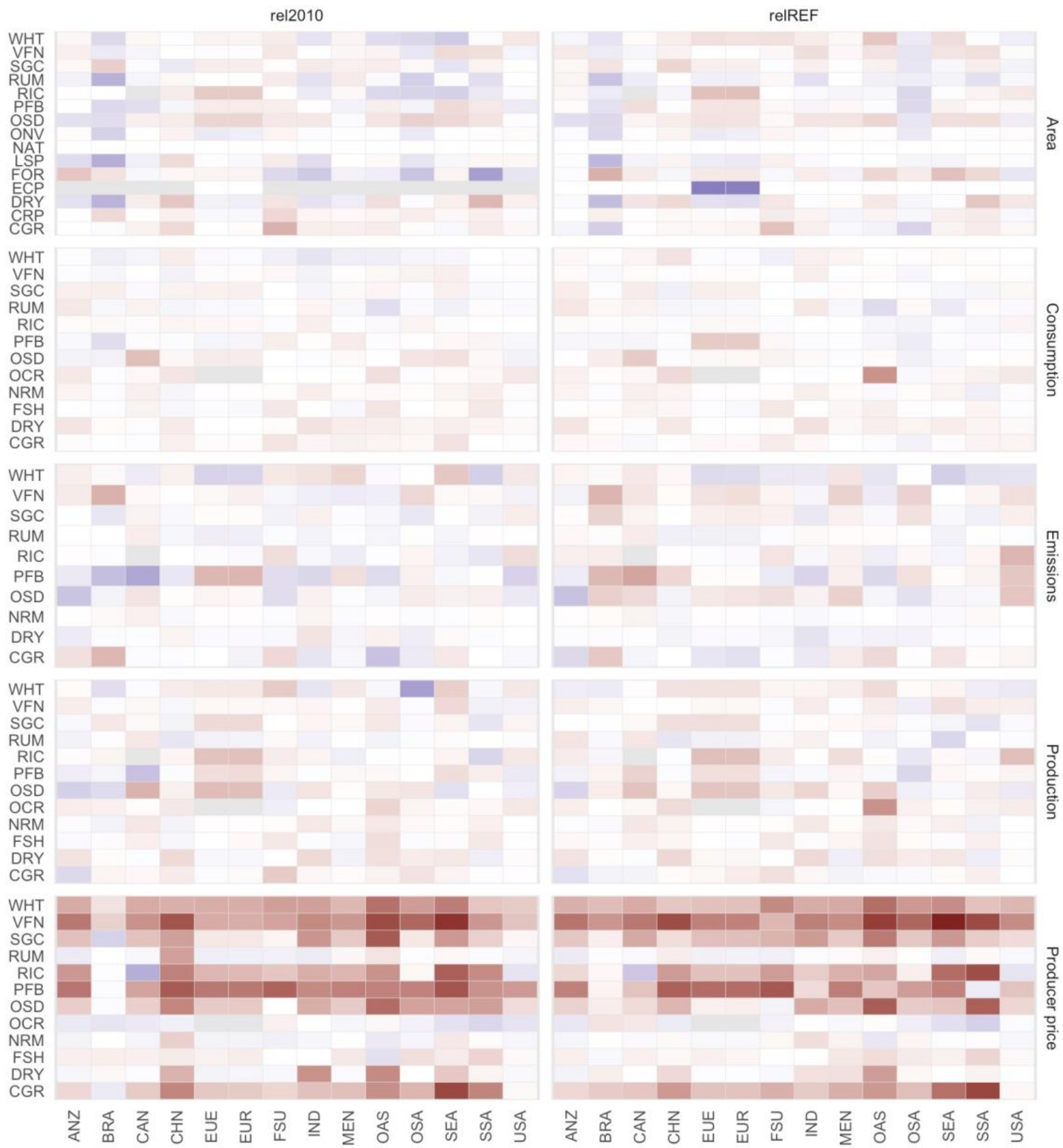
suprema

Global regression results

Coefficient		Rel2010 Mean	Rel2010 Std. Dev.	RelREF Mean	RelREF Std. Dev.
Items	CGR	**0.092**	**0.044**	**0.094**	**0.040**
	CRP	-0.001	0.124	-0.005	0.123
	DRY	-0.025	0.061	-0.059	0.062
	ECP	-0.052	0.125	-0.095	0.119
	FOR	-0.164	0.126	0.031	0.125
	FSH	-0.085	0.085	-0.092	0.088
	LSP	-0.078	0.131	-0.065	0.126
	NAT	-0.050	0.120	-0.042	0.124
	NRM	-0.095	0.071	-0.080	0.065
	OCR	-0.088	0.096	-0.061	0.085
	ONV	-0.068	0.135	-0.052	0.130
	OSD	-0.021	0.056	-0.048	0.055
	PFB	-0.040	0.061	-0.044	0.056
	RIC	-0.028	0.062	-0.044	0.058
	RUM	**-0.109**	**0.062**	**-0.109**	**0.059**
	SGC	-0.013	0.056	-0.021	0.056
	VFN	-0.008	0.061	-0.028	0.059
	WHT	-0.094	0.060	-0.027	0.057
Variables	Area	-0.008	0.029	-0.009	0.026
	Consumption	0.005	0.042	0.013	0.037
	Emissions	-0.032	0.045	0.012	0.039
	GDP	-0.061	0.153	-0.046	0.118
	Producer price	**0.284**	**0.061**	**0.274**	**0.060**
	Production	0.007	0.043	0.016	0.039
	σ^2	0.007	0.003	0.007	0.002
	Observations	62		62	
	Adjusted R^2	0.397		0.382	

- Positive value indicates divergence, negative divergence
- 95% significant results in bold
- Globally only RUM converging significantly (though many other items are on the mean)
- CGR & producer prices diverging
- Rel2010 and RelREF very similar

Regional CV



- Red indicates pos. CV (divergence), blue negative (convergence)
- Mixed results of convergence
- Producer prices seems to diverge most

suprema

Regional regression results

	Coefficient	Rel2010 Mean	Rel2010 Std. Dev.	RelREF Mean	RelREF Std. Dev.
Items	CGR	**0.035**	**0.012**	**0.022**	**0.012**
	FOR	**-0.078**	**0.035**	0.045	0.030
	FSH	**-0.056**	**0.018**	**-0.031**	**0.018**
	LSP	**-0.061**	**0.031**	-0.042	0.027
	NRM	**-0.047**	**0.017**	**-0.038**	**0.016**
	OCR	**-0.060**	**0.023**	-0.033	0.021
	ONV	**-0.052**	**0.028**	-0.036	0.026
	RUM	**-0.076**	**0.016**	**-0.065**	**0.015**
Regions	BRA	**-0.049**	**0.020**	-0.015	0.018
	CHN	**0.032**	**0.018**	0.018	0.016
	OSA	-0.006	0.018	**-0.027**	**0.017**
	SEA	**0.038**	**0.018**	0.005	0.017
Variables	Producer price	**0.146**	**0.017**	**0.134**	**0.013**
	Production	**0.022**	**0.012**	**0.023**	**0.011**
	σ^2	0.007	0.001	0.006	0.000
	Observations	847		859	
	Adjusted R^2	0.334		0.331	

- Rel2010 higher and more significant avg. convergence than RelREF
- FOR, LSP, OCR, and ONV items, as well as BRA, converge in Rel2010
- Differing results for the OSA and SEA regions (but small)

Conclusions

- Model convergence only partially across regions, items and variables.
- Statistically significant convergence for GDP and forest area. Also meat markets (FSH, RUM, NRM).
- Particularly strong convergence in BRA region.
- However, in terms of producer prices, the models exhibit post linkage a large and statistically significant divergence, which seems to increase over projected time.

Structural differences between the models need to be better understood to improve the linkage outcomes in the future

A Roadmap for agr modelling D1.10

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773499 SUPREMA.

suprema

Set-up

- Structure and content of D1.10
- Key findings / main conclusions by theme
- Recommendations
- Discussion

Table of contents

From needs

Modelling challenges by theme/ domain

and added Boxes

List of 14 boxes

- B1: Characterizing a global food system
- B2: The role of the CAP in the transition of the EU agricultural system
- B3: The European Green Deal and the agri-food system
- B4 : Modelling individual decision making
- B5: Approaches for acreage choices and land use modelling
- B6: Key features of GLOBIOM
- B7: The new eco-schemes
- B8: Future pathways for Dutch agriculture
- B9: The contribution of CAPRI to EcAMPA projects
- B10: Remuneration of the farmer in the supply chain
- B11: Econometric modelling of price transmission along supply chains
- B12: Linking AGMEMOD and MITERRA models
- B13: Equilibrium displacement modelling
- B14: DataM

1 Introduction

- **Aim**: provide a roadmap for future agricultural modelling in the EU, building on the outcomes of the SUPREMA (SUpport for Policy RElevant Modelling of Agriculture) project.
- **Issues**: improving existing models, their interlinkages, data management, taking into account changing policy needs.
- **Provide** a 'sketch' of possible modelling requests and future 'action plans' for their execution, using as a starting point the existing modelling capacity and identified gaps.
- **Scope**: the focus is mainly on large scale models that are well suited for EU policy assessment at macro or meso level.

2 Recent policy developments and modelling needs

- Input: assessment of policy documents (EU Green Deal, F2F, CAP after 2020 proposals), stakeholder workshops, policy experts (ppts)
- Key findings
  - food systems approach becomes more important (more integrated approach to policy impact assessments; cover wider range of aspects)
  - increasing emphasis on (environmental) sustainability
  - importance the meet climate objectives and its implications for agriculture

3 Primary production

- Input: needs assessment, literature assessment and model assessment/use/ results (WP2, WP3, Bonn-contribution)
- Key findings
  - representation of production activities and sectors needs extension (Mediterranean products)
  - need for a refined representation of specific input use (fertilizers, pesticides, antibiotics) and of the costs of production
  - the adoption of voluntary policy measures, farm management practices and technological innovations

More knowledge / case studies needed?

4 Land use

- Input: needs assessment, literature assessment and model assessment/use/ results (WP2, WP3)
- Key findings
  - sustainability of farming practices (e.g. eco-schemes) needs more attention
  - Land use-related climate measures need more efforts
  - (agro) forestry is currently covered in different ways
  - Land use in relation to technological innovation
  - Bioeconomy impacts on land use (better describe?)

5 Modelling of environmental aspects

- Input: needs assessment, literature assessment and model assessment/use/ results (WP2, WP3)
- Key findings
  - To represent economic-environmental trade-offs integrated model use (econ/biophysical) is needed
  - Nutrient coverage, their interactions and understanding and modelling of nutrient management by farmers needs strengthening
  - modelling of biodiversity impacts is only to a rather limited extent included in the current agricultural and economic models and is difficult to model (improve on a relevant indicator focus)
- Consider use of supplementary models/modelling at appropriate scale / granularity for biodiversity assessments

6 Dealing with climate change

- Input: needs assessment, literature assessment and model assessment/use/ results (WP3, long term scens, EcAMPA)
- Key findings
  - a better representation of climate mitigation measures is needed
  - is climate adaptation sufficiently covered?
  - policy representation needs attention (incentivize behavior, nutrient management tool)
- The representation of measures as such should be also accompanied with an appropriate modelling of their adoption and diffusion through the agricultural sector.

7 Representation of supply chains (SCs)

- Input: needs assessment, literature assessment and model assessment/use/ results (WP2, case study)
- Key findings
  - Considered models have a very poor representation of supply chains (firms are not modelled).
  - SC is important for understanding the evolution of the farmer-retail price spread.
- It is important to put more efforts in modelling supply chains. A fruitful approach maybe to develop special supply chain models for key agricultural supply chains with ‘later linkage’

8 Modelling of trade flows

- Input: needs assessment, literature assessment and model assessment/use/ results (EAB, OECD)
- Key findings
  - modelling of non-tariff measures and global value chains (GVCs)
  - Consider refinements and complementary approaches w.r.t. NTMs
  - GVCs are largely absent from the considered models
  - at a theoretical level there are still a number of issues that need further development
  - Link trade flows and environmental indicators (e.g. border-adj.mechanism)
- One aspect is how to incorporate global value chain representations in sectoral models (model integration with supplementary models?)

9 The role of food from a broader perspective

- Input: needs assessment, literature assessment and model assessment/use/ results (WP2, WP3, CAP2 scen)
- Key findings
  - Current modelling of demand/consumer behavior is under-utilizing relevant information (e.g. ageing, consumer profile)
  - Policy measure representation w.r.t change diets is weak and lacks refinement (e.g. product heterogeneity such as processed food)
  - Food-waste treatment is weak or absent
  - Consumer-ethical aspects of animal welfare (PS)

10 Integrated model use, maintenance ao

- Input: input from modellers, WP4 (D4.7)
- Key findings
  - Increasing need for integrated model use (with transparent linkages), not for all-encompassing mega-models
  - Baseline harmonization between key models that are used for policy assessments is important for policy makers and also for modelers.
  - Model maintenance is an important aspect of ensuring a good model performance, but a time demanding and costly activity
  - Model cross-validation is important to assess the credibility of modelling results and can take place in different ways
  - Data are the core of models and their proper management is a crucial at institute and EU level (FAIR principles, iMAP-platform, data management plans)

Synthetic conclusions

- The changing policy priorities require strengthening of the models with especially with respect to the sustainability aspects of agriculture and farmer behaviour
- The food systems approach demands integrated modelling assessments (e.g. economic & biophysical, health, ..) and better coverage of different stages of supply chains
- Policy representation of sustainability measures (e.g. mitigation packages) and farmer adoption of management practices and technologies needs strengthening
- Concerns w.r.t. ‘functional trade’ and sustainability trade-off justify more emphasis on global value chains and trade footprint indictors

Recommendations (i)

- EU's modelling strategy should give a prominent place to integrated (key-)model use (econ, biophysical, agron, ...)
- More attention is needed to model sustainability-issues and their trade-offs
- More attention needs to be given to modelling farmer individual decision making and micro-meso consistency
- From a food systems perspective real SC-modelling needs more efforts
- NTMs (incl standards) continue to be important as well as insights into 'functional trade' and 'fair trade' (e.g. border adj.mech, sustainability indicators)

Recommendations (ii)

- Quality control, model (cross)validation, transparency, data management, research networks are crucial and become of increasing importance when multiple models and a plurality in modelling approaches is likely to become more frequent
- The EU's role for providing services and platform-function has been recognized in the past and needs to be strengthened for the future

Discussion points raised from internal discussion on 1st draft of Roadmap

- Integrated model use requirement depends on type of problem and scope of the models involved
- Education / human capital is important for the upkeeping of viable modeller communities
- Alongside sustainability other themes like competitiveness and social issues (e.g. income distrib.) need not to be forgotten
- Is the bioeconomy theme sufficiently covered?
- Will supply chain modelling be able to work as results so far have been not to expectations?
- Should issues w.r.t standards and certification not get more attention (see references in F2F)?