D4.5: INTERNAL PROGRESS REPORT AND MINUTES OF THE SECOND MEETING OF THE EAB AND EB

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3	Version 1.0	24 April 2020	Third draft for review by consortium
4	Version 2.0	30 April 2020	Final version for upload

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 remaining part of 2020. It is primarily aimed at WP2 and WP3. 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 (November 2019). Updated versions are presented and discussed during the second meeting of the External Advisory Board (February 12, 2020).

Section 2 presents the progress in the project, discussed during the third project meeting. The project meeting discussed each task in WP3: (i) is the work for the different models agreed with the modelling teams? and (ii) what remains to be agreed upon in order the three tasks to complete the three milestones until the end of the year (Month 24) and finalize the three deliverables until early 2020 (Month 28, April 2020). Each of the tasks have specific expectations regarding model comparison and model improvements. The project meeting also discussed updates in the 3 other work packages and plan ahead for the coming months.

Section 3 includes the summary of the minutes of the second meeting of the External Advisory Board held in Brussels on 12 February 2020. This meeting of the advisory board was held immediately following the third workshop 'Strategic Prospects' held on 11 February 2020.

Evidence of accomplishment

The deliverable itself can act as the evidence of accomplishment.

Glossary / Acronyms

AGMEMOD	AGRICULTURAL MEMBER STATE MODELLING FOR THE EU AND EASTERN EUROPEAN COUNTRIES
AGMIP	AGRICULTURAL MODEL INTERCOMPARISON AND IMPROVEMENT PROJECT
CAP	COMMON AGRICULTURAL POLICY
CAPRI	COMMON AGRICULTURAL POLICY REGIONALISED IMPACT MODELLING SYSTEM
CGE	COMPUTABLE GENERAL EQUILIBRIUM
EAB	EXTERNAL ADVISORY BOARD
EU	EUROPEAN UNION
EUROCARE	EUROPEAN CENTER FOR AGRICULTURAL, REGIONAL AND ENVIRONMENTAL POLICY RESEARCH
EFA	ECOLOGICAL FOCUS AREA
FADN	FARM ACCOUNTANCY DATA NETWORK
GDPR	GENERAL DATA PROTECTION REGULATION
GLOBIOM	GLOBAL BIOSPHERE MANAGEMENT MODEL
IIASA	INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
JRC	JOINT RESEARCH CENTRE
MAGNET	MODULAR APPLIED GENERAL EQUILBRIUM TOOL
MFF	MULTIANNUAL FINANCIAL FRAMEWORK
MITERRA	INTEGRATED NITROGEN IMPACT ASSESSMENT TOOL ON EUROPEAN SCALE
MS	MEMBER STATE
OECD	ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
PE	PARTIAL EQUILIBRIUM MODEL
REA	RESEARCH EXECUTIVE AGENCY
SDG	SUSTAINABLE DEVELOPMENT GOAL
SUPREMA	SUPPORT FOR POLICY RELEVANT MODELLING OF AGRICULTURE
THUENEN	JOHANN HEINRICH VON THÜNEN INSTITUTE
UPM	UNIVERSIDAD POLITECNICA DE MADRID

WR	WAGENINGEN RESEARCH
WUR	WAGENINGEN UNIVERSITY AND RESEARCH

1 Introduction

This deliverable reports on progress in SUPREMA, with the agenda of the third project meeting (November 2019) and a summary of the findings from 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 Third project meeting (November 2019)

2.1 Agenda and participants

The third project meeting is held 5 & 6 November 2019 in the office of Partner Joint Research Centre (JRC) (Seville, Spain). Attending: Maria Blanco (UPM), Floor Brouwer (WR), Alexander Gocht (THUENEN), Ana Gonzalez (WR), Petr Havlik (IIASA), Torbjörn Jansson (SLU), Roel Jongeneel (WR), Jan Peter Lesschen (WR), Hans van Meijl (WR), Sebastian Neuenfeldt (THUENEN), Ignacio Perez-Dominguez (JRC), Petra Salamon (THUENEN), Andrzej Tabeau (WR) and Peter Witzke (EUROCARE).

Tuesday – November 5

9.30 Arrival and welcome

9.45 Update on WP3

To be discussed for each task in WP3:

i. Is the work for the different models agreed with the modelling teams?
ii. What remains to be agreed upon in order the three tasks to complete the three milestones until the end of the year (Month 24) and finalize the three deliverables until early 2020 (Month 28, April 2020).
iii. It is proposed to share templates for the three deliverables until end of the year.
iv. Note for the three milestones (all due for December 2019): Scenarios are produced and the results stored in a common reporting format (e.g. AgMIP format).

Each of the tasks have specific expectations regarding model comparison and model improvements:

- Task 3.1 includes an assessment of selected model linkages (e.g. iterative simulation or simultaneity, one directional causality, scaling to alternative model-results or parameters) with respect to measuring model linkage impacts and alignment. This reflective activity aims to providing insights and lessons learned about model linkage in different modelling contexts.
- Task 3.2 will identify common and diverging trends in results. For the latter, methodological and hypothesis drivers will be identified and documented in order to arrive to a better understanding of why models provide different results when evaluating policies. The tasks will also highlight how the different scales (sectoral, geographical, time) of the models can be best combined to provide a comprehensive assessment.
- Task 3.3 identify common and diverging trends in results. For the latter, methodological and hypothesis drivers will be identified and documented in order to arrive to a better understanding of why models provide different results when evaluating policies. The tasks will also highlight how the different scales (sectoral, geographical, time) of the models can be best combined to provide a comprehensive assessment.

WP3 also has an offer to develop and use a measure reflecting the level of integration and alignment between models to rank the different linkages and the model results.

9.45 – 10.45 Task 3.1 (Inter-model comparison and harmonization) – Ignacio Perez-Dominguez. Status of MS13 (Harmonized baseline 2030) (M24)

10.45-11.45 Task 3.2 (Using SUPREMA for a medium-term assessment of European agricultural policy alternatives) – Roel Jongeneel. Status of MS14 (Results policy scenario) (M24)

11.45-12.00 Break for coffee

12.00-13.00 Task 3.3 (Using SUPREMA for the long-term assessment of climate change goals) – Petr Havlik. Status of MS15 (Scenario results under climate change and policy) (M24)

13.00 – 14.00 Lunch

14.00 – 17.30 Update on the individual models
This session presents (i) progress in WP2 and WP3. Each model to update on WP3 (the 3 tasks, where applicable). This also includes an update from WP2 regarding model enhancement and integration, to cover (i) strengthening existing and establishing new linkages among SUPREMA models and (ii) targeted modelling improvements; (ii) update on the remaining gaps in the model and relevant areas of future directions for agricultural modelling in the EU. Future directions of agricultural modelling could be beyond the model presented. This would be input into Task 1.6 (Roadmap with future directions for agricultural modelling in the EU) (starting M26).

14.00 – 14.30 CAPRI (Peter Witzke)

14.30 – 15.00 AGMEMOD (WR/THUENEN)

15.00 – 15.30 IFM-CAP (Alexander Gocht)

15.30 – 16.00 Break for refreshments

16.00 – 16.30 MITERRA (Jan-Peter Lesschen)

16.30 – 17.00 GLOBIOM (Petr Havlik)

17.00 – 17.30 MAGNET (Andrzej Tabeau)

17.30 – 18.00 Wrap-up of the day

18.00 Closure of the day

Wednesday – November 6

9.15 Start of the day

9.30 WP2 (The tools – model enhancement and integration) (Peter Witzke)

Task 2.2 – Strengthening existing and establishing new linkages among SUPREMA Models (M3-M27) (Alexander Gocht/ Sebastian Neuenfeldt)
The following linkages appear to require specific efforts:

- Between IFM-CAP and CAPRI for the EU focussed scenario
- Between GLOBIOM and CAPRI on land use

- Between AGMEMOD, AGLINK-COSIMO and CAPRI for EU aspects of the baseline
- Between AGMEMOD and MITERRA for interactions of economic aspects and environmental impacts and constraints
- Between MAGNET and GLOBIOM and CAPRI for nexus and mitigation related issues
- Between MAGNET and AGMEMOD for supply chain and bioeconomy issues

Deliverable D2.2 (Report on model linkages, with general parts and including assessments on the key specific linkages with bilateral authorship) is due for M27 (March 2020).

Task 2.4 – Model testing and versioning (M3-M27) (Torbjörn Jansson)
Deliverable D2.4 (Final (maintenance) stable release version downloadable with instructions and test report for CAPRI) is due for M27 (March 2020).

10.30 – 11.00 Break for coffee

11.00 – 12.00 WP1 (Challenges, needs and communication – topics for model improvements, applications and disseminations) (Petra Salamon)

Task 1.3 Documentation and training (M9-M20) (Maria Blanco), with (i) AgMEMOD (end of August 2019) (WR/THUENEN), (ii) CAPRI (6-8 November 2019) (UAM and CAPRI team) and (iii) GLOBIOM/MAGNET) (IIASA) (pending)
MS11 (Three training sessions are organized) (due for Month 20) will be available after the third training. MS11 includes agenda and list of participants for each of the training sessions.

Task 1.4 Communication and dissemination activities (M3-M30) (Petra Salamon)
Deliverable D1.6 (Report on the communication and dissemination activities) is due for Month 30.

Task 1.5 Strategic prospects (M20-M26) (Petra Salamon)
Deliverable D1.8 (Report on the prospects for research) is due for Month 26 (February 2020) and Deliverable D1.9 (Stakeholder workshop Strategic prospects) is due for Month 24 (December 2019), but will be completed after February 11.

Task 1.6 Roadmap with future directions for agricultural modelling) (M26-M30) (Floor Brouwer)
An outline of Deliverable D1.10 (The SUPREMA roadmap exploring future directions for agricultural modelling in the EU) will be drafted in December.

12.00 – 13.00 WP4 (project coordination and management) (Floor Brouwer)

Task 4.5 Future governance structures of the models (M26 - M30) (Torbjörn Jansson)
D4.7 (Future governance structures of the models) is due for Month 30.

Task 4.4 – Data management (M1 – M30) (Floor Brouwer)
This task includes implementation of open access of research data. Open access is by default in H2020 (online access of research results, free of charge to the user), and will be offered through Data portal of agro-economics research - DataM (JRC). In order to have access, you need to follow:

- Go to https://datam.jrc.ec.europa.eu
- Click on the right-top corner to ”Log in”
- Follow the instructions to create an account

Mail Arnaldo Caivano (JRC) the user-id of the just-created account and he will give the authorization to the SUPREMA group. But in this moment, there are no contents in the SUPREMA group. If somebody gets the password and the access, (s)he would not see anything more than a public.

Deliverable D4.8 (Data management report) is due for Month 30, and will present the open access of model runs in WP3.

Task 4.3 – Setting-up and maintenance of a project website (M1-M30) (Petra Salamon)

Task 4.1 & Task 4.2 Contract management and Coordination (M1 – M30) (Floor Brouwer)
Deliverable D4.5 (Internal progress report and minutes of the second meeting of the EAB and EB) is due for M24, and will be submitted after the workshop on 11 February 2020. EAB meeting will be linked to the third workshop 'Strategic prospects'.

Deliverable D4.6 (Internal progress report and minutes of the third meeting of the EAB) is due for Month 28, and will be submitted after the third meeting of the EAB (to be planned).

The following needs follow-up from the review meeting:

- Policy briefs, press releases and newsletters should be provided, as key elements for dissemination. Response: this will be implemented in the follow-up activities:
  i. Three policy briefs will be developed until the end of the project. Lead: THUENEN.
  ii. Three press releases will be published (e.g. related to the deliverables in WP3), with the support of THUENEN (providing template and translation in German language). Lead: JRC, WR and IIASA.
  iii. Newsletters. Lead: THUENEN. WR will contribute two news items for the EAAE Newsletter.
- Ensure that during the remaining part of the project, at least two scientific papers in academic journals ('Gold' open access) and contributed papers to international conferences as indicated in the DoA. Response: THUENEN will initiate the first scientific paper (due for submission before the end of 2019) ('Golden' open access). WR/IIASA will initiate also a scientific paper, drawing from Deliverable D1.10 (The SUPREMA Roadmap exploring future directions for agricultural modelling). The latter paper will be available for submission at the end of the project to scientific journal ('Golden' open access)
- Annex 1 – Expert's opinion on deliverables (and implementation by the consortium). D1.7 – Draft communication and dissemination activities is publicly available on the website. The expert also expressed an interest to provide some indicators on the number of visits/access to the social media and website. Mitigation actions to stimulate visits will be implemented.
- Three risks should be closely monitored by the project team and the progress should be reported on the next internal progress report, namely the IFMCAP-CAPRI link, the access to single farm level data of the Farm Accountancy Data Network (FADN); and stakeholder involvement in workshops and project related activities. Response: the three risks will be introduced in the participant portal (May 2019), and proposed risk-mitigation measures will be introduced. In addition, the states of play for the risk mitigation will be monitored in the project in November 2019 (during the project meeting).

Similarly, see also e-mail from the European Commission (16.10.2019) on how to avoid errors when claiming expenses in Horizon 2020.The purpose of the email is to help you avoid errors in the cost accounting of the Horizon 2020 projects. The first ex-post audits in H2020 projects show that participants continue to make mistakes in their cost claims. A persistent high error rate damages the reputation of the EU Framework Programme and of research in general. Also, for you as beneficiaries, such errors may lead to annoying and costly consequences. It is therefore in our common interest to avoid them as much as possible. To this end, the Commission has prepared a short guidance document on "How to avoid errors when claiming costs in H2020 grants". The document is accessible in SUPREMA-Cloud: Other material > WP4 > 4.1: https://cloud.suprema-project.eu/index.php/f/2422

Following an internal re-distribution of grant agreements in REA, the project officer responsible for SUPREMA has changed. Christof Weissteiner (Christof.Weissteiner@ec.europa.eu) will take care of project and respond to all queries.

13.00 Closure and lunch

2.2 Minutes of the third project meeting

2.2.1 November 5, 2019

Administration: Regarding the request to amend the Grant Agreement to September 2020, the consortium will make explicit how the extension will benefit DG AGRI. WR has drafted a letter, and consortium is invited to comment until 7 November. The document (Justification request for Amendment Grant Agreement) will be summited to the project officer on 8 November. The amendment is proposed to the Project Officer and was not expressed favourably by REA, and therefore cancelled late 2020 by the SUPREMA consortium.

Model collaboration

- With regard to the inter-model comparison and harmonisation, the assessment of model linkages will be completed by the end of 2019. Important items on this discussion are: (i) aggregation and harmonisation in the way of calculating/reporting the results, e.g. comparison of trends, levels, etc.; (ii) level of detail/disaggregation that we would like to cover; (iii) whether iteration between the models should be included or not; and (iv) which indicators could be used to assess the degree of linkages. Within JRC, the role of forestry is becoming a more important subject of study. Another important topic in baseline work is the spatial resolution. Baseline is a product in DG AGRI and not a reference trend on top of which comes a political shock; new technologies are in a baseline scenario and SUPREMA will adopt this approach. The baseline is created by calibrating the global trend, and short-term trends (t+1, t+2) are achieved through market experts. When harmonising and comparing different models, the use of basic statistics and/or a clustering exercise could help to make explicit the level of model linking.
- There is an agreement on using the current Outlook as the baseline for this project. In the case of the baseline, the only linkage that would be investigated is AGMEMOD-AGLINK. All the other model linkages will be scrutinized in a scenario context (the outcome could be also used as input for the other WPs). A proposal for assessing the linkage in the case of AGMEMOD-AGLINK is to take the macroeconomic conditions and other assumptions from AGLINK and bring them into AGMEMOD. Then, we can observe the outcomes of the latter (without using the scaling). This exercise would allow us to see 'how close' the results are with and without scaling, as well as permitting us to identify 'systematic' differences (overestimating/underestimating) in the projections. In the case of CAPRI a similar effort, compiling a baseline without AGLINK (or GLOBIOM) input, contradicts the model design, as CAPRI has always been linked to the DG Agri baseline since about 2000. Therefore most model linkages are better investigated in the context of scenarios (WP3.2 or WP3.3), which is a certain modification of the initial work plan.
- Regarding the linkage AGLINK-AGMEMOD-CAPRI, there is a lot of uncertainty about the progress that we could achieve on time for the Stakeholder Meeting (11 February 2020). A possible 'solution' would be to present key figures of the models (focusing on the key insights delivered by their comparison) and to focus on a comparative analysis and explain what would be the 'value added' of the intended model linkage. Thus, a simulation using AGMEMOD input at MS level for CAPRI instead of using regular AGLINK's input for CAPRI could be an item for the roadmap, rather than for SUPREMA. Attempting to implement AGMEMOD input into CAPRI might work or not in the available time and is therefore too risky to try. Moreover, it was

suggested to use the CAP scenario as the 'environment' to further explore and test the linkage between IMF-CAP and CAPRI.

- With regard to WP2 (The tools – model enhancement and integration), Hans van Meijl will coordinate the MAGNET-GLOBIOM-CAPRI linkage. A possibly very relevant additional linkage (apart from co-ordination on macroeconomic drivers) was via energy prices. High carbon prices drive up energy prices in a CGE context to a significant extent, an effect currently ignored in the PE models CAPRI and GLOBIOM. To implement this effect AGLINK might help with information on the shares of different energy carriers.
- Roel Jongeneel will be responsible for the AGMEMOD-MITERRA linkage. This may be expected to be a top-down linkage from AGMEMOD to MITERRA under SUPREMA.

Medium-term assessment of European agricultural policy alternatives

- There is strong (an increasing) interest in the potential impacts on livestock-production sectors related to changes in consumer preferences for meat. A key issue on this regard is the uncertainty that surrounds the transition towards a more plant-based diet. When doing this type of simulation, an issue to keep in mind is that the consequences could be different if the shock under consideration affects only European consumers or if it is a world-wide phenomenon. In this case, the scenario should have a 'European' flavour since we are looking at global impacts when modelling the long-term scenario. Apart from that, it is expected that meat consumption in developing countries will increase when income rises.
- Although there was some discussion about the modelling of a carbon tax applied to certain products, e.g. dairy, the final agreement was to discard this proposal since it would be very unrealistic to assume that carbon pricing will affect only an individual product. However, an increase in the price of fertiliser related to the implementation of a specific tax has been agreed to be interesting to model.
- Important items that could be (partially) explored in this scenario are the budgetary shift between Pillars I and II, the implementation of a fertiliser tax and the capping of direct payments. A reference study for the assessment of a fertiliser tax is the simulation carried out for the OECD by means of the MAGNET model.
- A draft proposal for the CAP scenario has been worked out (including EU Green Deal elements) and discussed. A lot remains uncertain in the current CAP Reform process, and the lack of information with respect to specific implementation options that might be used at MS level.

Long-term assessment of climate change goals

- The 'core' of the long-term scenario is on the leakage aspect under different EU-ROW climate mitigation ambition levels in achieving certain mitigation goals. This scenario is modelled by combining GLOBIOM, MAGNET and CAPRI. Following the recommendation from a DG CLIMA representative attending the last stakeholder meeting, the focus should be on 1.5 °C scenarios.
- In order to focus the process, the teams could select some of the scenarios that are already modelled by GLOBIOM. One result was that the most serious leakage effects could already be avoided with a moderate "buy-in share" in the sense of the EAAE paper scenarios. Based on the GLOBIOM experience we could select some "corner stone" relative implementation rates for non-EU regions. E.g. a 10% variant gave already sizeable improvements. Early results suggest that 25% of the rest of the world to implement EU measures could already achieve 70% of the reductions in the rest of the world. It was considered to focus on the non-EU relative implementation rates and to kick out the diet shifts to economise on the number of scenarios (while leaving the door open to reactivate them if to get a subsequent paper accepted) The aim should be to understand better what the differences that we get in the results are, e.g. at geographical level.
- It is important to bear in mind that when a model is used to exactly reproduce the outcome of another one, there are high chances that the 'gain' is smaller than the 'loss' in the quality of the

modelling of other aspects. We should not have high expectations about the outcomes of that type of exercise. So if fixing some variable requires to release another (in the style of a closure swap) then the chances are high that the released variable will take on unreasonable values with collateral damage elsewhere.

2.2.2 November 6, 2019

Narratives for CAP scenario

- The general idea for this scenario is to assess the impacts of taxes on final products combined with tariffs. For example, the scenario could simulate the impact of a carbon tax, including some revenue recycling in the form of a direct payment for the farmer. In order to observe changes in emissions, the modelled tax should be defined as a 'traditional' carbon tax. There has been a discussion on the exact implementation strategy of the carbon tax. The proposal by Roel Jongeneel was to compute the tax per product assuming given emission factors per product from the tax on carbon or CO2eq. The CAPRI and GLOBIOM teams argued that this would miss the incentive to implement technological mitigation which changes emission factors.
- A contribution (by Torbjörn Jansson and colleagues) that we should have a look is: https://www.agrifood.se/publication.aspx?fKeyID=1960. This paper has basically investigated the effects of a carbon tax with fixed emission coefficients (in line with Roel's proposal), as mitigation technologies were not "activated" in these CAPRI runs. Accordingly the carbon tax had rather large leakage effects. To prevent these from happening compensatory carbon border adjustments (CBAs) had been investigated. However, the study concludes that CBAs will not prevent leakage to a significant degree.
- Key items in the context of this scenario are the assumptions on the technology adopted, as well as the emissions coefficients that are included in the models. For a better representation of these aspects, Roel Jongeneel and Ana Gonzalez will coordinate with Maria Blanco and Jan Peter Lesschen to see how these elements are represented in each of the models. A way forward could be to identify the relevant technologies across Europe.
- An important issue to consider for this scenario is the impact of Brexit. Previous estimates indicates that total EU budget will go down -6.8%. Therefore, it is plausible to assume a 7% reduction, accompanied by a 3.5% additional contribution to 'close' 50% of the gap created by the previous reduction. Total reduction in the EU budget is assumed to be 8.5%.
- The modelling of capping and redistribution impacts will be only implemented in IFM-CAP.

Dissemination of findings and closing the project

- In terms of WP1 (Challenges, needs and communication – topics for model improvements, applications and disseminations), a full-day workshop on 'Strategic Prospects' is scheduled on 11 February 2020. It would be hosted at the Representation of Lower Saxony to the European Union located in Brussels. It would be ideal to increase the participation in the workshop of representatives from the South and East of Europe. Petra is in charge of getting in touch with potential participants. By the end of November, she would like to circulate a 'save the date' e-mail. The presentations of this third meeting will be disseminated with the official invitation. By the end of December/beginning January, some flyers prepared by a professional designer would be available for sharing with the participants. In view of the above, there is a decision of cancelling the 'online workshop' proposed at an earlier stage of the project.
- Regarding the training activities, Petr Havlik and Hans van Meijl will take action on the organisation of a training on GLOBIOM and MAGNET.
- The project will deliver a newsletter (in English), two scientific papers, some policy briefs and the roadmap document. The aim is to produce a policy brief/paper on the medium-term scenario and another one on the long-term scenario. Petra will initiate the policy briefs, while Roel Jongeneel, Floor Brouwer and Ana Gonzalez will circulate a draft of the roadmap.

3 External Advisory Board (EAB) meeting

3.1 Second meeting of the EAB - agenda

The EAB had their second meeting on Wednesday, 12 February 2020, 9.30 – 16.00 (Leopold Hotel Brussels, Rue du Luxembourg 35, 1050 Brussels). Participants include: Allessandro Antimiani (European Commission, DG Trade), Martin Banse (Thünen Institute), Francesca Bignami (FoodDrink Europe), Mariia Bogonos (European Commission, JRC), Natalia Brzezina (European Commission, DG AGRI), Floor Brouwer (Wageningen Research), Francois Chantret (European Commission, DG AGRI), Emil Erjavec (University of Ljubljana), Ana Gonzalez (Wageningen Research), Petr Havlik (IIASA), Roel Jongeneel (Wageningen Research), Alan Matthews (Trinity College), Ignacio Perez-Dominguez (European Commission – JRC), Petra Salamon (Thünen Institute), Ben van Doorslaer (European Commission, DG AGRI), Hans van Meijl (Wageningen Research), Frank van Tongeren (OECD), Peter Witzke (Eurocare).

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The role of the EAB will be to provide feedback on the project interim and draft final results, and also to share relevant information about relevant topics for modelling European agriculture. The EAB will convene three times in a regular meeting: Month 4 (to present existing modelling capacity and discuss modelling needs), Month 24 (to present achievements in the project and initial discussion on future modelling needs) and Month 28 (to discuss a draft of the Roadmap with future directions for agricultural modelling in the EU). In addition, the members of the EAB will be consulted for ad-hoc advice and reviews.
The objective of the meeting is to start the roadmap with future directions for agricultural modelling in the EU. SUPREMA delivers a roadmap, providing directions for future modelling, improving existing models and their interlinkages, data management and requirements, and governance structures of models and modelling platforms. The SUPREMA Roadmap is a plan to close the gap between expectations of policy makers and model capacity on a permanent basis.

9.30 Welcome and tour de table (Hans van Meijl)

9.45 Summary of the SUPREMA workshop on February 11 (purpose, initial findings and some early conclusions). Petra Salamon (Thuenen Institut) to present a summary of the workshop on February 11. (purpose, initial findings and some early conclusions). This is very much to inform the participants who did not attend the workshop on the previous day.

10.00 Model improvements and model linking in SUPREMA. Achievements made and tentative conclusions. Presentation of 20 minutes with 20 minutes discussion. Peter Witzke (EUROCARE).

10.40 Break for coffee

11.00 Baseline scenario in SUPREMA, with a reflexion providing insights and lessons learned about model linkage in different model contexts. Presentation of 20 minutes with 25 minutes discussion. Mariia Bogonos and Ignacio Perez-Dominguez (European Commission – JRC).

11.45 CAP scenario, with a perspective what methodological and hypothesis drivers are identified to arrive at a better understanding of why models provide different results when evaluating policies. Presentation of 20 minutes with 25 minutes discussion. Roel Jongeneel (Wageningen Research).

12.30 Climate scenario, with a perspective what methodological and hypothesis drivers are identified to arrive at a better understanding of why models provide different results when evaluating policies. Presentation of 20 minutes with 25 minutes discussion. Petr Havlik (IIASA).

13.15 Lunch

14.15 Introduction of the Roadmap (topics and brief outline) (Roel Jongeneel, Wageningen Research)

15.30 Follow-up and next meeting of EAB (June 2020)

16.00 Closure

The next sections present the different topics of the EAB meeting and the items discussed during the day.

3.2 Outcomes of the SUPREMA workshop on February 11

Petra Salamon (Thünen) does report a summary from the workshop 'Strategic Prospects' on February 11. The interactive workshop has the following objectives: (i) Draft findings of 'Model enhancement and integration' are presented, with a focus on testing the SUPREMA model family based on the 'Narratives'; (ii) Aimed to capture feedback of Stakeholders to narrative based scenarios and related outcomes, and (iii) start identifying findings which can feed into a 'Strategic Paper on research needs'. The deliverable D1.8 (Report on the prospects for research) and D1.9 (Stakeholder workshop Strategic prospects) will report on the workshop. Several posters did seek for feedback:

- The first poster focussed on 'Farmers' decision and their reactions to changing environment', and the following remarks are made: (i) individual behaviour is missing in models, (ii) structural change missing, (iii) potential of using agent based modelling, (iv) representation of alternative technologies, (v) risk aversion of farmers with respect to volatile EU policies, and (vi) heterogeneity among farmers across different EU MS.
- The second poster focussed on addressing the demand side in agricultural modelling, and the following remarks are made: (i) innovations in the bio-economy seem missing, with bio-economy and bio-energy the new outlets for bio-energy, (ii) quality aspects of products should be reflected, (iii) importance of voters/consumer responses on green CAP and backlash, and (iv) how to change consumption behaviour.
- The third poster focussed on supply chain, and aiming to clarify what is missing (decision, market power, structure): (i) follow flows of products, also to take into account firms, (ii) price transmission along the chain, (iii) focus on contracting needed, (iv) address market power over different steps, (v) coordination in the chain, (vi) supply chains and product quality.
- The fourth poster does focus on the Sustainable Development Goals (SDGs) and whether they are efficiently addressed, and the following remarks are made: (i) many SDGs indicators need higher resolution; (ii) biophysical models are underrepresented, (iii) Inequality SDGs with respect to poverty, food security and gender, and (iv) matrix on SDGs, indicators, sectors.

Regarding the focus on dedicated supply chains in modelling, there is a comment from the EAB to address contracts to require further elaboration, e.g. role of cooperatives. The outcomes of the

workshop will be reported in Deliverable D1.8 (Report on the prospects for research) and D1.9 (Stakeholders workshop Strategic prospects), due for submission April 2020.

3.3 WP 2: Model improvements and linkages

Peter Witzke (Eurocare) does introduce the achievements in WP2 (The tools – Model enhancement and integration), including strengthening linkages (Task 2.2) and targeted improvements (Task 2.3). The objective is to improve the capacity of existing modelling network.

Task 2.2 to strengthen model linkages include the following tests:

- IFM-CAP –CAPRI, with an iterative calibration to test a scenario with increased organic farming in the EU, possibly also ecological set aside. Testing is only interesting if scenario gives non-negligible price effects.
- GLOBIOM/AGLINK – CAPRI link, with a one-way alignment in baseline. Testing is not reasonable, with no efforts for stand-alone CAPRI baseline.
- AGLINK -AGMEMOD, will include a one way alignment in baseline, with testing possible in Task 3.1 (strict top down vs some independence).
- AGMEMOD –MITERRA, with a one-way top-down calibration.
- MAGNET –GLOBIOM –CAPRI linkage in scenarios. MAGNE delivers changes in GDP and energy price changes in full economy, with carbon price scenario to GLOBIOM + CAPRI. GLOBIOM delivers forest and energy crop areas to MAGNET and CAPRI in carbon price scenario. CAPRI is recipient of both. Testing is through a scenario run without external model input
- MAGNET – AGMEMOD will examine supply chain issues only informally, without testing.

There is confirmation by EAB the list covers a lot. The EC has a lot of interest in conversion to organic and there will be more data collection to start on prices of organic products. The link between organic farming and impacts on biodiversity would require more scientific evidence, with current methodologies often to link use of inputs with biodiversity. Fertilizer balances might already be useful, and similar approaches might be needed on pesticides.
A priority of research needs could not be presented yet from the European Commission, with the Multiannual Financial Framework (MFF), budget issues, Green Deal, conversion to organic farming, as well as fertilizers/pesticides to be high on the agenda. Border tax adjustments is an issue in the European Commission, but there is uncertainty regarding the impacts and support by modelling remains thin. It seems investigations on fossil fuel subsidies remain limited. Such subsidies are in the Green Deal and seem not homogenous across sectors in the economy. The OECD has an inventory of support measures for fossil fuels. It identifies, documents, and estimates the value of support arising from more than 1 000 individual policies that encourage the production or consumption of fossil fuels. See also: https://www.oecd.org/fossil-fuels/data/OECD-Fossil-Fuels-Support-database-brochure-2019.pdf

The EAB also expressed the importance of a mapping exercise of variables; it would support future work, to address questions like: is a 'cow' in the models the same? EAB also observed the model linkages are presented in a rather technical way, and there is an interest to express the potential for a higher level outcome, e.g. CGE models to present monetary outcomes and PE models to present physical outcomes (e.g hectare and yield outcomes). There might be ways to make them comparable and SUPREMA could build on previous work (e.g. AgMIP) and support future work. In any case the SUPREMA consortium is aware policy makers wish different outcomes are well communicated and there is an increasing interest to better understand the impacts at the end of the chain (e.g. effects on the environment). There is a comment the impacts on employment are important as well. SUPREMA consortium comments employment is covered in some models (e.g. MAGNET), considering full employment and the topic is a research area for this CGE model.

Finally, the EAB comments that a more regulatory approach might be needed in the model development when policy are increasingly targeted at sustainability (and less price-driven). The level of compliance to the legislation should probably be understood as well.

3.4 Inter-model baseline comparison: Lessons learned and next steps

Task 3.1 has developed baseline scenario for 2030 for three models: AGMEMOD, CAPRI, IFM-CAP, while MAGNET and GLOBIOM remains to be added. First insights are available into the differences in the modelling outcome. The models are different in: (i) structure and methodologies, (ii) units, regions, commodity definitions, (iii) simulated variables, and (iv) timing/schedule/approaches of the baseline generation and model development/update. There are differences across the three models regarding yields of crops and production levels.

Projections might differ because of (i) different external baselines, (ii) time series or base year used, and (iii) values of elasticities, dependent variables and of constraints. Main reasons for differences in baselines of AGMEMOD, CAPRI and IFM-CAP are (i) external baseline, (ii) major policy assumptions (e.g. CAP, demand for biofuels), (iii) databases used, (iv) estimation approach, and (v) exogenous macro-economic variables. Three follow-up steps are taken to harmonize baselines: (i) similar external baseline, policy assumptions and exogenous macro-economic variables, (ii) analysis of the differences, and (iii) application of the harmonization approach targeted at specific values and depending on the type of model linkage.
Learning from the different model outcomes is of course important and aiming to understand differences. Differences across the models are partly due to the differences in used data sources. Databases differ across the models (e.g. CAPRI mainly using information from EUROSTAT; AgMEMOD using data from EUROSTAT and complemented with statics from individual Member States) and there could be technical problems happening during model linking (e.g. moving files from one model to the other).

3.5 Medium-term scenario & selected results

Task 3.2 has developed medium-term scenarios (EU (red)meat consumption scenario and a CAP scenario) for 2030, and is introduced by Roel Jongeneel. The CAP scenario does focus at more green value for less money. Model linkages are established with AGMEMOD-MITERRA and with CAPRI-IFMCAP and these models show different results. AGMEMOD shows pretty high slippage effects. Differences might also result from the price transmission effects that occur in the two models.

The following observations relate to model linkages. Model linkage AGMEMOD and MITERRA is relatively easy to manage. However, compared to CAPRI, it is weaker on taking into account endogenous behavioural feedback effects. Model linkage CAPRI and IFM-CAP has as a strength that it can provide insights into farm income effects. AGMEMOD has a farm income modality (linked to FADN) but this needs further development regarding policy payment linkages.

The following observations relate to scenario results. First, changes in consumer behaviour may induce further changes in the EU livestock sector than is accounted for in current projections and maybe superimposed on future CAP climate measures (e.g. the EU's announced Farm to Fork Strategy). The results also confirm that when reducing the budget, in the context of a successfully decoupled CAP, limited market impacts may be expected, while market effects of increasing EFA are also limited. It therefore looks the environmental benefits of the policies examined seem fairly small.

During the discussion, the EAB commented AGMEMOD seems more sensitive to MS conditions, and able to model features from individual member states. Member State level detail in AGMEMOD also seems to be a strength with the new CAP, which will become more MS sensitive and CAP policies might

not be uniform across countries. Related to this, there is a comment to play with the regional distribution of CAP funding, and taking into account differences regarding farm size and the impact of alternative strategies by Member States.

There also is a comment on the impact of CAP measures for dairy and beef. The beef sector is impacted differently in the two models (CAPRI and AGMEMOD), while the results are much closer in the dairy sector. This seems counterintuitive since dairy and beef are closely linked in production. Dairy production in AGMEMOD is declining due to the price reduction and as a result beef production does increase. Moreover, the impacts of meat preference shifts are stronger for pork than in the beef sector, and some price responses seem surprising as well. The teams will further work on this.

It is important the project has a clear picture on what the models can deliver, and the project is advised to select a set of indicators (e.g. 50-70) and mention how they could be assessed. Roel Jongeneel responds it is planned which indicators can be covered by the models, which indicators will be more of a challenge or could realistically even not be implemented.

3.6 Long-term climate mitigation: Selected preliminary results

Task 3.3 developed long-term climate mitigation scenarios and is introduced by Petr Havlik (IIASA). Trade as means of mitigation, and a uniform carbon tax would operate under a coordinated climate policy. However, trade alone does not suffice, and the Green Deal strives for Europe to be the first climate-neutral continent. The European Commission will propose a carbon border adjustment mechanism, for selected sectors, to reduce the risk of carbon leakage. The presentation does address how much models need to converge. We need to be aware some models offer a better understanding on specific SDGs (e.g. environmental domains) while some other are better targeted for specific regions of the world. On top of it, there is also interest into harmonized tools.
Following interaction with the EAB, there is appreciation for the approach adopted, with a comment to mention the tools support evidence that even unilateral action is beneficial for the environment and becomes more effective if coalition grows. Similarly, the message from an analysis is important; even the occurrence of 'leakage effects' to be 45% could be qualified as an improvement. Also, there are questions on the mechanisms of leakage effects to happen and why they are not higher. There might be some reasons for other regions outside Europe with similar efficiency rates as is the case in Europe.

The EAB does also advise to bring interventions closer to the current policy agenda in the EU. The topic of climate mitigation might be better linked to the CAP reform (e.g. afforestation in UK, Ireland and Denmark). Related to the policy support of this modelling work SUPREMA is also advised to consider the impact of climate change on agriculture (also including the occurrence of extreme events). This might be negative for some regions. Work on the impacts of climate change could also establish links to the Sustainable Development Goals (SDGs) (e.g. food security).

3.7 Roadmap exploring future directions for agricultural modelling in the EU: some preliminary observations

SUPREMA has a deliverable D1.10 (The SUPREMA roadmap exploring future directions for agricultural modelling in the EU) due for M30 (June 2020). The topic is introduced by Roel Jongeneel, to distinguish between

- Key societal and policy challenges

- The food system as a starter
- Modelling: issues and challenges
    - Primary agriculture
    - Supply chains
    - Bio-economy
    - Food system
    - Sustainability & circularity
- Concluding remarks / inputs for discussion

Feedback is received from the EAB regarding:

- Importance of modelling supply chains and scientific evidence still remains fairly thin. Prices in Europe, for example seem to follow world market prices. There is work at OECD on global value chains and international trade, with a wide coverage of countries and sectors. The work does use inter-country input/output tables, to give proof of where the value-added is earned. This type work would clarify for a country/sector x% if value-added is earned from imports and y% of value-added is earned from service sectors.
- Model infrastructure and its maintenance is important and technology might facilitate better collaboration. Validation of model to historic data is advised as well. Improving the model infrastructure could be a way to respond faster to calls for policy support actions.
- Modelling for CAP support. Relevant to have an overview of the available modelling capacity. Is there a possible to link CAP to planetary boundaries? The adoption of farmers of voluntary measures (e.g. farm management activities, agri-environmental and climate schemes and eco-schemes) is so far poorly modelled.
- Relevant other topics are the role of innovations in modelling, food security (also in the EU) and poverty, role of consumers (most of the models current have 'one consumer'), farm behaviour, social impacts, role of ecosystem services, biodiversity, health issues, labour markets. Priorities are mentioned towards integrated approaches, food policy (which also is a service policy).

4 Conclusions and follow-up

A Roadmap exploring future directions for agricultural modelling will be delivered by the project and is due for submission in June 2020. This roadmap will address the following questions:

- Which are the strengths and weaknesses of the modelling tools that have been explored within SUPREMA?
- What is needed to overcome gaps between expectations from policy makers and the actual capacity of models to deliver relevant policy analysis?
- Which aspects of the upcoming (societal) challenges are to be addressed in future modelling? What topics are to be addressed in future modelling?
- What has been achieved by networking and co-operation among modelling teams?
- What steps to take next to facilitate model collaboration (including among others model development, model improvement and model linkages)?

The Roadmap (Deliverable D1.10) will cover these questions.

Appendix A: Presentations EAB February 12

Third Stakeholder Workshop - summary SUPREMA External Advisory Board 12 February 2020

Petra Salamon, Martin Banse, Laura Angulo, Max Zirngibl

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

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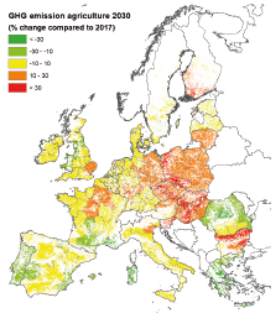
3. Interactive Workshops in Brussels February 11th, 2020 – 'Strategic Prospects'

- Based on the outcomes of previous Workshops ‚Needs' and ‚Narratives'
- Draft findings of 'Model enhancement and integration' and especially of 'Testing the SUPREMA model family' based on the 'Narratives'
- Aimed to capture feedback of Stakeholders to narrative based scenarios and related outcomes
- Discussions should result in findings which can feed into a 'Strategic Paper on research needs'

Flyer with selected draft results

Changing meat consumption pattern in the EU until 2030

Baseline



- The baseline indicates a strong shift in production and GHG emissions towards the EU13 Member States (Fig. 5).

Scenario

- Narrative: Change in preferences with a decline in meat consumption whereas Member States with above average meat consumption and below average population shares of vegetarians depict higher reduction rates
- Results indicate relative small price effects for beef (-0.5% compared to the baseline in 2030) and strong ones for pork (-20%) (Fig 6).
- The beef price decline is low because cuts in beef consumption are small in contrast to pork. Therefore, a higher impact on pork consumption and price could be expected.

- Reduced consumption affects EU production only to a smaller extent. The EU has more room to export, especially pig meat.
- Decline in red meat consumption lead to some substitution and also to slight shifts in production towards white meat (poultry).

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Support for Policy Relevant Modelling

In the following, we present some outcomes of the Stakeholder Workshops so far, including narratives developed as well as selected draft results from testing of the SUPREMA model family.

1st Stakeholder Workshop 'Needs'

- Insights into the view of stakeholders on future challenges of the agri-food sector and related policies
- Identifying stakeholders' needs for model-based analyses and support evidence based policy making
- Define priorities by stakeholders (Fig. 1)

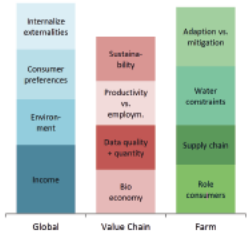

Figure 1 | Four most prioritized items given to challenges by stakeholders

2nd Stakeholder Workshop 'Narratives'

Development of three narratives for impact analyses in SUPREMA together with stakeholders

- Common Baseline (Reference)
- Climate change policy narratives to study potential contributions of the EU agricultural sector to climate change mitigation efforts (by investigating specific sectors, regions or mitigation targets)
- Common agricultural policy (CAP) related narratives with a foci on climate and environment, production, supply chain and consumer preferences

Climate mitigation policies and the EU agricultural sector in the perspective of SDGs until 2050

Scenarios

- Scenario 'EU alone agGHG' depicts an unilateral EU carbon tax to reduce non-CO2 agricultural greenhouse gas emissions (agGHG);
- Scenario 'Buy-in' simulates also a partial involvement of all countries outside the EU approximated by a carbon tax at the level of 25% of the tax applied in the EU.

Results

- An unilateral carbon tax to reduce EU agGHG emissions will lead to 45 % leakage by increased non-CO2 agGHG emissions outside the EU (Fig. 2).
- Already a 25 % Buy-in (tax) in the RoW provides a decline in non-CO2 agGHG emissions by 70 % globally compared to a 100 % Buy-In (Fig. 3).
- An unilateral mitigation effort of the EU will mainly reduce ruminant production compared to the baseline and RoW farmers will increase their ruminant production in this case (not shown).
- A 25 % Buy-in in the RoW will lead to a reduction in ruminant production shared by almost all countries in the RoW, except for USA and Canada (Fig. 4).
- No significant change is projected for EU-28 consumers' commodity prices in case of a unilateral agGHG action of the EU-28 (Figure not shown).
- Indeed mitigation policies can have negative effects on food availability globally (Figure not shown).
- But besides these trade-offs, a carbon tax is also projected to yield in co-benefits for the environment like increased natural vegetation areas inside the EU-28 (Figure not shown).

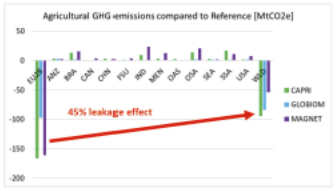

Figure 2 | Changes in agGHG emissions in the unilateral EU mitigation scenario (agGHG) compared to the baseline in the year 2050

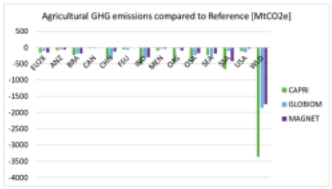

Figure 3 | Change in agGHG emissions in the mitigation scenario Buy-in compared to the baseline by 2050

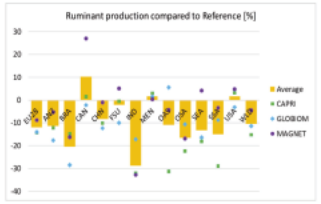

Figure 4 | Change in ruminant production in the Buy-in scenario compared to the baseline by 2050

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Elements of the 3. Workshop
Climate related scenario

Selected draft results on long-term baseline and climate related scenarios

Question and answers

Interactive feedback; flipcharts (appreciated/not appreciated, additional information required, relevant needs for future)

First conclusions

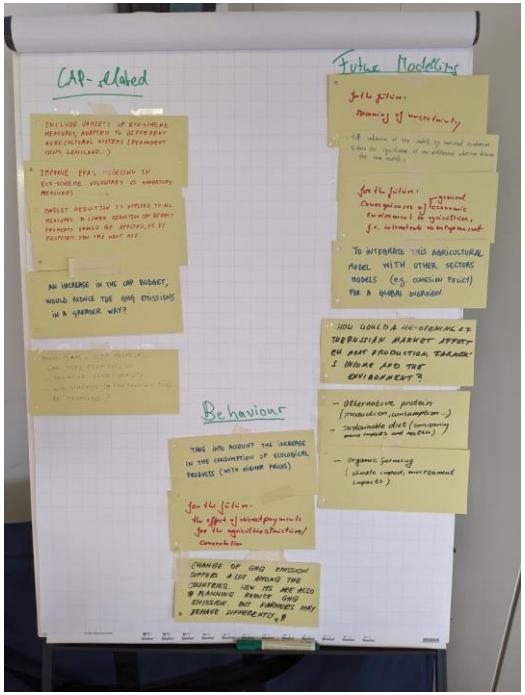
- Challenges because of need to covereconomic, environmental and social issues
- Consumer behaviour – can consumer behaviour be changed? Collaboration with sociology and psychology
- Think more out of the box about different economic systems?
- Internalize externalities
- Stepwise integration of SDGs
- Link to biophysical models – multidisciplinary (language issue)
- Exogenous in models: technology and innovation processes
- In the past agricultural policy at the expense of ecology – now eco policies at the expense of social issues (integrate social)

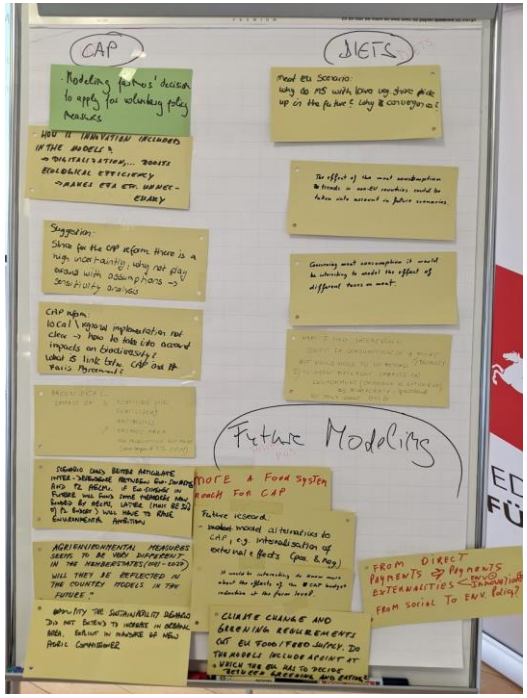
Element: CAP related scenario

Selected draft results on medium-term baseline and CAP related scenarios

Question and answers

Interactive feedback; flipcharts (appreciated/not appreciated, additional information required, relevant needs for future)





First conclusions

- Diets
  - Non EU-countries
  - Consider impact of taxes on meat
  - Changing consumption patterns: less but quality
  - Consumption with environmental consciences
- Future models improvements
  - Internalize external effects
  - Innovation - uncertainty
- CAP-related issues
  - Adoption of eco schemes difficult since they are voluntary for farmers and lack of data – farmers decisions - sensitivity analysis
  - Impacts on biodiversity

Element: Model improvement and linkages

Model improvement and linkages

Question and answers

- MAGNET to GLOBIOM: how to translate/transfer outcomes from one model to the other - quantities vs. volumes
- Coverage of forestry – afforestation – yield impacts
- Replication of e.g. organic farms from IFM-CAP to CAPRI
- Type of linkage between model: soft or hard linkage relevant, focus more on e.g. degree of linkage, or one way or two way, circular
- Stick to linking models since policy gets more and more complex

Poster: Famers' decision and their reactions to changing environment?

- Individual behaviour is missing in models
- Structural change missing
- Agent based modelling
- Representation of alternative technologies
- Risk aversion of farmers with respect to volatile EU policies
- Heterogeneity among farmers across different EU MS

Poster: Demand side adequately reflected?

- Innovation in bio economy missing
- Bio economy and bio energy new outlets for bio energy
- Quality aspects of products should be reflected
- Voters/consumer response on green CAP and backlash
- How to change consumption behaviour

Poster: Supply chain - what is missing (decision, market power, structure)

- Follow flows of products; take into account firms
- Price transmission along the chain
- Attention on contracting needed
- Market power over different steps
- Coordination in the chain
- Supply chains and product quality

Poster: SDGs addressed efficiently?

- Many SDGs indicators need higher resolution
- Biophysical models underrepresented
- Inequality SDGs with respect to poverty, food security and gender
- Matrix on SDGs, indicators, sectors and importance

Structure of the 3. Workshop Running World Café

- Testing on CAP and climate change policies - what are we missing?
  - Biodiversity / eco system services
  - Job creation
  - Technology adoption
  - Volatility
  - CAP budget
  - Modelling the circular economy
  - Include residues and waste
  - Food system perspective

Poster: Additional issues

- Land use markets
- Health impacts of diets
- Social issues (inequality and value based policies)
- Better representation of permanent crops and smaller commodities
- Investments (how to finance?)
- Models are quite simple compared to CAP policies
- Are outputs relevant for policy makers

Workshop ‘Narratives’

- Set-up of the Workshop ‘Need’
- Setting the Scene
- Expert Discussion Groups with Stakeholders
- First level
- First level
  - Second level
    - Third level
      - Fourth level
        - Fifth level
- First level
- First level

WP 2: Model improvements and linkages

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

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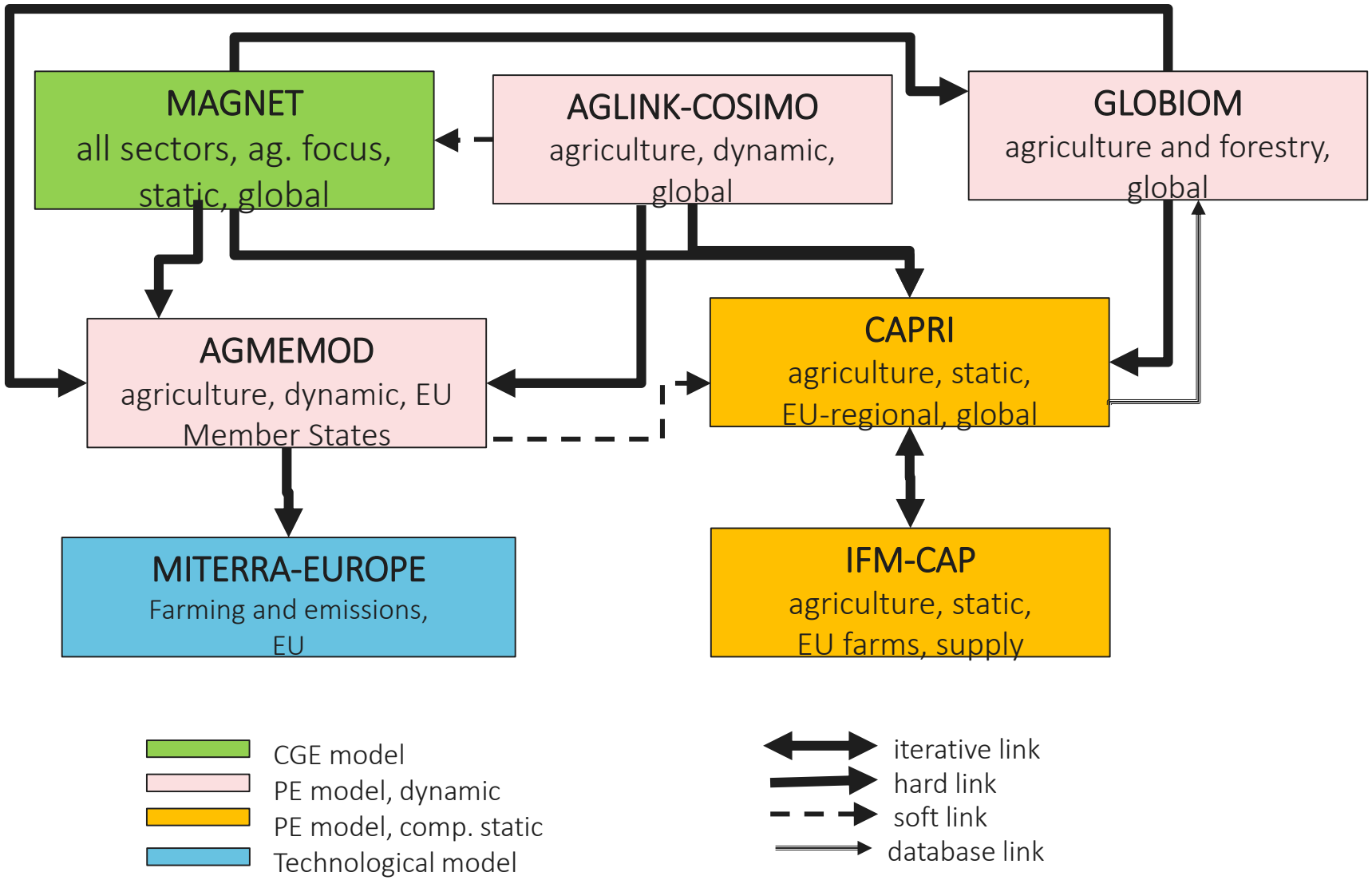
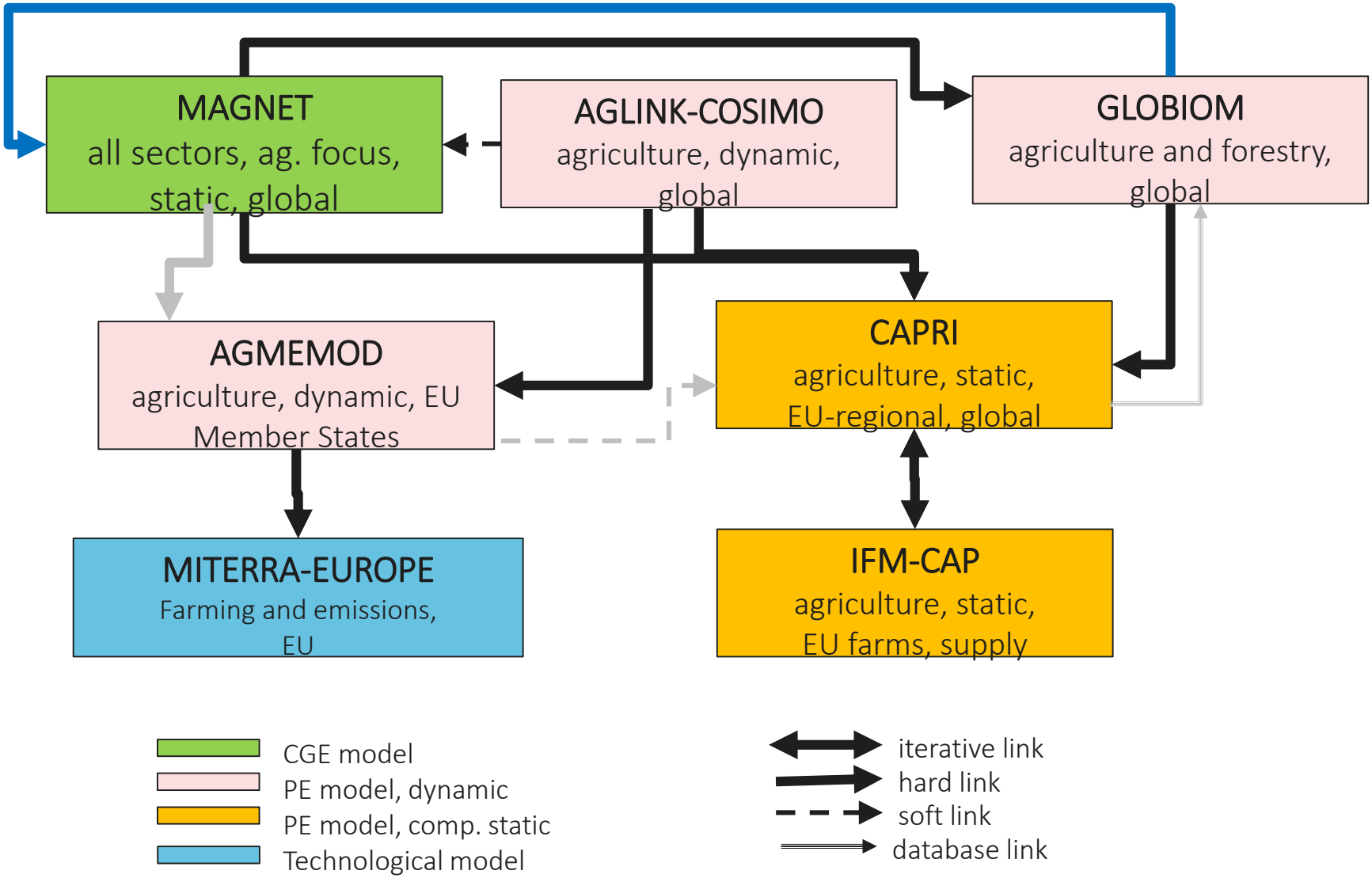
Main Objectives of WP2

- Improving capacity of existing modelling network
- Via activities that are light investments but have high pay off
- Guidance:
  - Policy objectives and challenges,
  - but also feasibility of implementation
- Combines heterogeneous elements
  - Infrastructure for improvements (Task 2.1)
  - **Strengthening linkages (Task 2.2)**
  - **Targeted improvements (Task 2.3)**
  - Model testing and versioning (Task 2.4)

WP 2.2 Linkages envisaged



WP 2.2 Linkages tested



WP 2.2 Linkages for testing (1)

- IFM-CAP – CAPRI -> iteratively calibration
  - Organic conversion scenario, possibly also ecological set aside
  - Testing is only interesting if scenario gives non-negligible price effects
- GLOBIOM / AGLINK – CAPRI -> one way alignment in baseline
  - Testing not reasonable, no efforts for stand alone CAPRI baseline
- AGLINK - AGMEMOD -> one way alignment in baseline
  - Testing possible in WP3.1 (strict top down vs some independence)
- AGMEMOD – MITERRA -> one way calibration top down, hard linkage
  - Linkage gives additional results, testing = skipping environmental results from MITERRA (not reasonable)

WP 2.2 Linkages for testing (2)

- MAGNET – GLOBIOM – CAPRI in sceanrios
  - Magnet delivers GDP + energy price changes in full economy carbon price scenario to GLOBIOM + CAPRI
  - GLOBIOM delivers forest + energy crop areas to MAGNET + CAPRI in carbon price scenario
  - CAPRI is recipient of both
  - Testing = scenario run without external model input
- MAGNET – AGMEMOD
  - supply chain issues only addressed **informally**, testing impossible (?)

IFM-CAP & linkage to CAPRI

IFM-CAP

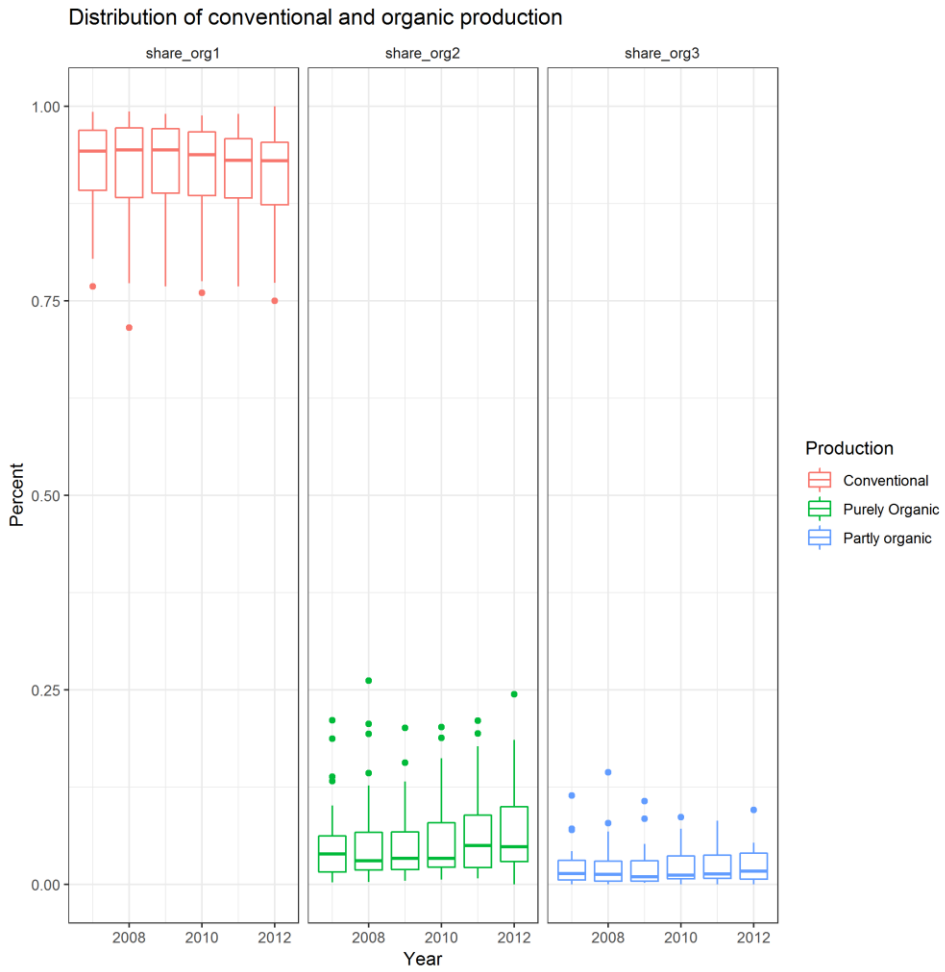
- **Individual farm model based on FADN data** & math programming incl. risk & PMP & integer programming
- **Reduction of long execution** time of IFM-CAP -> **light version ->** now runs for all farms in EU27 instead of >9 hours only 80 min > first full EU application

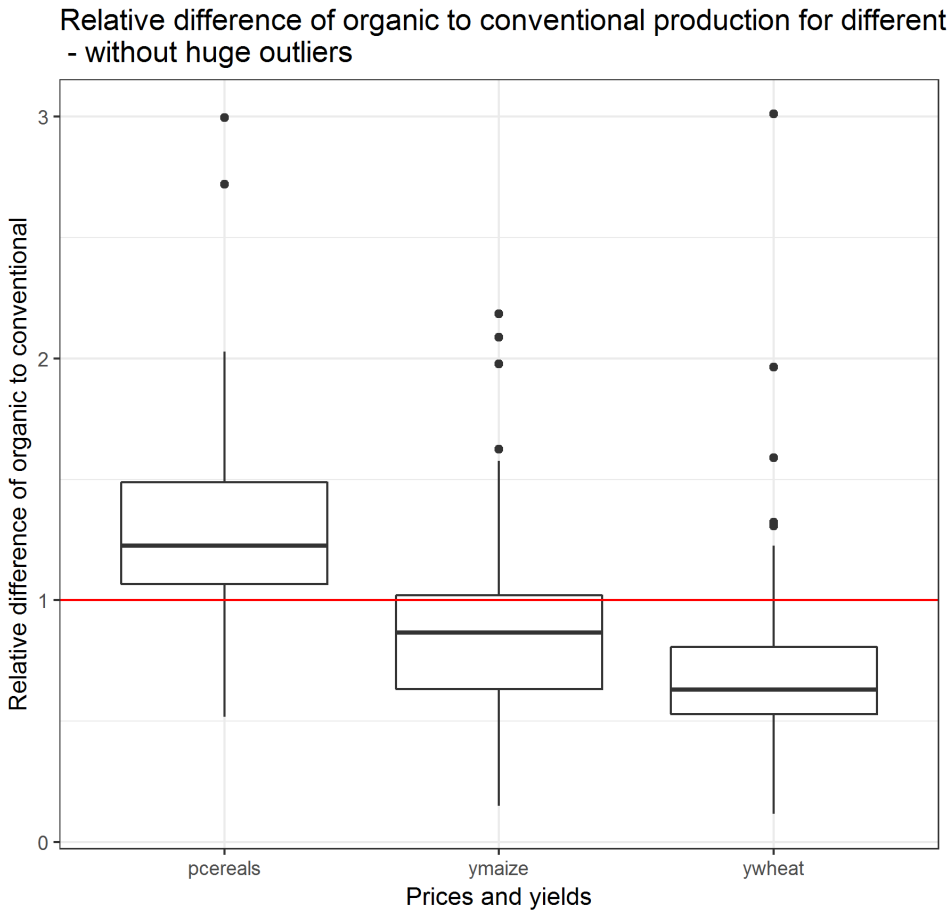
Test Scenario for Task 2.2 “increased organic farming in the EU”

- IFM-CAP represents also organic farms -> exploits comparative advantage
- **Step 1**: Determine Δ yield and Δ price between organic and non-organic farms
- **Step 2**: % change are apply to a certain share of (converting) conventional farms
- **Step 3**: Supply changes in IFM-CAP to CAPRI > Price feedback until convergence

WP3.2 Scenario probably less interesting as smaller price feed-backs

IFM-CAP & CAPRI linkage step 1: FADN evidence



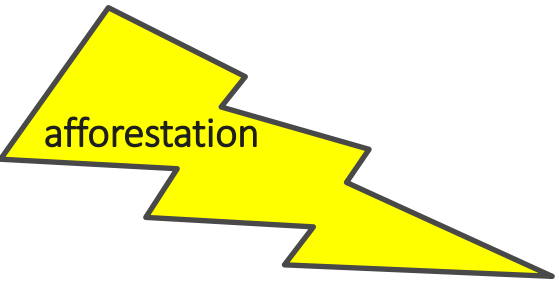


AGLINK-AGMEMOD linkages

- AGMEMOD takes macro and policies from DG Agri (by MS)
- AGMEMOD supports EU Outlook by providing MS level information, linked to EU15/EU13 aggregates
  - Matching => “breaking down” of DG-Agri results to MS-level, validated by national market experts
  - Benchmarking => compare different model-results, while letting both models tell their own story (~ “testing”)
- Alignment via scaling procedure for MS results to “fit” to EU-15/EU-13 or to EU total
  - Details: Deciding what it the “weak information” to adjust in case of “hard information” on certain MS and on the aggregates
  - But no fundamental changes under SUPREMA

GLOBIOM to MAGNET linkage

- Implementing exogenous afforestation, forest protection or energy crop (plantation) areas from GLOBIOM
  - understanding consequences of land related mitigation for food security
- Current method: Exogenous shift of land demand
  - Future: endogenous afforestation based on economic incentives with respecification of substitution relationships



	AGRI_PRIM	FOOD
Production volume	-19	-11
Private consumption volume	-20	-11
Price production real	338	41
Agri land	-38	NA
Yiled	32	NA
Calories consumption		-19

GLOBIOM to CAPRI linkage in scenario

- Implementing exogenous afforestation, forest protection or energy crop (plantation) areas from GLOBIOM
- Current method: "closure swap" in land supply
  - Also possible: exogenous change in forest land rent
- Technical test: increase forest area by 10% of UAA:

		Area		LULUCF-CO2	
		ref (mha)	Δ	ref (mt CO2)	Δ
Indonesia	Forest	94.9	5.8	-302.4	-815.4
	Cropland	47.3	-2.5	1313.9	-1052.5
	Grassland	26.5	-2.3	317.1	-307.8
	GRS>FOR	0.0	1.1	-13.8	-775.4
	FOR>CRP	1.2	-1.2	1004.2	-990.3
	Total			1496.6	-2316.0

Contribution of more afforestation or less deforestation depends on country

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Full GLOBIOM – MAGNET- CAPRI linkage

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 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

Soft linkage via infrastructure

- Development of SUPREMA template in the first project phase, but real test will come in the context of WP3 comparisons
  - Many new indicators
  - New option to compare bilateral trade flows (fresh, but first testing under AgClim50iii has been done)
  - New option to compare MS level results (at least between some models)
  - Possibly also decomposition analysis of mitigation like in AgClim50-2: from activity levels, mitigation technologies and structural (residual)

WP 2.3 SUPREMA improvements

- AGMEMOD: consolidation of market network
- GLOBIOM and MAGNET: Focus on SDGs
- CAPRI: Land use and carbon in non-European regions
- MITERRA: Update of LULUCF accounting rules
- IFM-CAP: Reduction of execution time

WP 2.3 MAGNET improvements (partly future)

- SDGs: Adding omitted more specific SGD indicators, especially in socio-economic domain (inclusiveness\distributional)
  - Partly adressed
- Extreme weather events: stocks implementation
  - Adressed in AgCLim50-3
- Endogenous forest land ⇔forest commodities supply
- Endogenous tech. change extension towards:
  - energy use efficiency, emissions reduction, private incentives
  - implementation of (BE)CCS technologies
- Extended MAC curves To replace exogenous impacts from IMAGE

WP 2.3 CAPRI improvements (partly future)

- More “symmetric “ coverage of non-EU regions relative to EU regions on land supply, land transitions between UNFCCC categories, carbon accounting
  - = Key contribution under SUPREMA
- Complementary progress from other work:
  - Improved representation of environmental constraints from policy
  - Stylised representation of extreme events (short run yield shocks)
  - Improved diet baseline and scenario work
- In short run pipeline
  - Trade data updates, flexible EU sub-regions, Armington issues
  - Work on European land use and mitigation (Ecampa4)

WP 2.3 CAPRI improvements (Options)

- Empirical research on adoption: Conceptual note under SUPREMA, possibly linkage with BESTMAP, more needs to follow.
- Biodiversity indicators linking to intensity (fertilisers, pesticides), not only land use
- Refinements on new energy crops and other bioenergy
- Non-EU coverage for fertilisers, irrigation.
- Consolidation of “CAPRI-fish” and standard versions
- Distinction of organic and conventional: only IFM-CAP?
- More complete coverage in non-EU regions for animal herds
- Food security of vulnerable segments of the population?

Inter-model baseline comparison:

LESSONS LEARNED & NEXT STEPS

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D.4.JRC

12 Feb 2020

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

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Content

1. Introduction: models, assumptions, purpose
2. Selection of indicators
3. Comparison
    - Production
    - Use and net trade
    - Price
4. Lessons learned
5. Next steps

suprema

1. Introduction

2030 baseline: AGMEMOD, CAPRI, IFM-CAP

Model version and assumptions - AGMEMOD

Version: update of 2019 (extension to sugar/iso-glucose)

Assumptions:

- GDP, population, EUR exchange rate, world market prices for agri commodities – EU MTO2018 and MS specific
- Output prices, domestic use, production, area and animal stocks – based on EU MTO2018 (EU-N13 and EU-15)

1. Introduction

2030 baseline: AGMEMOD, CAPRI, IFM-CAP

Model version and assumptions - CAPRI

Version: update of January 2020

Assumptions:

- GDP, population, output prices, domestic use, production, land use, net trade – based on OECD 2017 and GLOBIOM-EU 2018
- Biofuel use – results of PRIMES model 2017

1. Introduction

2030 baseline: AGMEMOD, CAPRI, IFM-CAP

Model version and assumptions – IFM-CAP

Version: v.1 of 2018

Assumptions:

- Growth rates of yields and prices are based on CAPRI baseline 2017

1. Introduction

The models are different in:

- Structure and methodologies
- Units, regions, commodity definitions
- Simulated variables
- Timing/schedule/approaches of the baseline generation and model development/update

Do the models support, complement, contradict each other's projections?

First insights into the differences in the modelling outcome.

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2. Selection of indicators

Following D2.1 of this project and baseline harmonization issues, variables to be compared in CAPRI, AGMEMOD and IFM-CAP are:

- Yield/production
- Area harvested
- Domestic use
- Per capita consumption
- Net trade
- Price

➢ MS level. DE – soft wheat, FR – rapeseed, ES – pork

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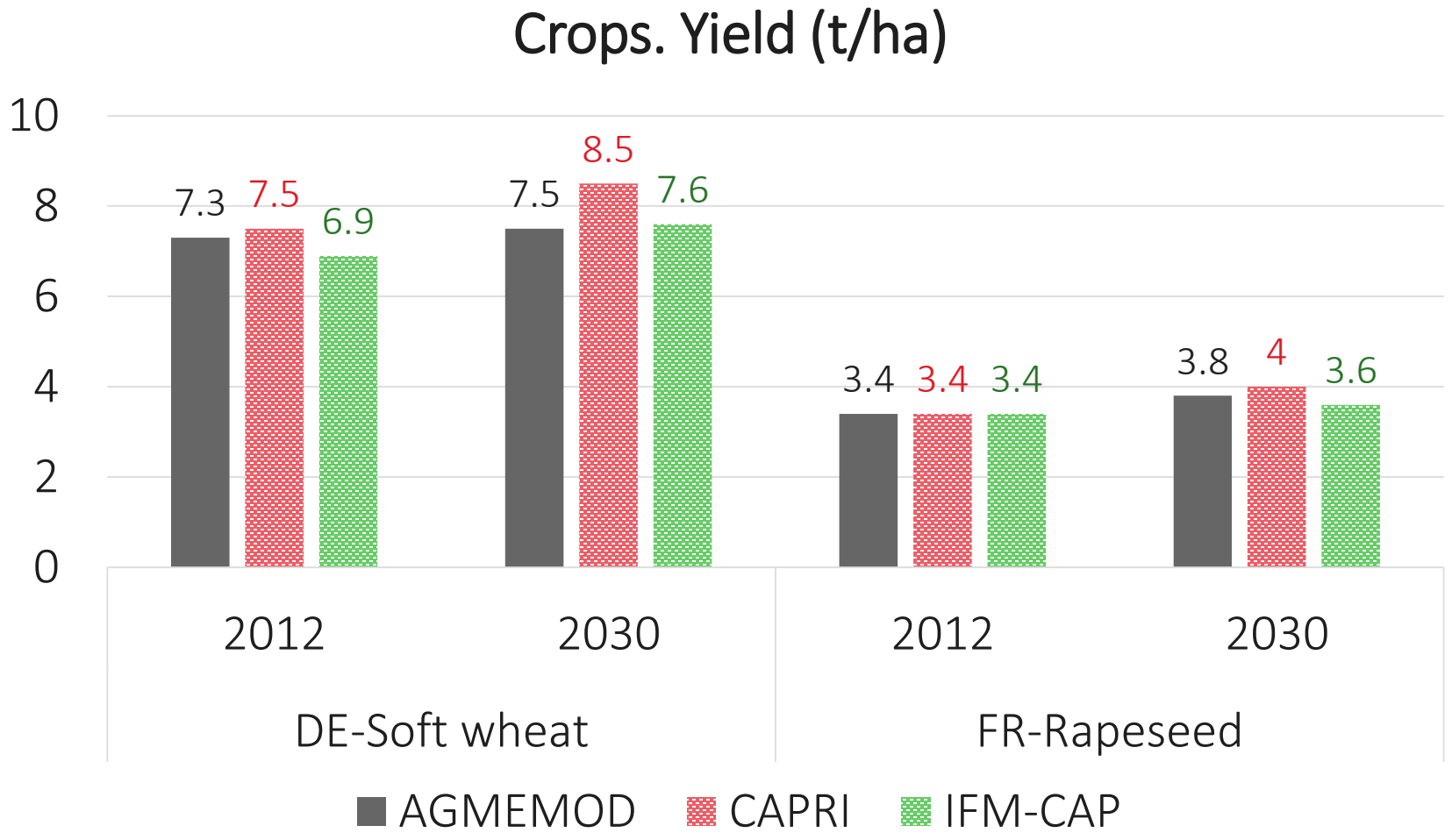
3. Comparison

Production



NOTE: Patterned bar – the value is based on external baseline

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3. Comparison

Production

Reasons for the base year/database differences:

- AGMEMOD – EUROSTAT, national statistics, additional sources, balancing
- CAPRI – EUROSTAT, FAOSTAT, data consolidation
- IFM-CAP – FADN supported by Eurostat and CAPRI database

Reasons for projection differences:

- Different external baselines
- Time series/base year
- Values of elasticities, dependent variables and of constraints

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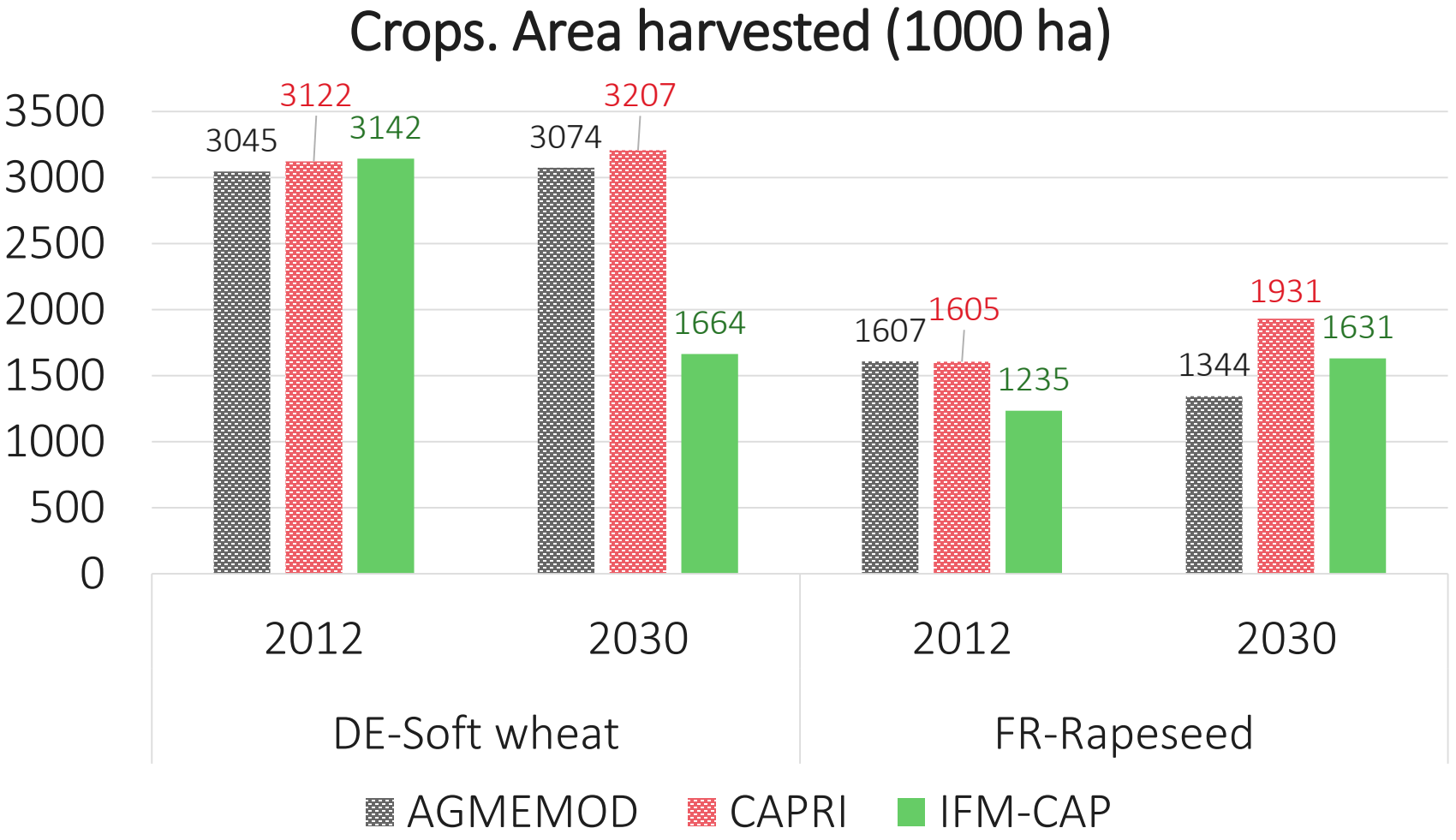
3. Comparison

Production



NOTE: Patterned bar – the value is based on external baseline
Solid bar – the value is projected by the model

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3. Comparison

Production

Projection differences:

- Underlying assumption on future biofuels demand
- CAP (farm diversification in IFM-CAP)
- Different external baselines
- Time series/base year
- Values of elasticities, dependent variables

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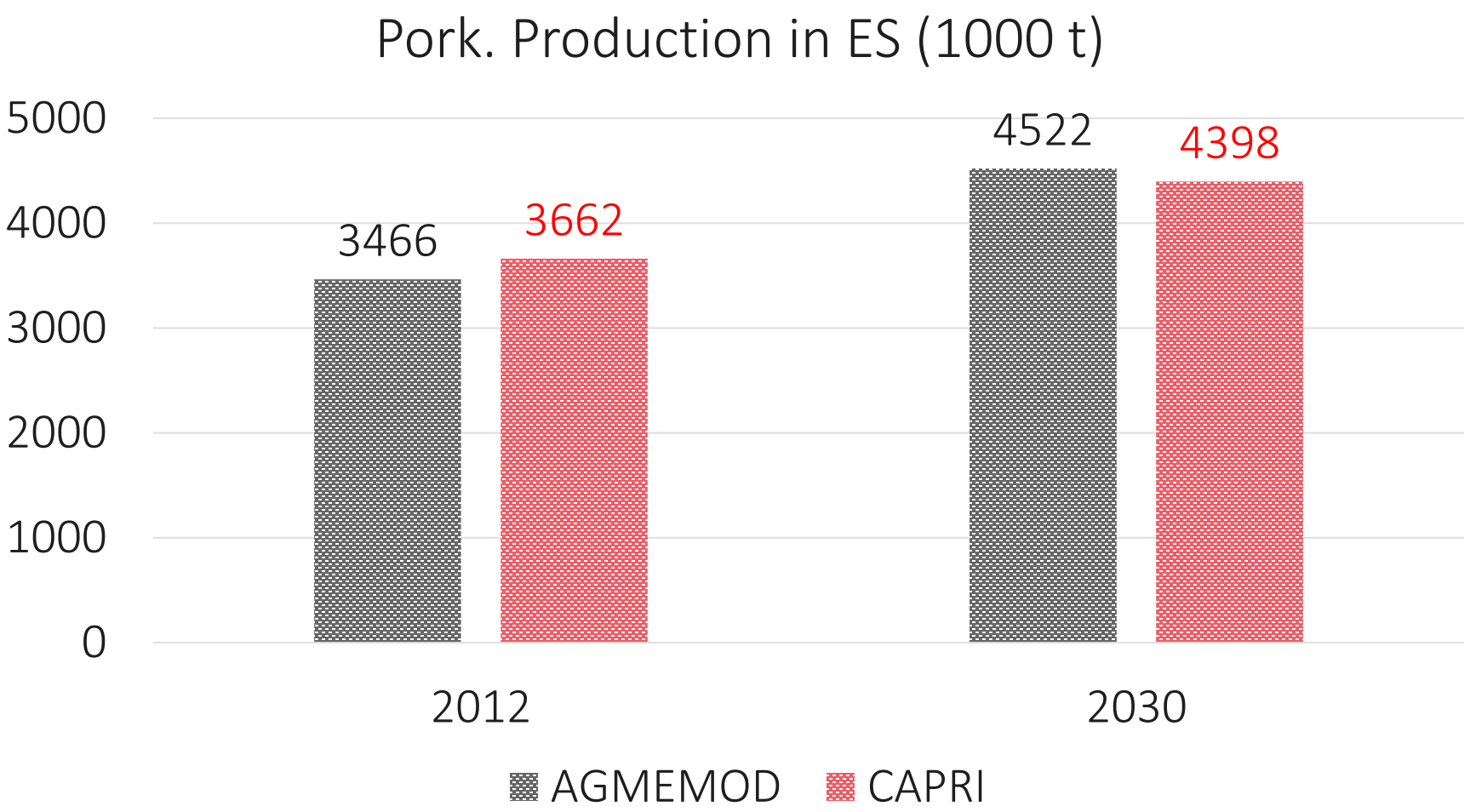
3. Comparison

Production



NOTE: Patterned bar – the value is based on external baseline
Solid bar – the value is projected by the model

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3. Comparison

Production

Projection differences:

- Pigs slaughter weight (i.e., lower in AGMEMOD in 2012)
- Difference in approach of modelling the number of slaughtered pigs:
  - AGMEMOD – function of herd number, export demand, trend, pigs crop
  - CAPRI – optimization model with feed, labour, amount of fattening days, revenues, human consumption, (expert based) constraints on growth rates

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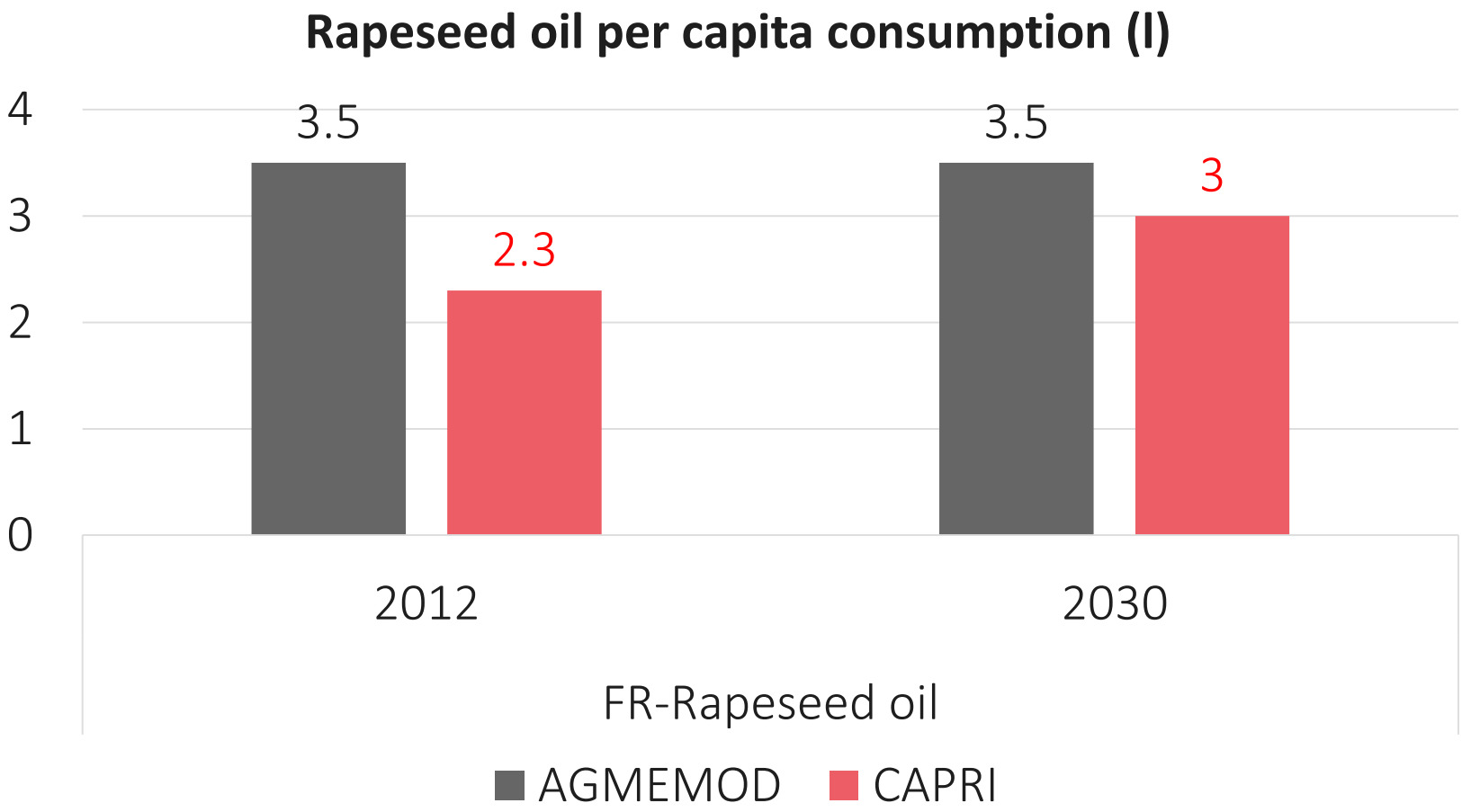
3. Comparison

Use



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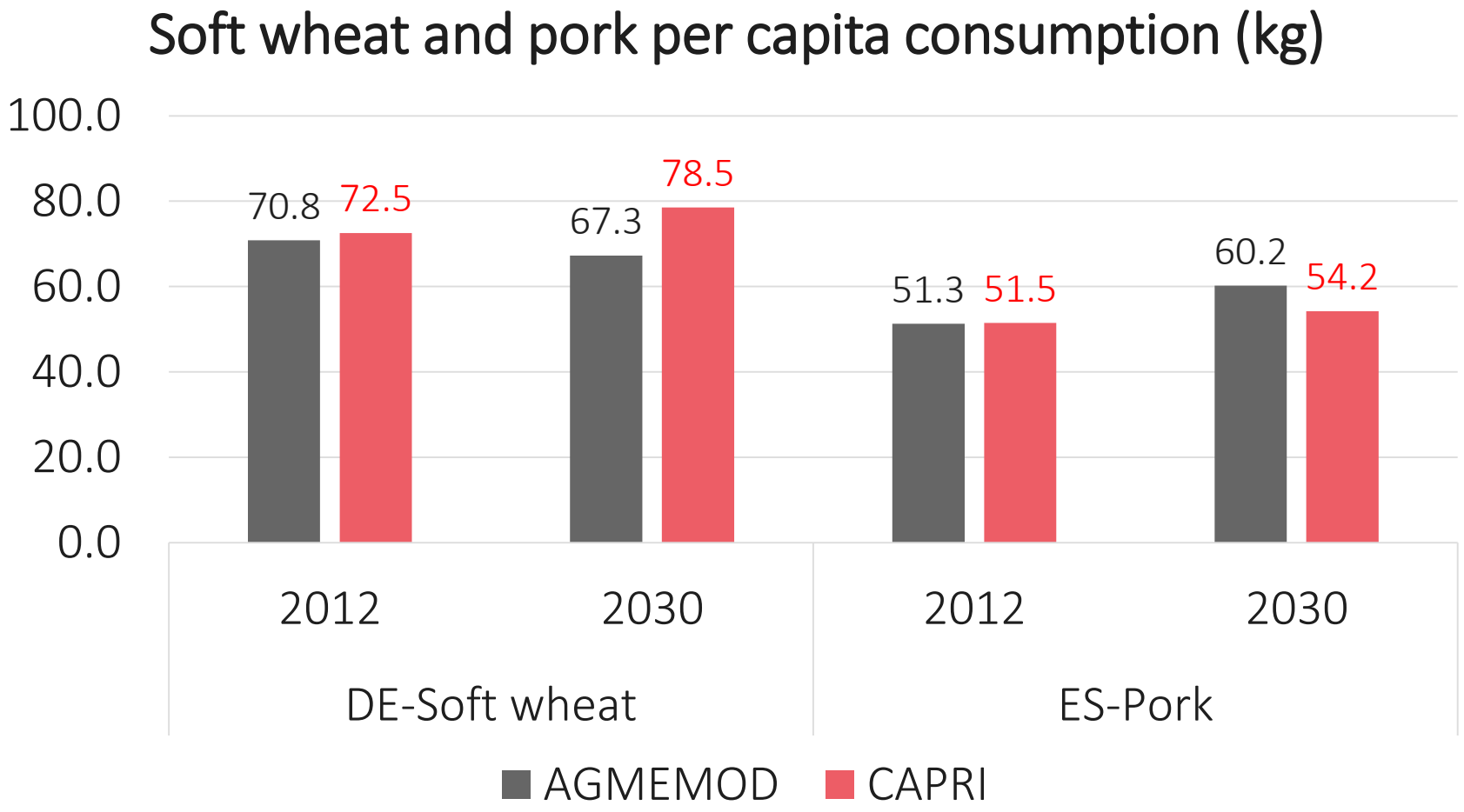
3. Comparison

Use



NOTE: Solid bar – the value is projected by the model

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3. Comparison

Use

POPULATION, mil	2012	2030
	ES	
AGMEMOD	46.6	46.6
CAPRI	46.2	44.8
	FR	
AGMEMOD	63.6	70.2
CAPRI	65.4	71.5
	DE	
AGMEMOD	80.4	82.3
CAPRI	81.9	80.8

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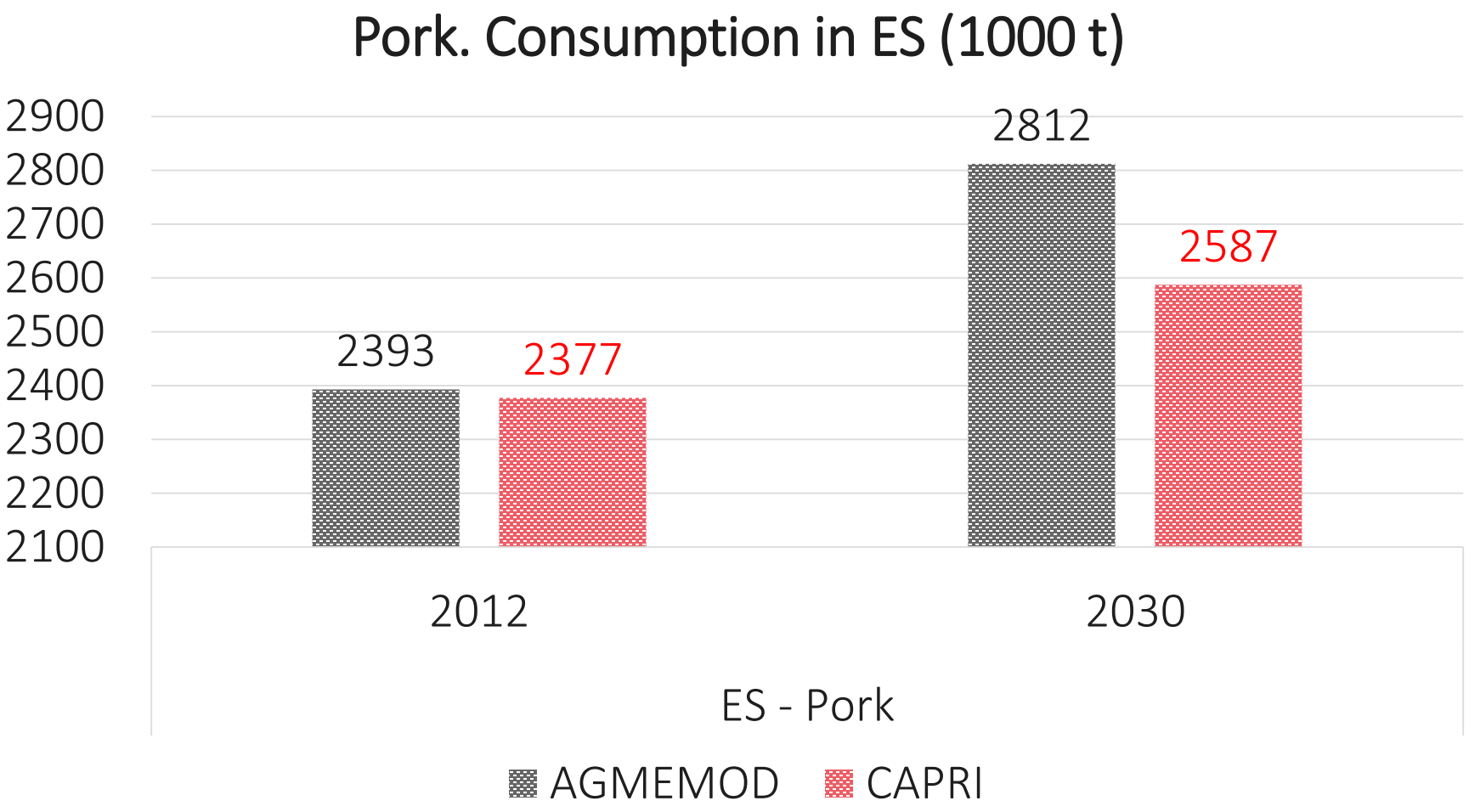
3. Comparison

Use



NOTE: Patterned bar – the value is based on external baseline

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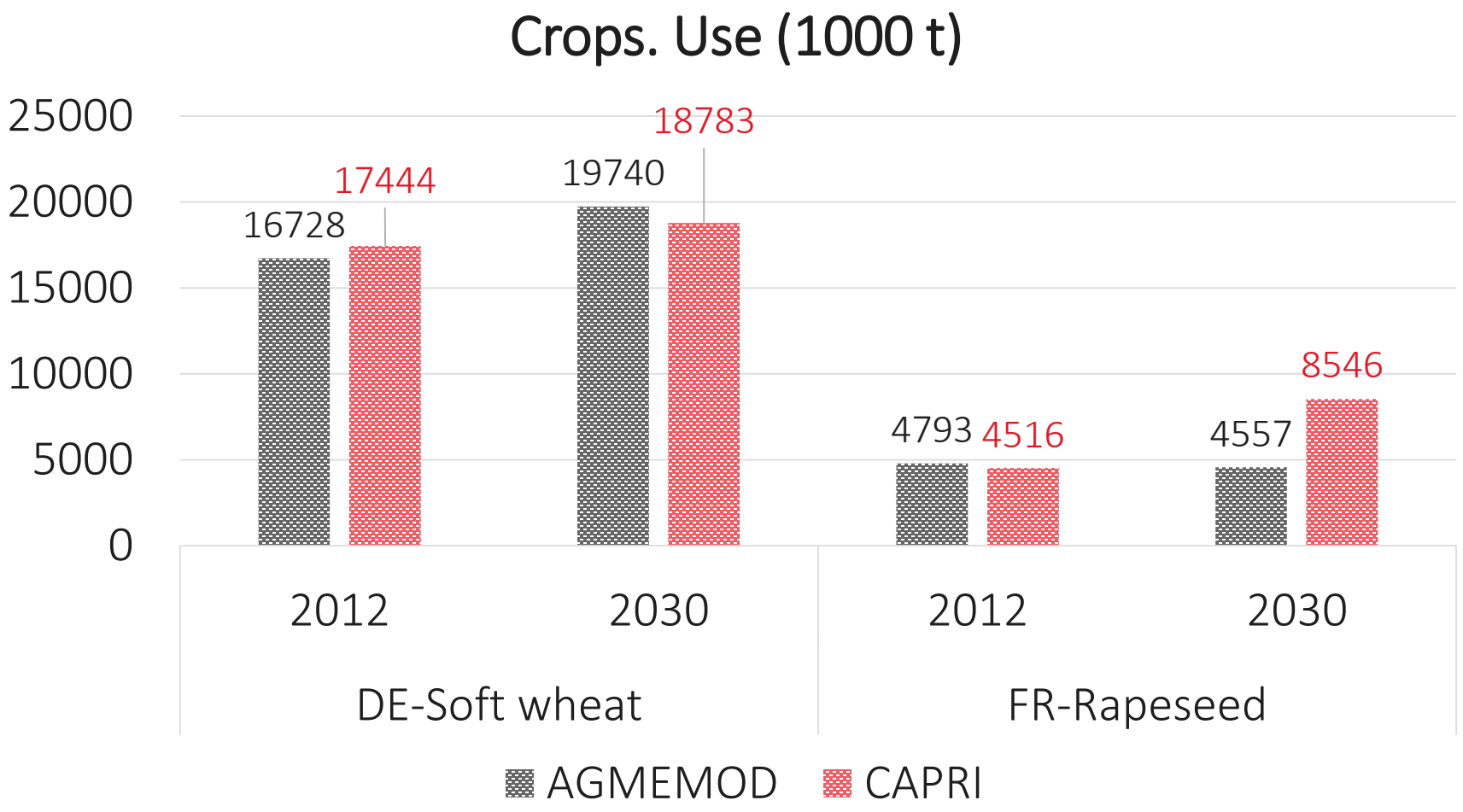
3. Comparison

Use



NOTE: Patterned bar – the value is based on external baseline

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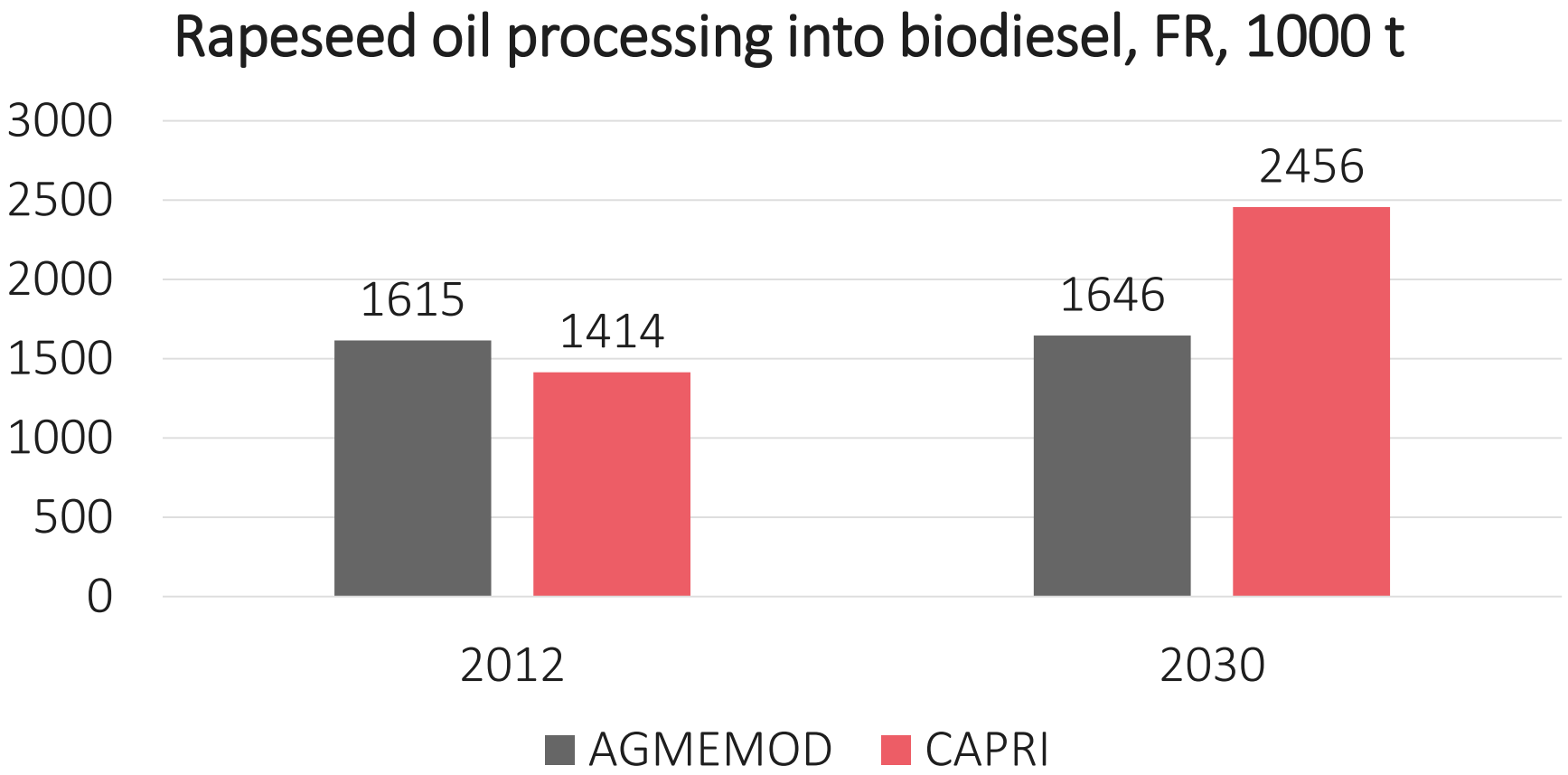
3. Comparison

Use



NOTE: Solid bar – the value is projected by the model

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3. Comparison

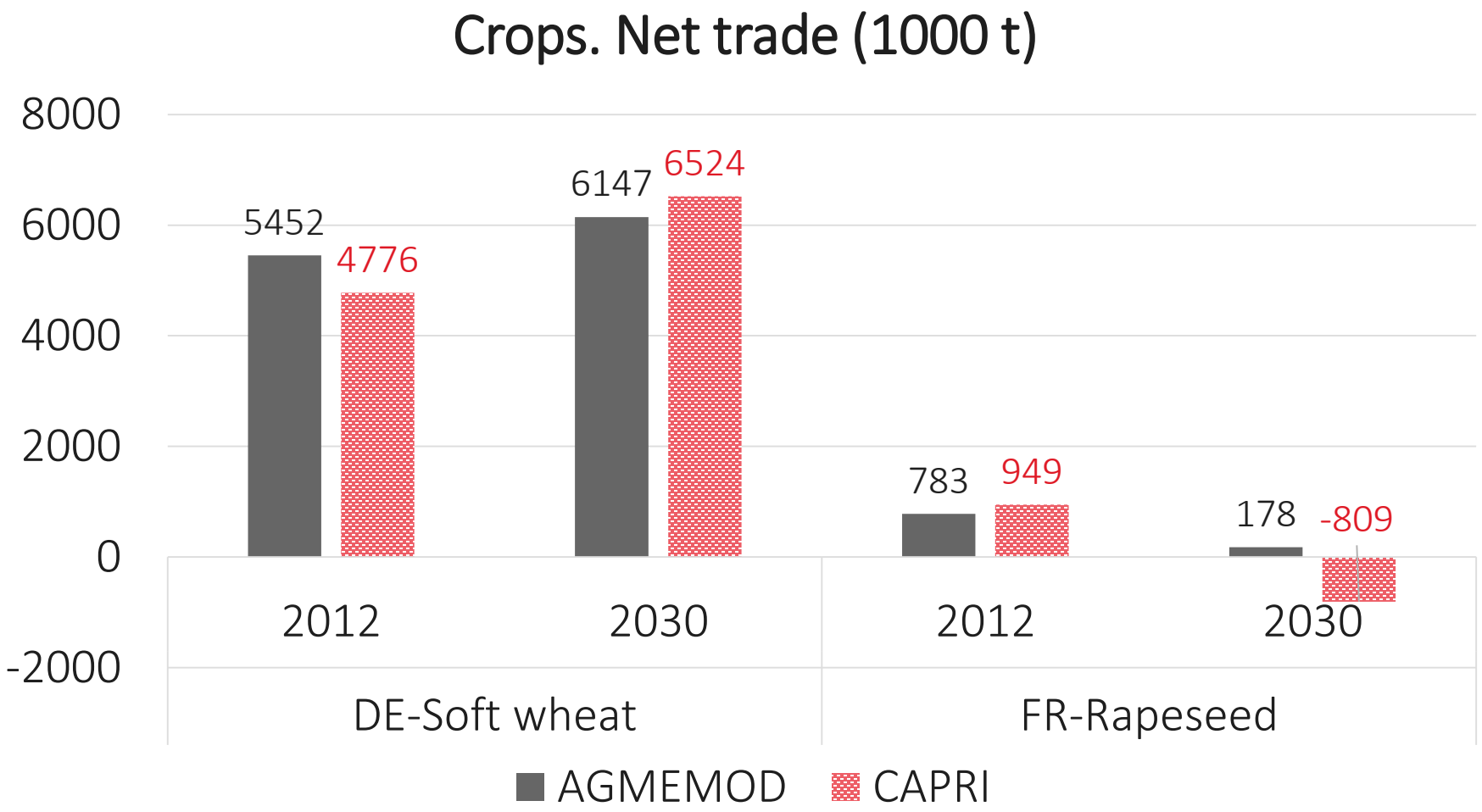
Use

Projection differences:

- Modelling outcome of each of the use type, values of the dependent variables (incl. exogeneous) and elasticities
  - feed use (number of animals, feed composition)
  - food use (population, prices)
  - other uses (biofuels)
- Difference in estimation of feedstock processing (e.g., fixed value in AGMEMOD model, PRIMES in CAPRI)
- Policy

3. Comparison

Net trade



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Solid bar – the value is projected by the model

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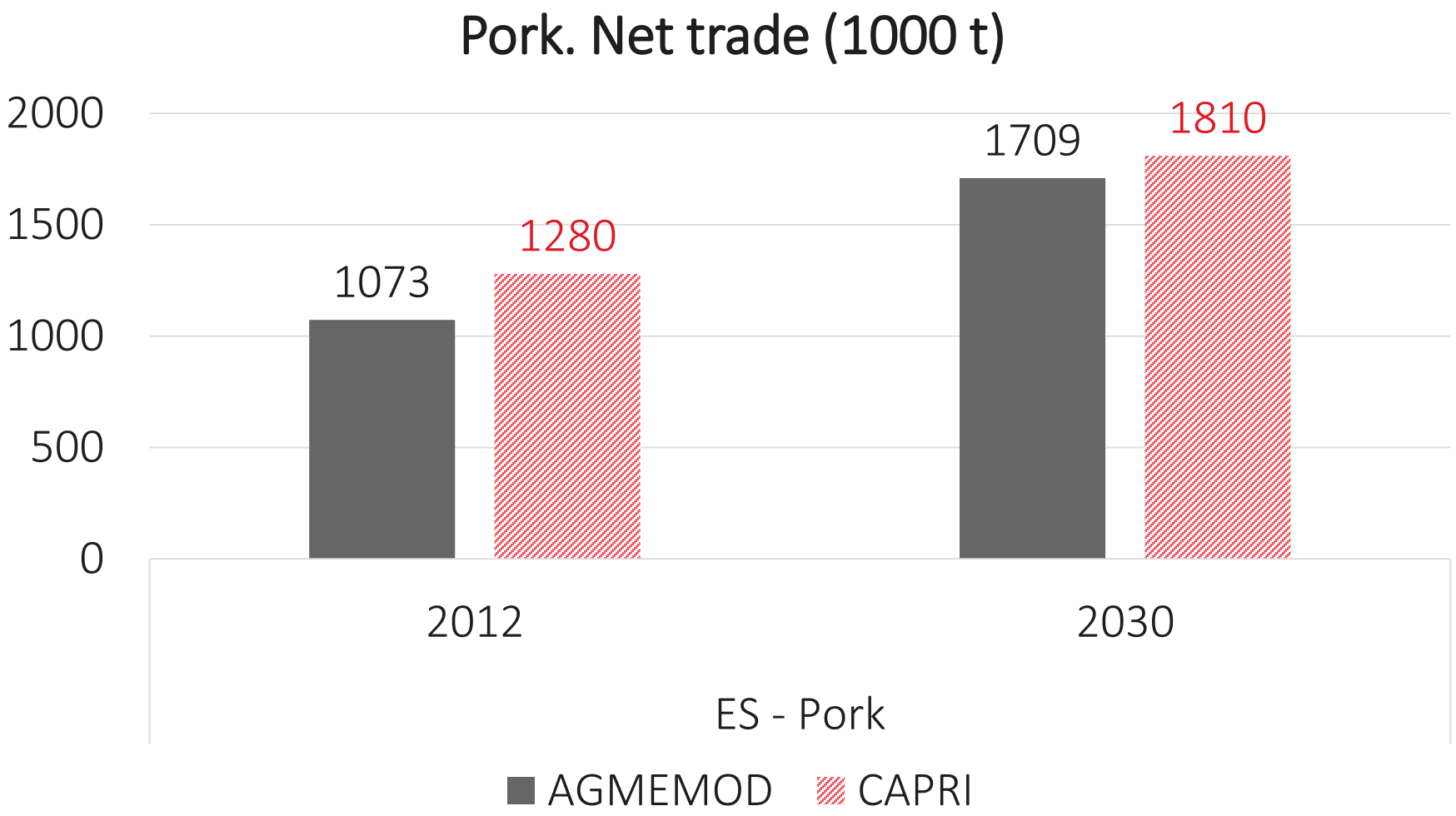
3. Comparison

Net trade



NOTE: Patterned bar – the value is based on external baseline
Solid bar – the value is projected by the model

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3. Comparison

Net trade

Projection differences:

- CAPRI: bilateral trade flows of import and export, import prices
- AGMEMOD: total import and export flows, world and domestic market prices
- Differences in production and use

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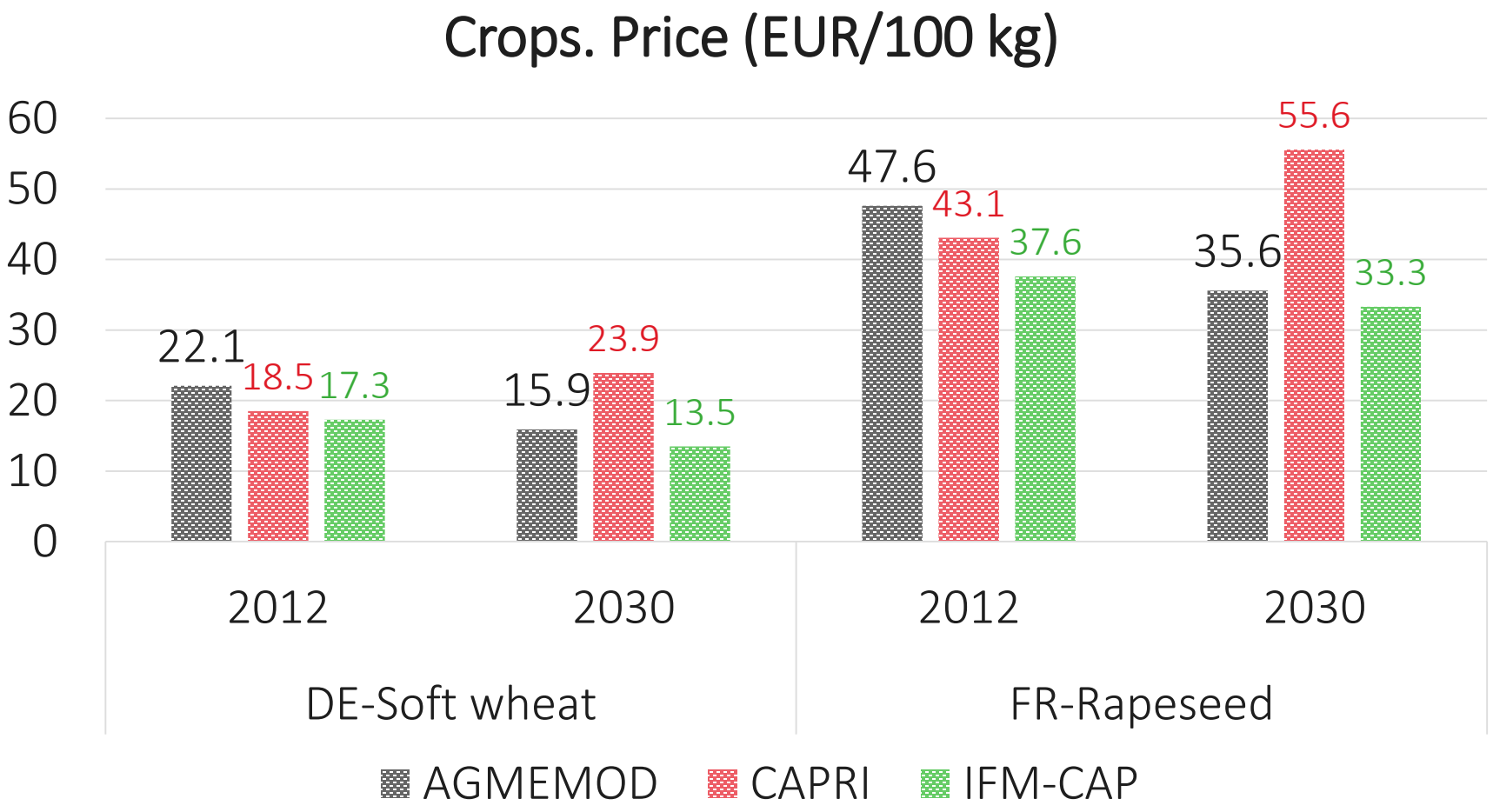
3. Comparison

Price



NOTE: Patterned bar – the value is based on external baseline

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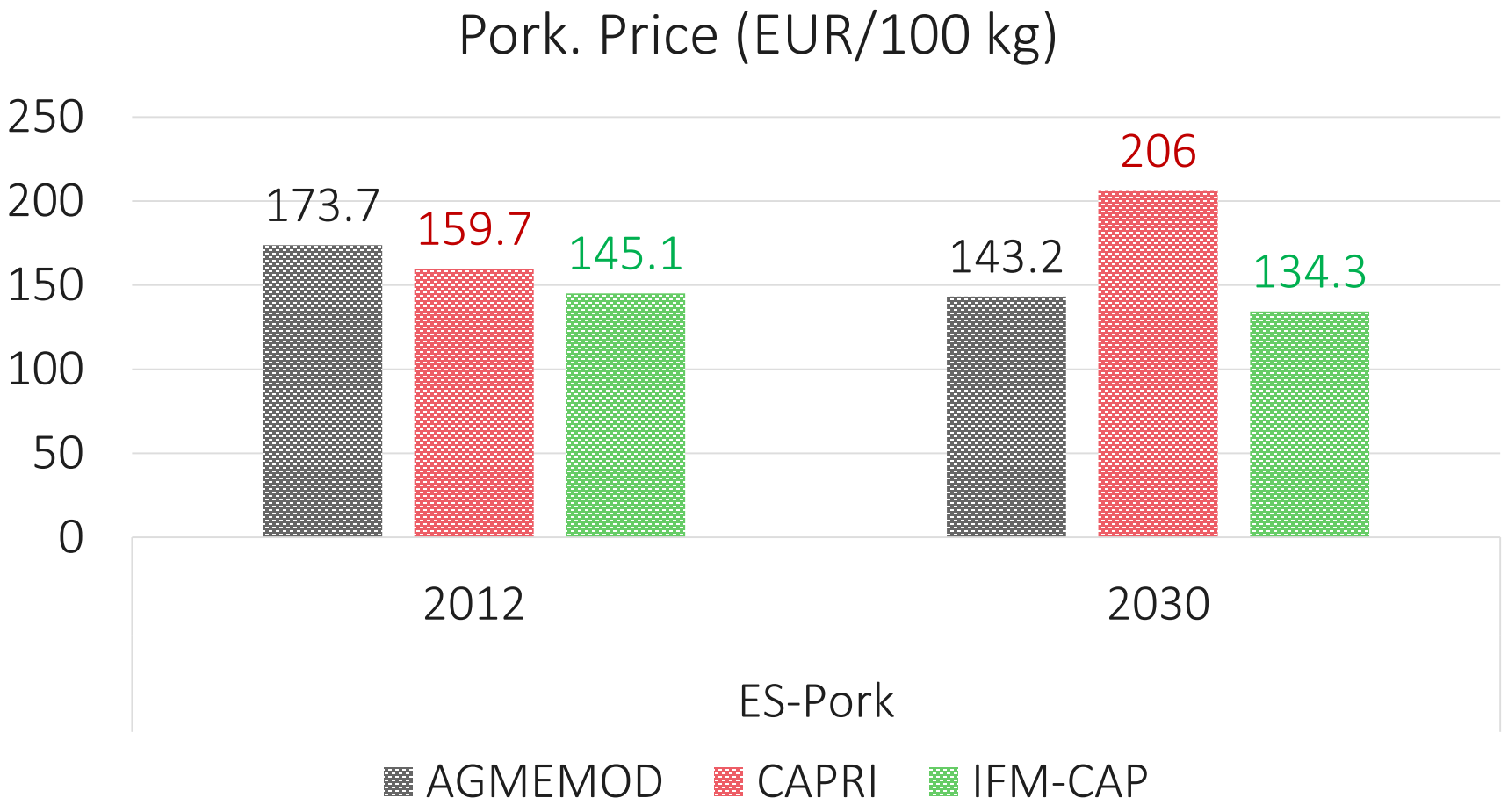
3. Comparison

Price



NOTE: Patterned bar – the value is based on external baseline

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3. Comparison

Price

Database differences:

- CAPRI
  - market price is a function of import and producer prices
  - Economic Accounts for Agriculture (EAA) and price indices for gap filling, otherwise unit value calculation
- AGMEMOD
  - Eurostat, national statistics

Projection differences:

- External baseline
- Modelling approach
  - CAPRI: iteration between market and supply modules; import and domestic prices
  - AGMEMOD: world market/key prices, self-sufficiency rates

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4. Lessons learned

Main reasons for differences in baselines of AGMEMOD, CAPRI and IFM-CAP are:

1. External baseline
2. Major policy assumptions (CAP, biofuels demand)
3. Database
4. Estimation approach
5. Exogenous macro-economic variables

4. Lessons learned

Challenges in baseline harmonization:

1. Harmonize the timing of baseline development
2. Harmonize key database differences (difference in database update schedules and duration)

Lessons learned:

- In constrained time, harmonization of the baselines between the models should be topic/scenario-focused
- The degree of harmonization depends on the type and purpose of model linking

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5. Next steps

Baseline harmonization

Step 1

- Similar external baseline
- Policy assumptions
- Exogenous macro-economic variables

Step 2

- Analysis of the differences

Step 3

- Application of the harmonization approach targeted at specific values and depending on the type of model linkage

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THANK YOU FOR YOUR ATTENTION

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Annex

YIELD, t/ha		AGMEMOD	CAPRI	IFM-CAP
DE-Soft wheat	2012	7.3	7.5	6.9
	2030	7.5	8.5	7.6
FR-Rapeseed	2012	3.4	3.4	3.4
	2030	3.8	4	3.6

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Annex

AREA, 1000 ha		AGMEMOD	CAPRI	IFM-CAP
DE-Soft wheat	2012	3045	3122	3142
	2030	3074	3207	1664
FR-Rapeseed	2012	1607	1605	1235
	2030	1344	1931	1631

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Annex

PORK PRODUTCION, 1000 t	AGMEMOD	CAPRI
2012	3466	3662
2030	4522	4398

Annex

USE, 1000 t		AGMEMOD	CAPRI
DE-Soft wheat	2012	16728	17444
	2030	19740	18783
FR-Rapeseed	2012	4793	4516
	2030	4557	8546
ES - Pork	2012	2393	2377
	2030	2812	2587

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Annex

NET TRADE, 1000 t		AGMEMOD	CAPRI
DE-Soft wheat	2012	5452	4776
	2030	6147	6524
FR-Rapeseed	2012	783	949
	2030	178	-809
ES - Pork	2012	1073	1280
	2030	1709	1810

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Annex

PRICE, EUR/100 kg		AGMEMOD	CAPRI	IFM-CAP
DE-Soft wheat	2012	22.1	18.5	17.3
	2030	15.9	23.9	13.5
FR-Rapeseed	2012	47.6	43.1	37.6
	2030	35.6	55.6	33.3
ES-Pork	2012	173.7	159.7	145.1
	2030	143.2	206	134.3

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AGMEMOD modelling within SUPREMA

Medium-term scenario - Background information & selected results

Roel Jongeneel, Ana Gonzalez-Martinez, Jan Peter Lesschen, Maria Blanco

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Outline

- Medium term scenarios
  - EU (red) meat consumption scenario
  - EU CAP scenario
- Scenario simulation results
  - Meat consumption scenario
  - CAP scenario
- Concluding remarks

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Introduction

- Suprema objective
  - Enhancing SUPREMA model family (incl. model collaboration)
  - Share and discuss findings (incl. comparative assesments)
  - Directions for future modelling in relating to needs

- Worshops and policy makers
  - A long wishlist of issues, such as sustainability, adaptation/mitigation responses, bioeconomy, supply chains, role of consumers, CAP-reform (see flyer)

General information

- Characterization of scenario's

- Shift in meat consumption (ageing population, climate footprint concerns, health/over consumption, preferences youngsters)

  ➡ "More healthy and modern" (MHM)

- CAP scenario: account for a further CAP budget reduction and improvement in its greening, while acknowledging the uncertainty w.r.t future measure design (especially eco-schemes)

  ➡ "More value for less money" (MVLM)

EU (red) meat cons scenario

More healthy and modern

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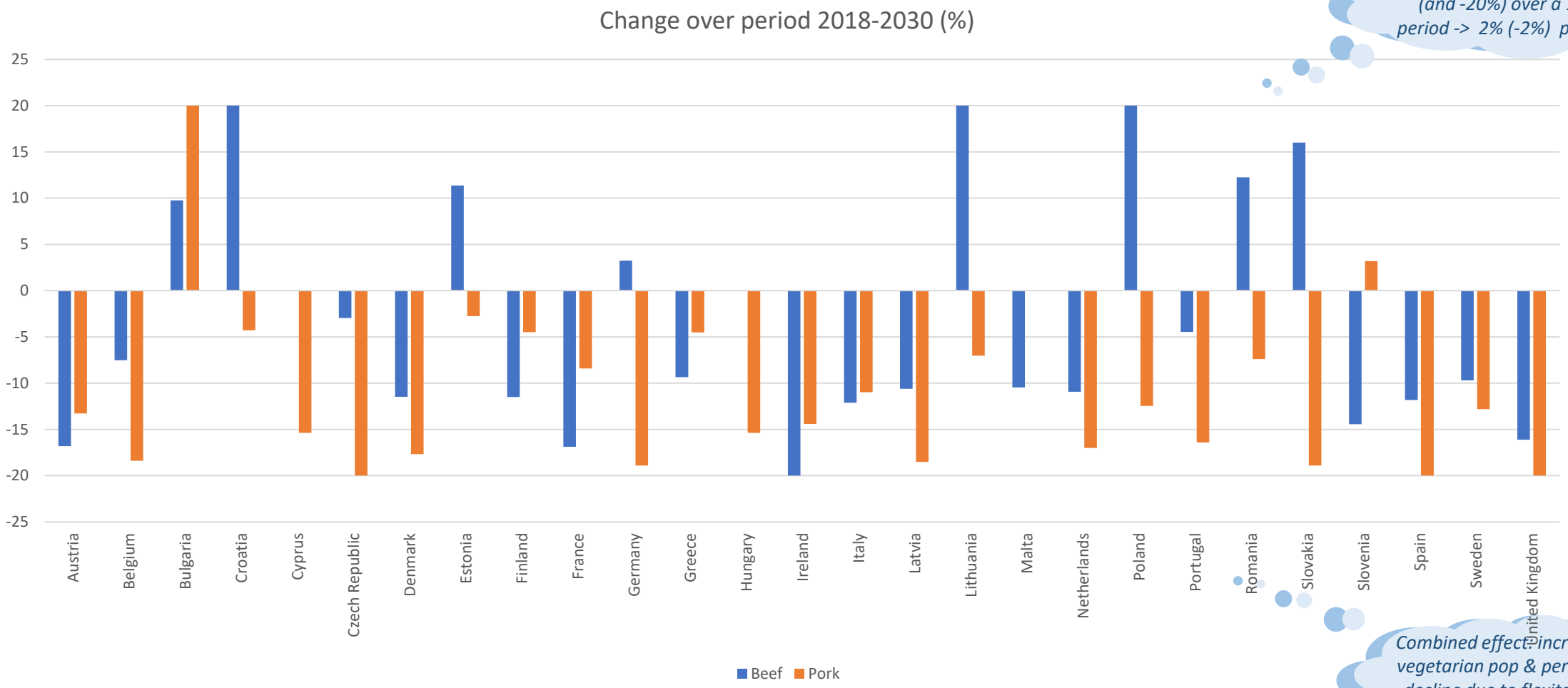
Scenario

- Vegetarian numbers
  - Slow adjustment (0.25% increase/annum) in countries with already a high share of vegetarians (DE, SW, AU, IT, PL)
  - Stronger increase (0.50% increase/annum) in countries have a relative low share of vegetarians (all other EU MS)
  - This implies that in 2030: The MS-average share of vegetarians increases in EU-15 from about 6% to 10.5% (+4.5%), while in the EU-13 it increases from 2.5% till about 8% (+5.5%). (NO changes after 2030 are considered)

- Meat consumption per capita (red meat focused)
  - MS with below average consumption follow their current trend
  - MS with above average consumption decline red meat consumption by 1.0% per annum
  - MS with average meat consumption decline read meat consumption by half the amount of ‘above', or by 0.5% per annum
  - No assumptions are made with respect to the compensation by poultry and dairy products (existing development is assumed to continue unchanged)

Note(s): Consumption shocks starts in 2020.

Consumption scenario: change in per capita consumption



Maximum increases (and declines) are limited to 20% (and -20%) over a 10 year period -> 2% (-2%) per annum

Combined effect: increase in vegetarian pop & per capita decline due to flexitarians, price reactions, etc.

Source: Authors' calculations

EU CAP scenario

More green value for less money

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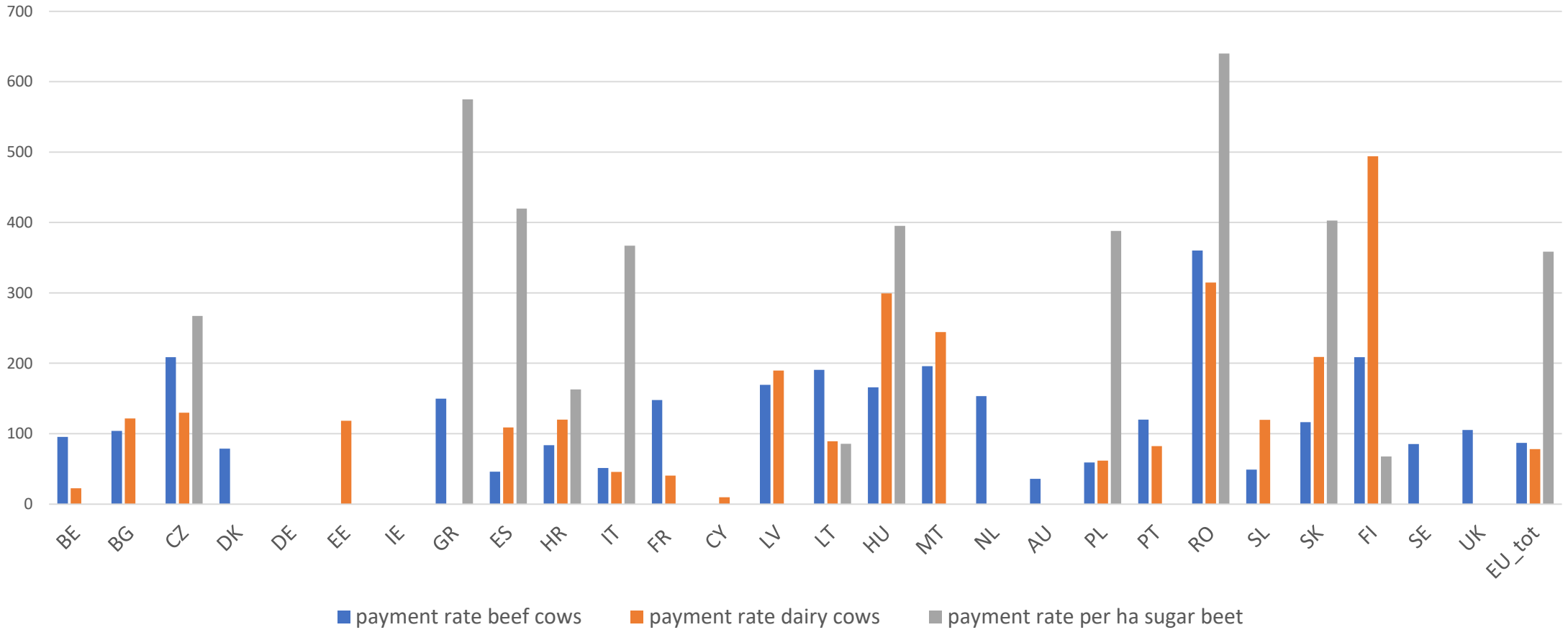
Summary CAP scenario

- A budget reduction of 9% (= 5% + 4% added) which applies linearly to all direct payments, including voluntary coupled support (with focus on key sectors B&V, Dairy and Sugar beet; see next slide for more specific info on VCS in 2019)
- Expected net effect: a reduction of coupled support by 9% and more extreme effect in farm incomes (to the extent these are simulated)
- EFA's will be part of the enhanced conditionality and the current effective levels will apply as the minimum rates included in the Enhanced Conditionality part of the NSPs of MSs (see details in shifter table)
- MS can/should impose eco-schemes: it is assumed that they will offer extended buffer zones (see GAEC 4) and/or and 'maintenance of non-productive elements (see GAEC 9) which leads to an additional 2% of land which can be counted as EFA-area
- Expected net-effect: an increase of the (effective) EFA area from about 3.5% to 5.5% (or a change of +2% to the current values used in the models)

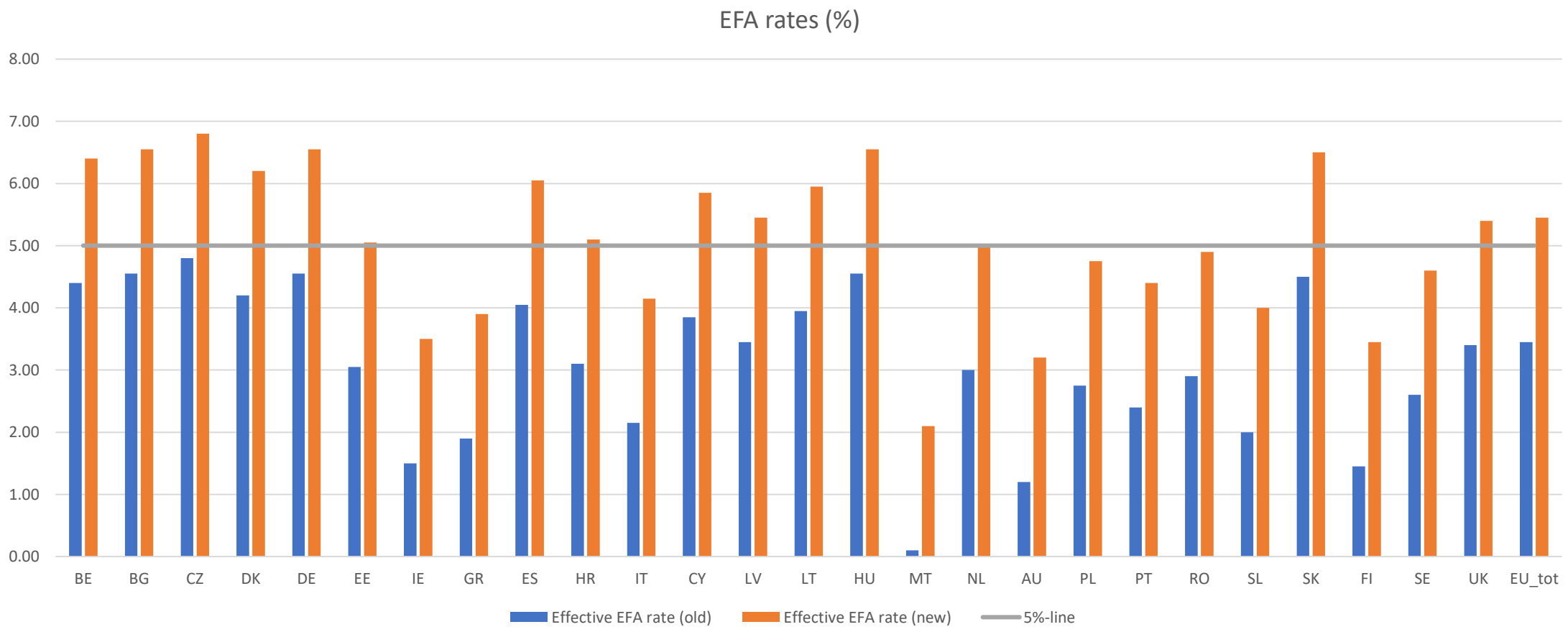
Note(s): New CAP is assumed to start in 2023 -> starting year for implementation of shocks.

CAP scenario: VCS rates for focus products



Amounts in euro/animal or ha (as applied in 2019) to which the budget reduction will be applied

CAP scenario: calculated effective EFA rates



EU meat cons scenario: results

More healthy and modern

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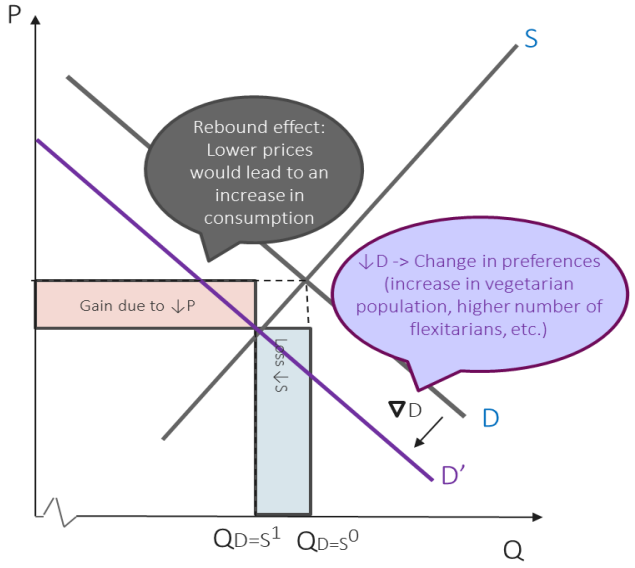
Summary of mechanism and results

- Operating mechanism



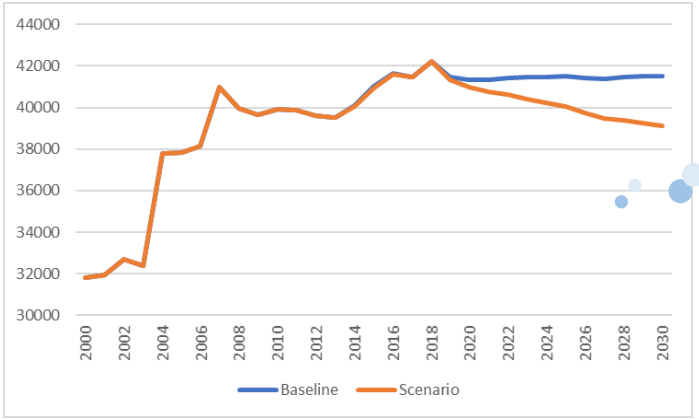
- Meat preference shift impacts: i) on consumption (direct) and ii) on price
- Due to inelastic supply the negative price effect dominates the volume (reduction) effect
- Impacts on farm revenue (negative) are stronger than on farm sales

Summary of economic results

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

Percentage deviation from baseline in 2030 (at EU level)

	AGMEMOD		CAPRI	
Product	Production	Price	Production	Price
Beef	-0.32	-1.56	-3.44	-12.44
Pork	-4.98	-20.80	-3.80	-5.64
Poultry	0.04	-2.32	-0.30	-0.99



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

Source: AGMEMOD.

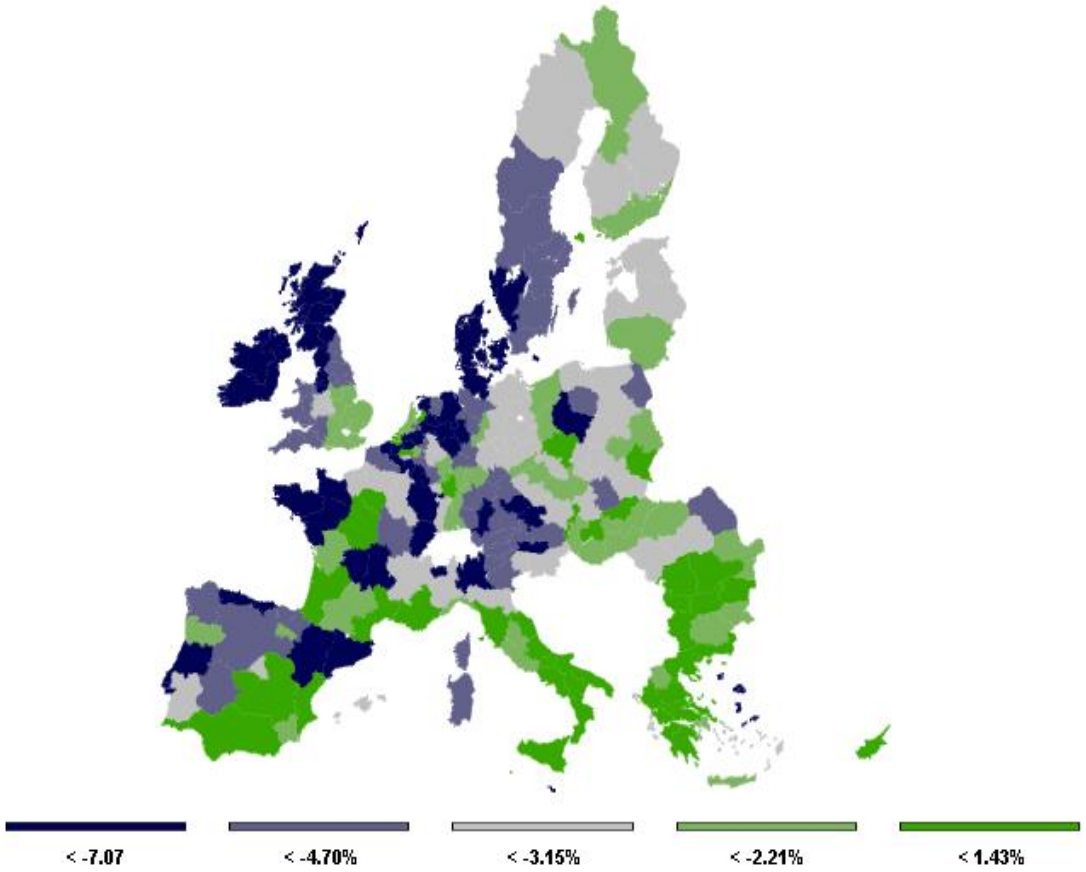
Summary of area and income effects

- 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%

Income per hectare (% change from baseline 2030)



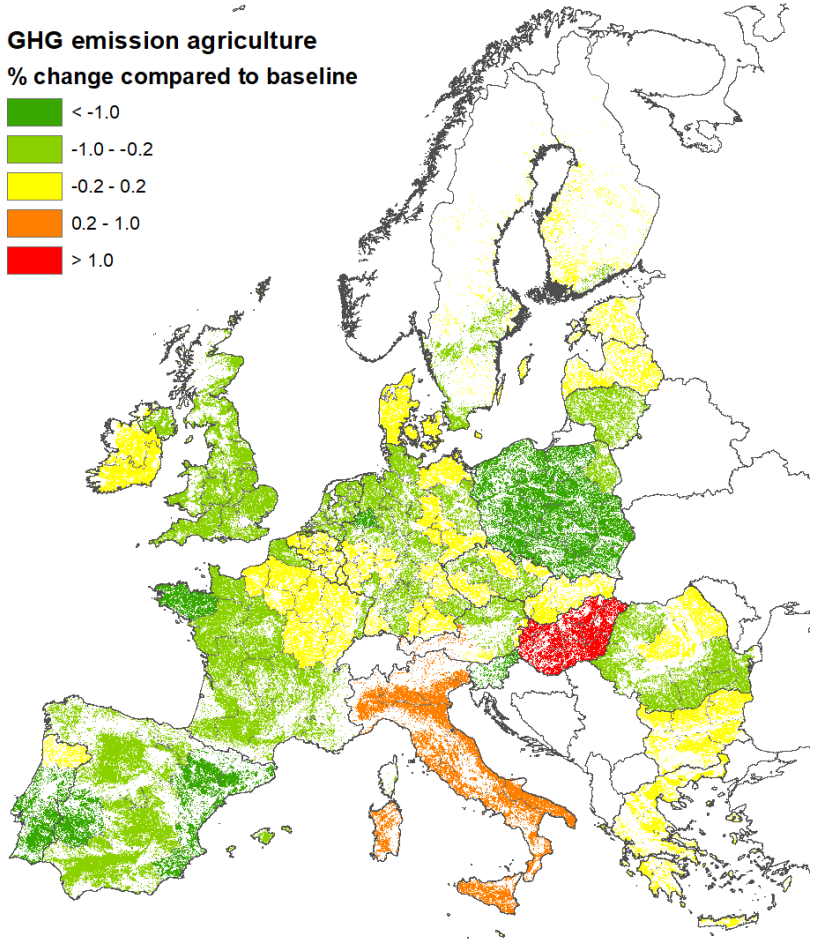
Source: CAPRI results

Summary of environmental indicators

- 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-Europe

EU CAP scenario: results

More green value for less money

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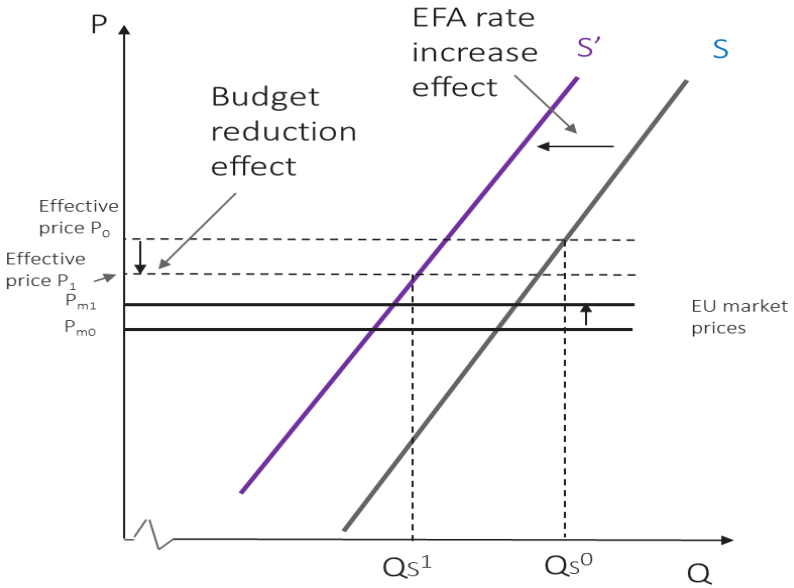
Summary of mechanism and results

- Operating mechanism



- Increase in EFA rate reduces available land and crop production (leftward shift of S to S')
- The budget decline reduces the Voluntary Coupled Support and lowers the effective price farmers face (movement along S) for supported crops and animal products

Summary of economic results

- Impacts are marginal for both models (especially for AGMEMOD), which confirms the decoupledness of CAP support payments
- AGMEMOD has a (too?) strong slippage effect

Percentage deviation from baseline in 2030 (at EU level)

	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

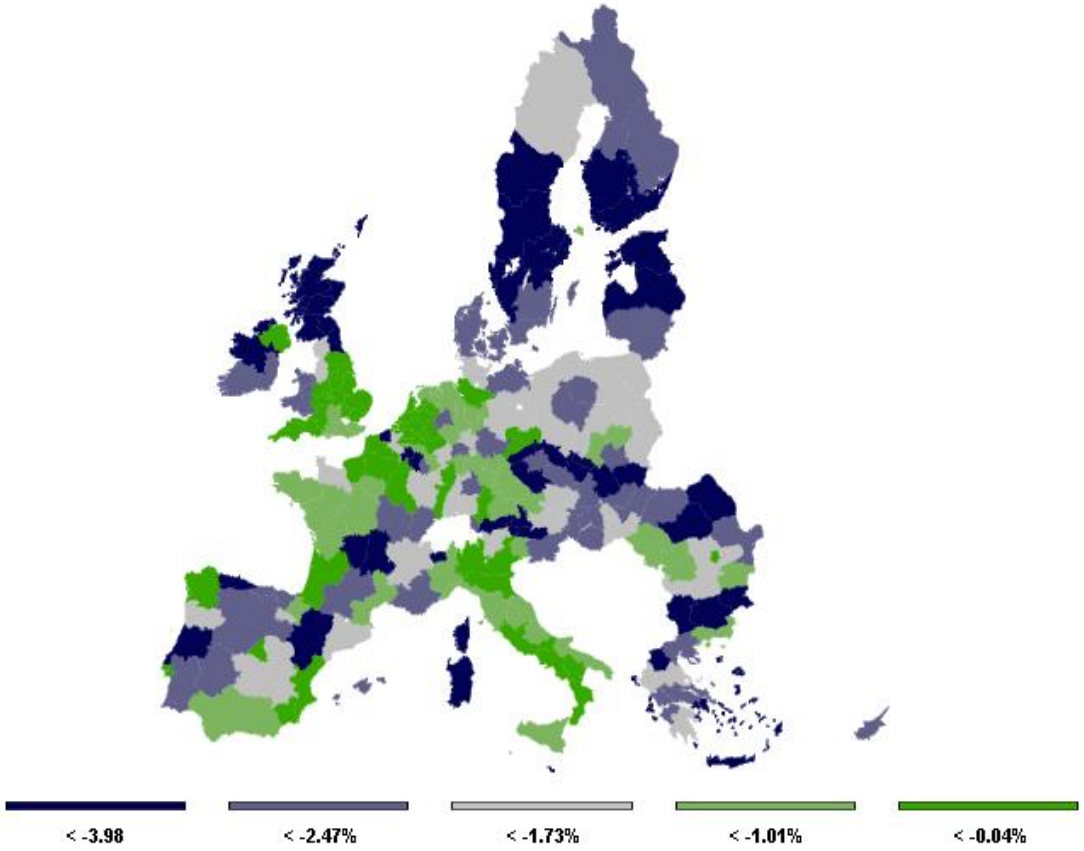
Summary of area and income effects

- 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%

Income per hectare (% change from baseline 2030)



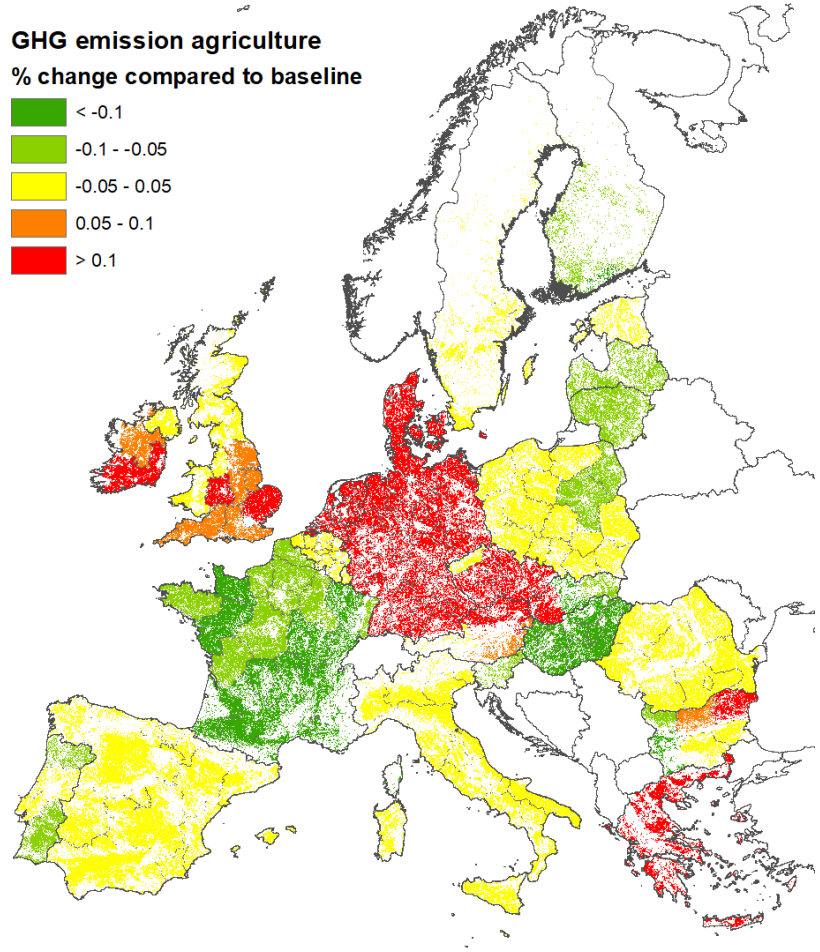
Source: CAPRI results

Summary of environmental indicators

- 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-Europe

Concluding remarks

Concluding observations

- The AGMEMOD-MITERRA and CAPRI-IFMCAP models show different results? Differences can partly be explained by a different treatment of 'slippage' and price transmission effects in both models
- The AGMEMOD-MITERRA model combination is relatively easily manageable but is weaker than CAPRI w.r.t. taking into account endogenous behavioural feed back effects
- CAPRI-IFMCAP has as a strength that it can provide insights into farm income effects. AGMEMOD has a farm income modality (linked to FADN) but this needs further development w.r.t. policy payment linkages
- On scenario results:
  - Changes in consumer behaviour may induce further changes in the EU livestock sector than is accounted for in current projections and maybe superimposed on future CAP climate measures
  - The results confirm that when reducing the budget, in the context of a successfully decoupled CAP, limited market impacts may be expected, while market effects of increasing EFA are also limited (does this signal low opportunity cost of increasing biodiversity?)

Thanks for your attention.

Any questions?

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Long-term climate mitigation: Selected preliminary results

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

IIASA

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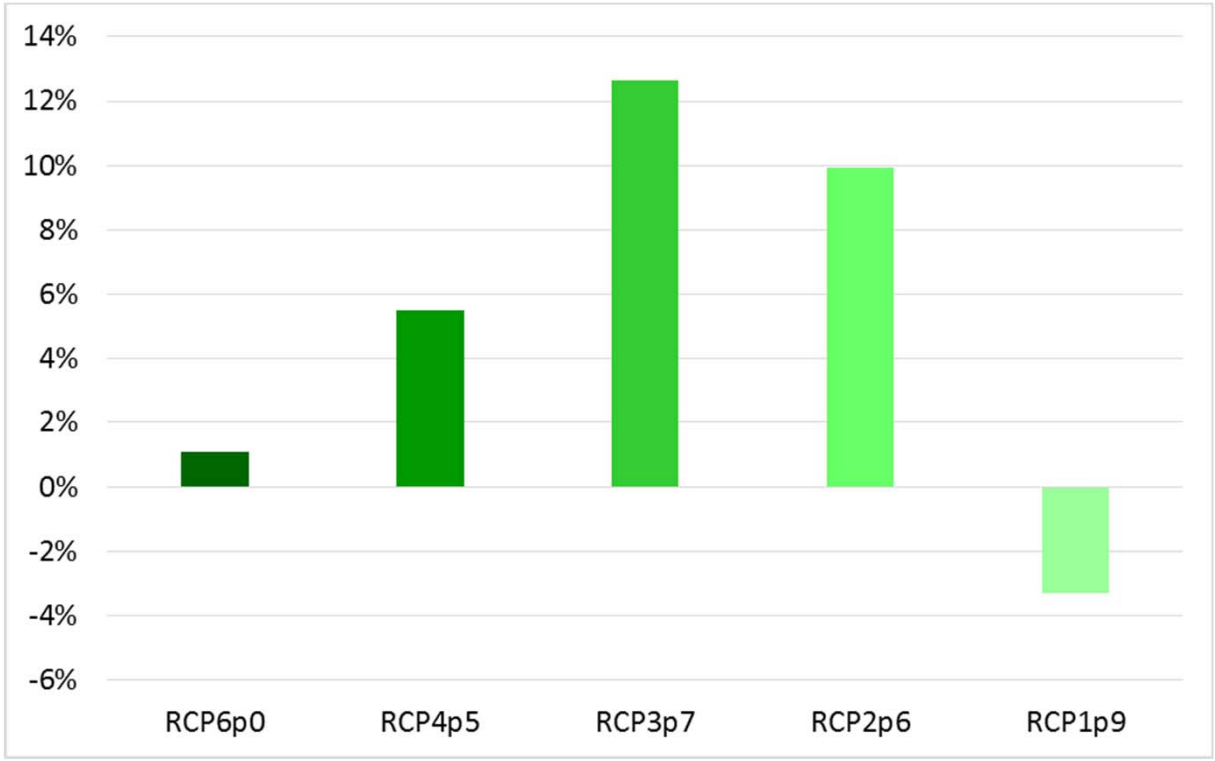
EU climate mitigation policies

- 2030 targets/NDC: 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
- 2050 climate strategy: 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

Global beef trade volume compared to Reference by 2050



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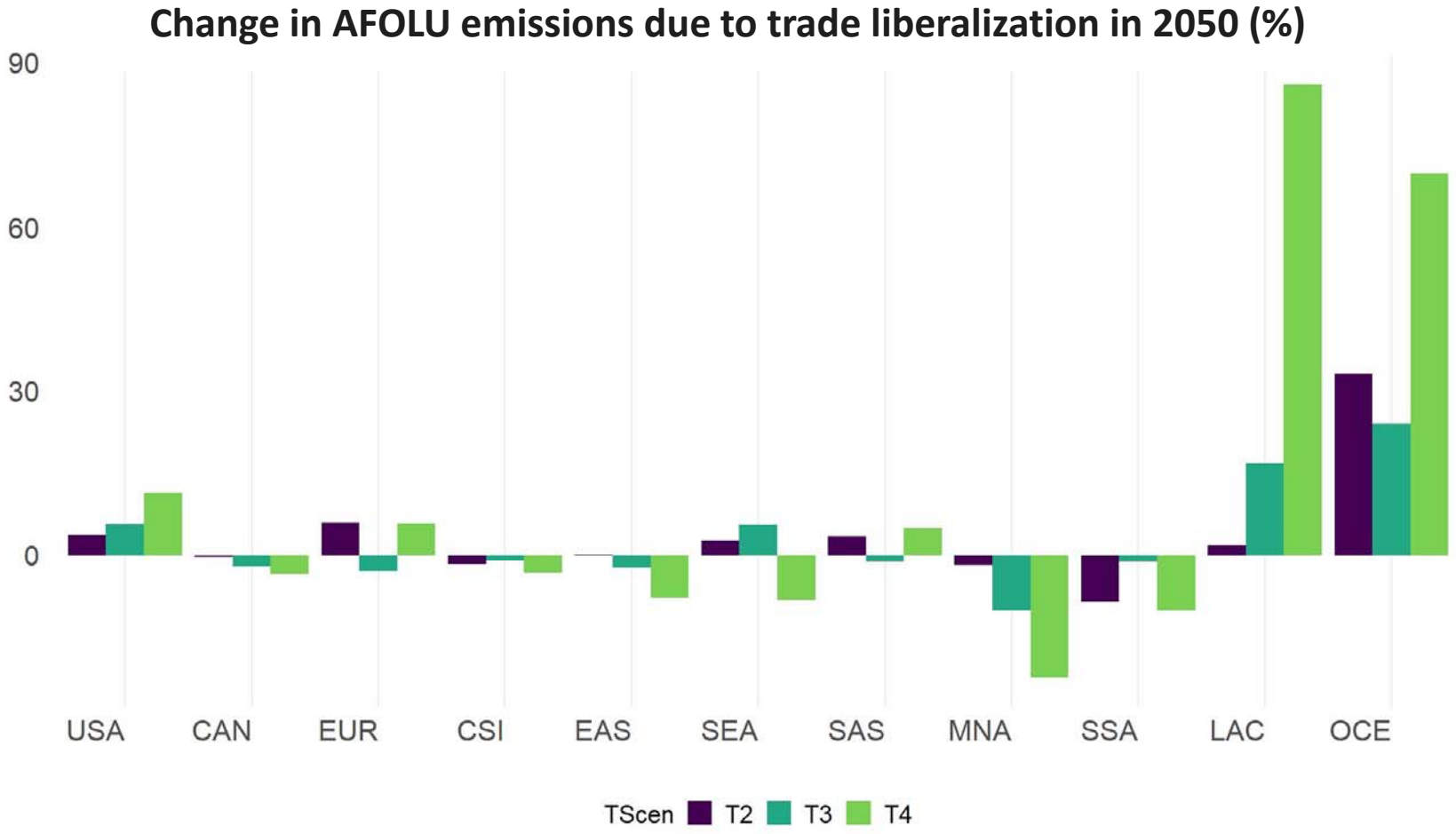
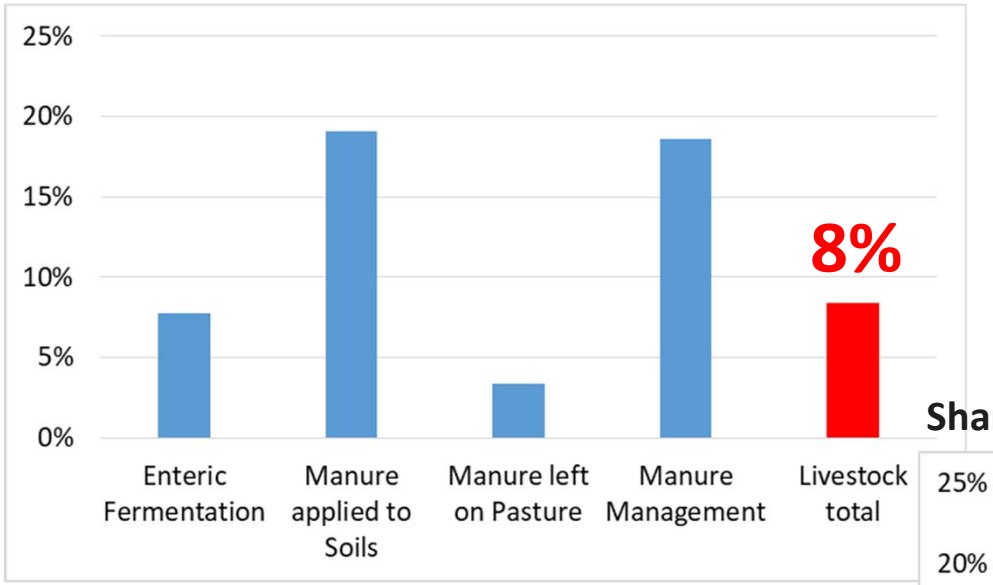
Trade alone does not suffice



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

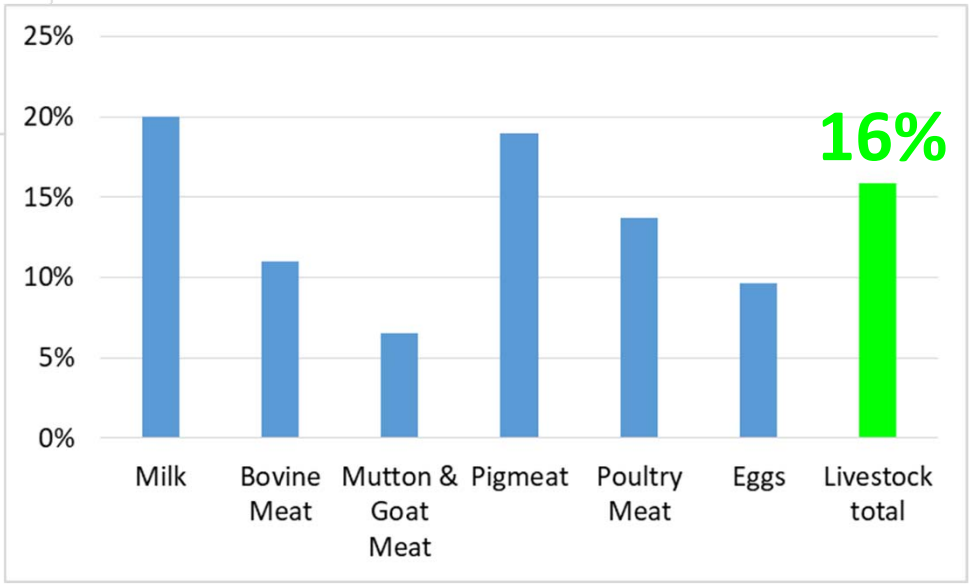
Highly GHG efficient EU agricultural sector

Share of EU livestock emissions in Global emissions



Source: FAOSTAT

Share of EU livestock production in Global production



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Narratives and SUPREMA Toolbox

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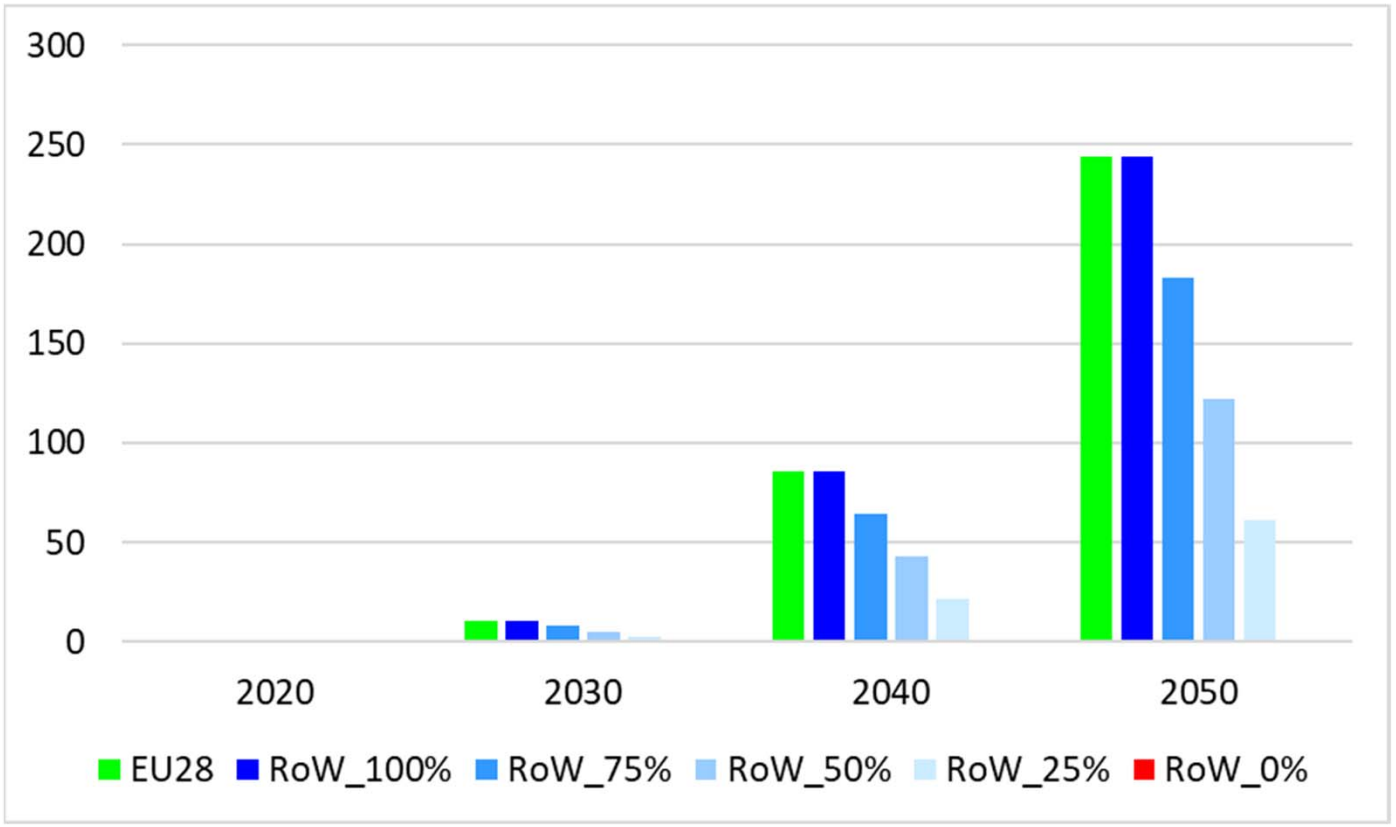
SUPREMA Long-term Narratives: Final

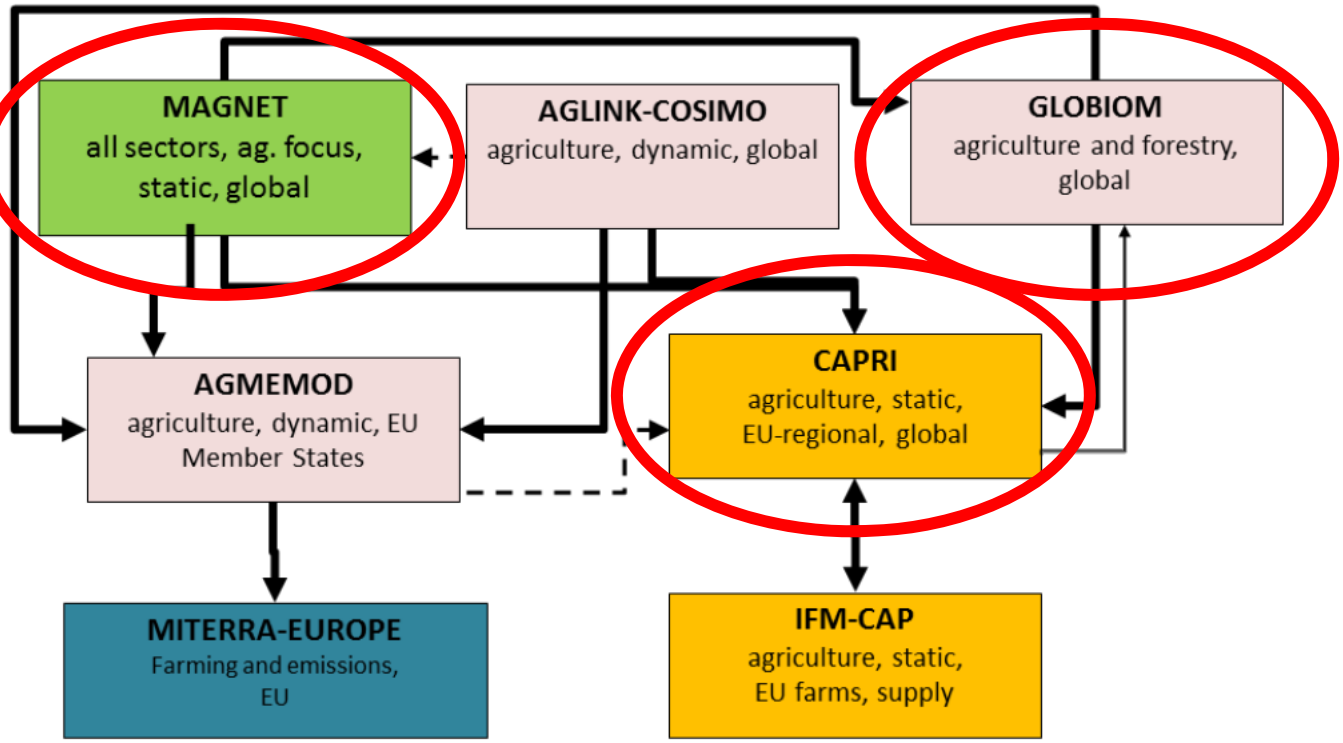
- Focus on 1.5°C target (1p5deg)
- Focus on non-CO2 emissions from agriculture (AG)
- Nuanced assumptions on Buy-In from the Rest of the World
  - RoW carbon price a fraction of EU carbon price implemented on non-CO2 emissions from agriculture (0%, 5%, 10%, 25%, 50%, 100%)
- Trade policy assumptions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

Uni-lateral EU policy to increase global GHG emissions?

- Scenarios: Differentiated carbon price in the EU and in RoW [USD/tCO_2e] applied on **non-CO2 emissions from agriculture**



SUPREMA Toolbox



GLOBIOM → Forest and energy plantations areas → CAPRI & MAGNET

MAGNET → Energy prices and GDP → CAPRI & GLOBIOM

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Sustainable development goals (SDGs)

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Preliminary results

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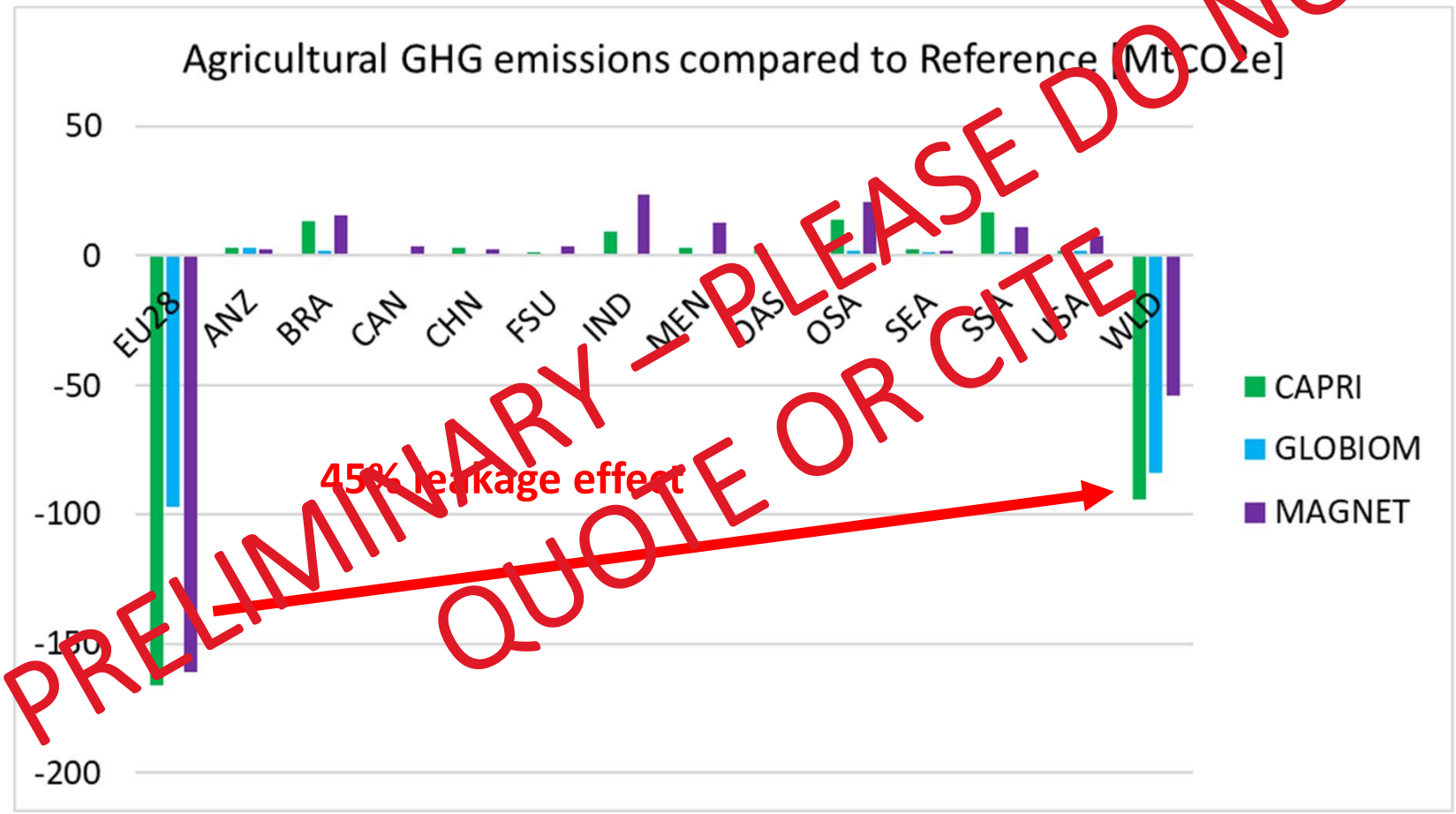
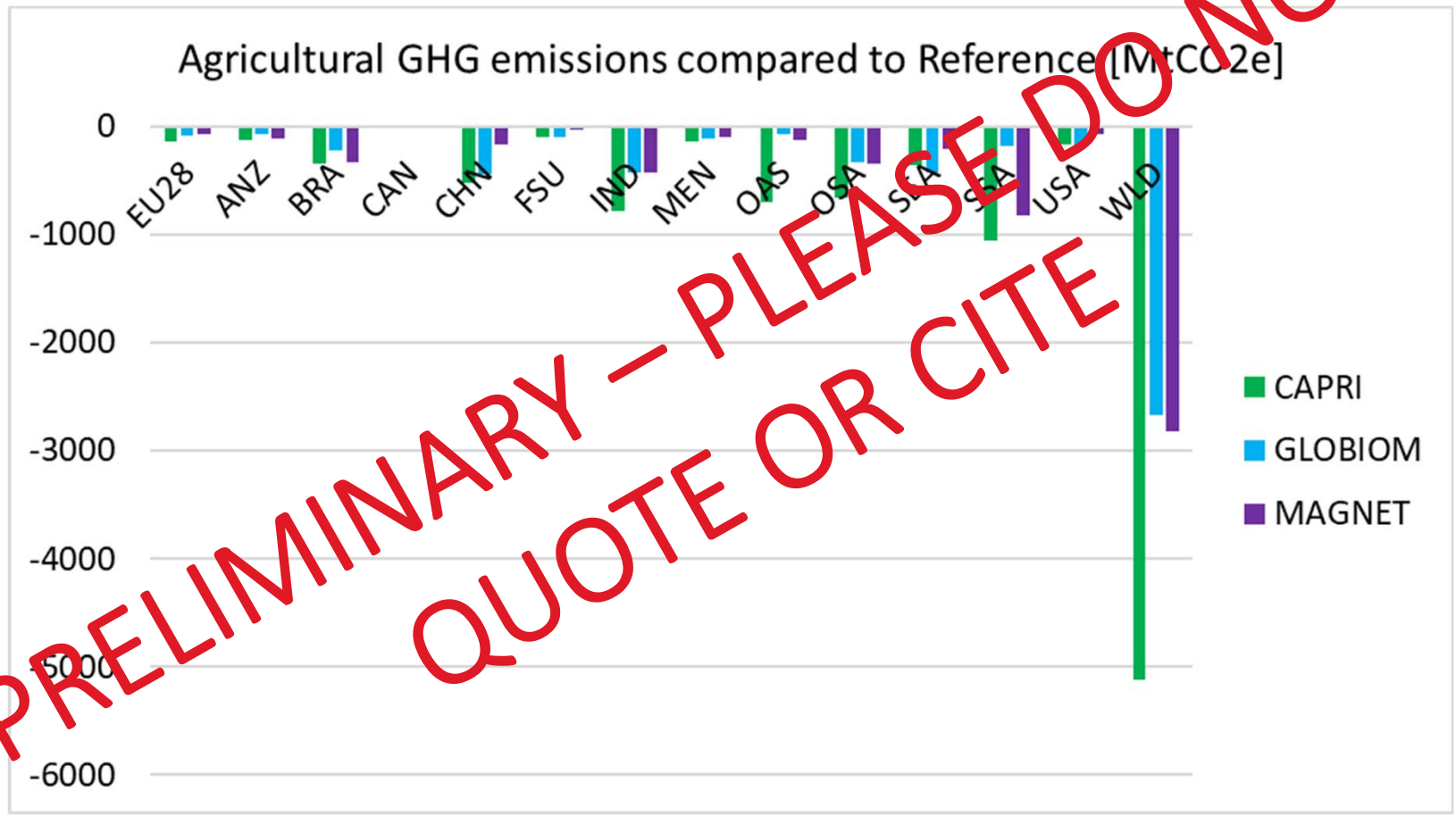
Even unilateral climate action is beneficial

- Albeit the uncertainty across models



Coordinated action needed for the ambitious target

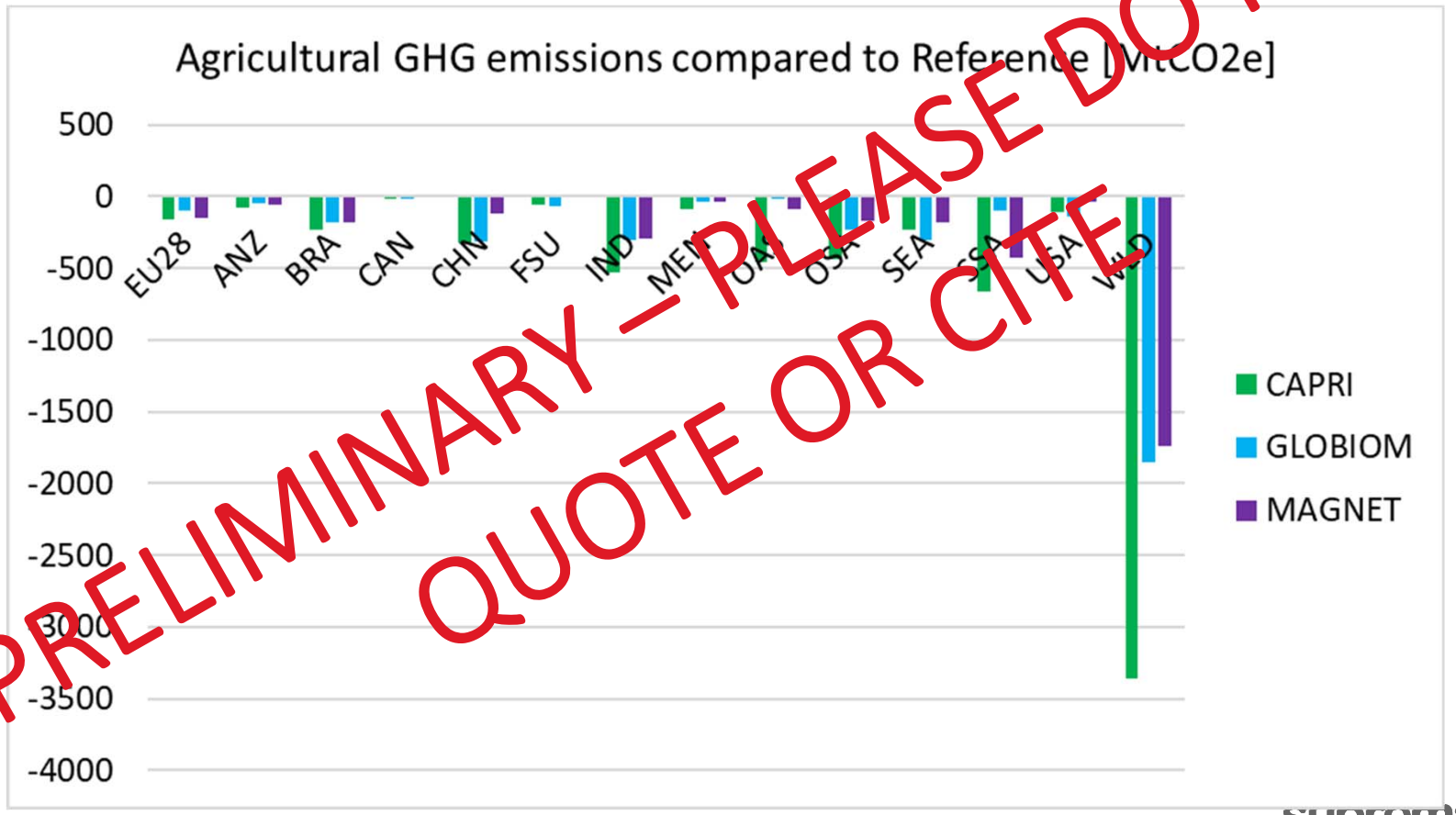
- With global full Buy-In, 30 times more mitigation



Also partial enrollment matters

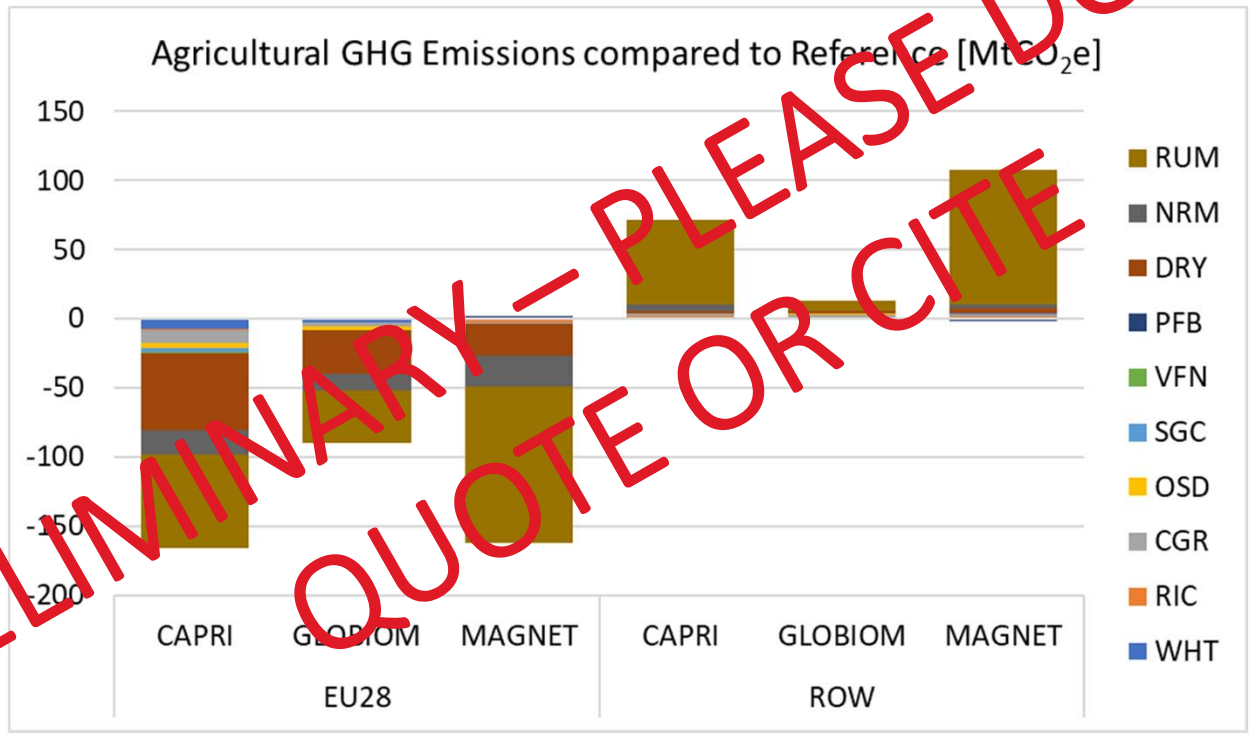
- 25% Buy-In from RoW achieves 70% of the potential

→ Space for sensitive policy design



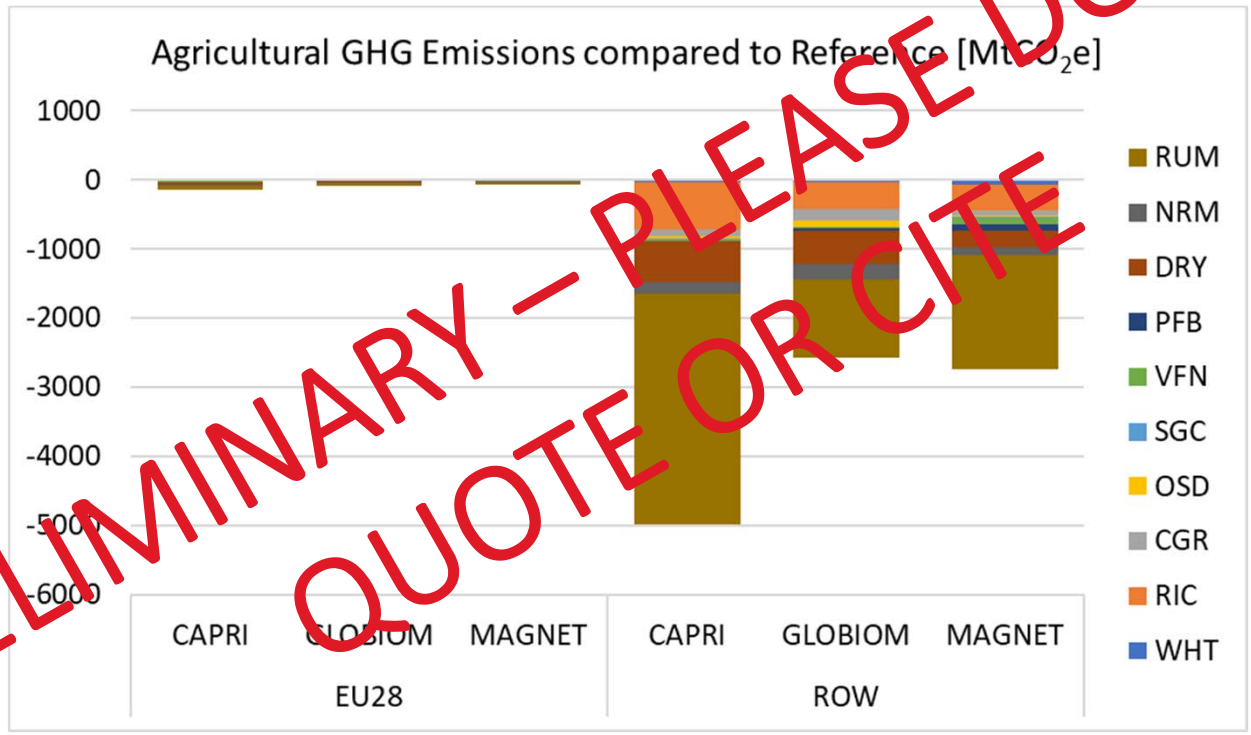
Mitigation by commodity

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



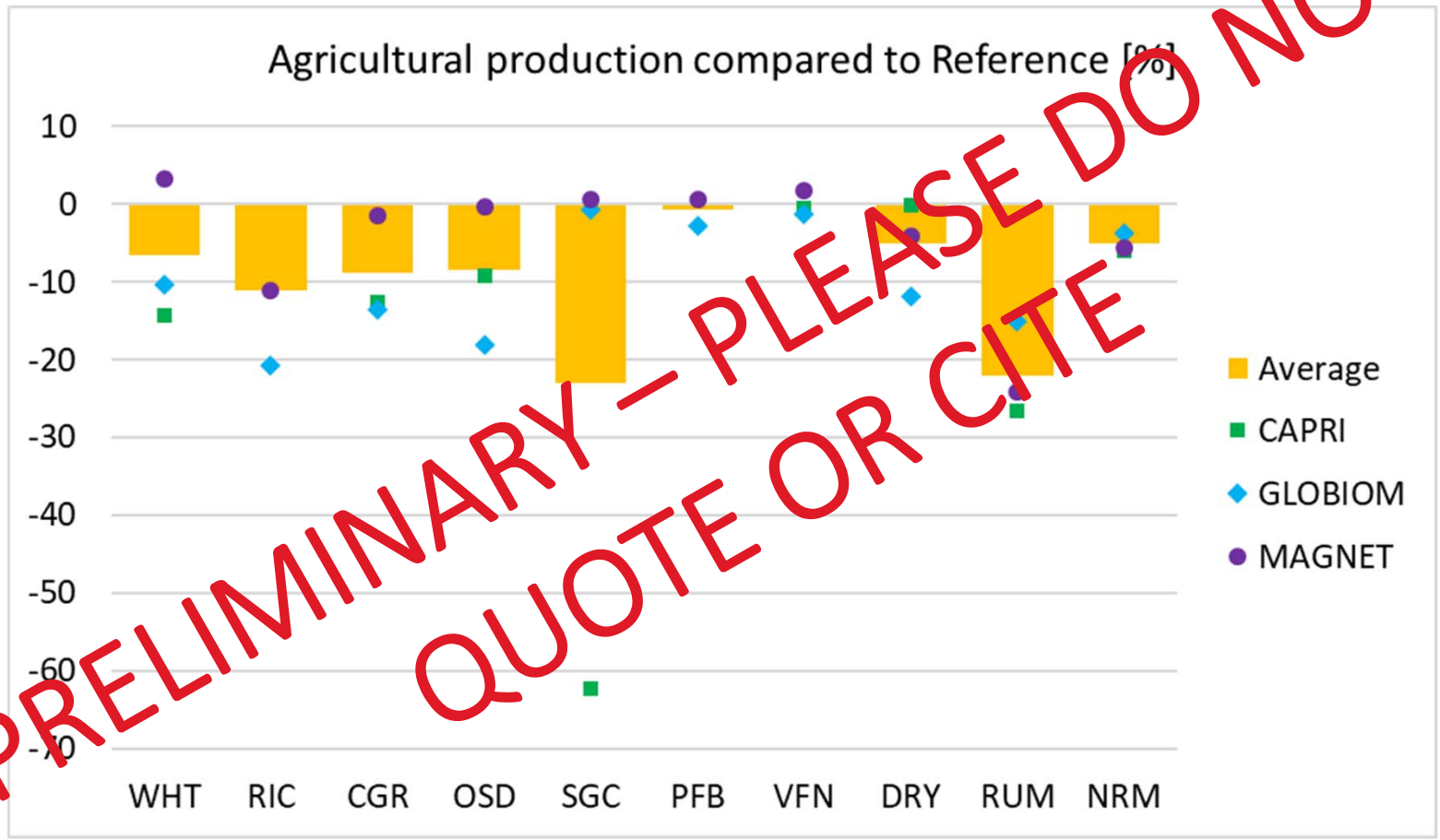
Mitigation by commodity

- Uniform global policy: Rice becomes an important mitigation sector



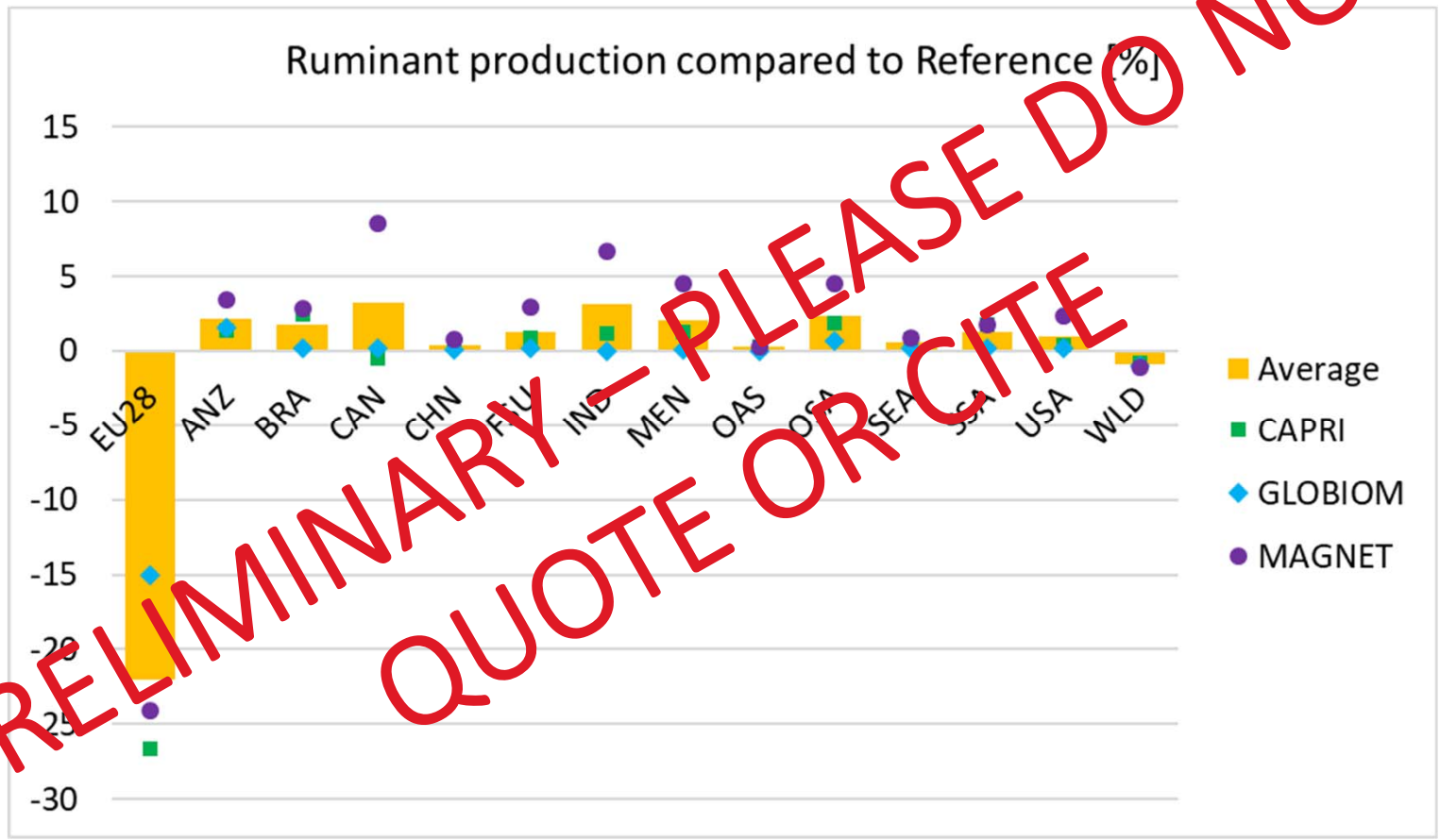
EU agricultural production

- Unilateral action: Large decreases in beef production



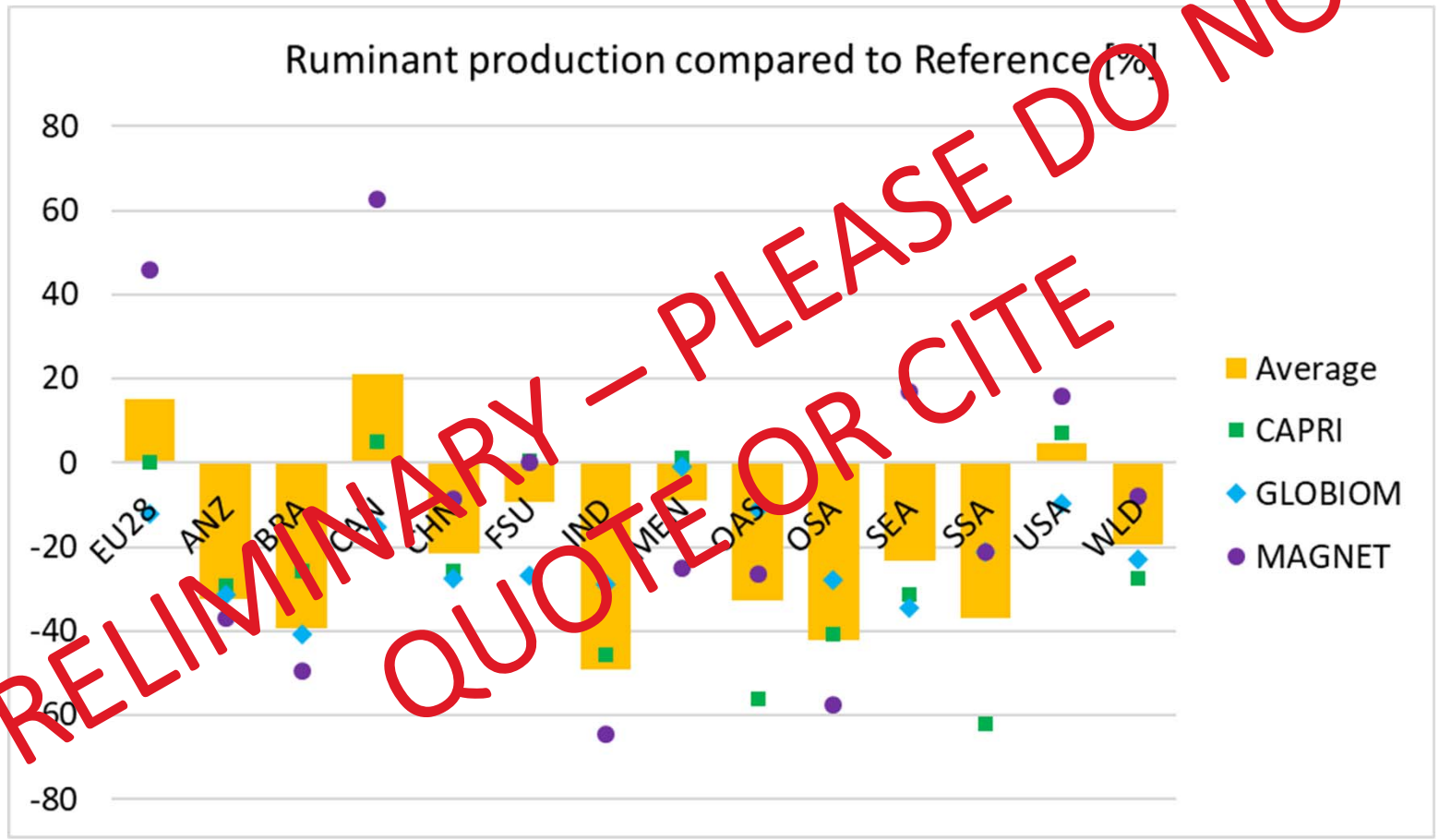
Beef production across the world

- Unilateral policy: Farmers outside the EU benefit



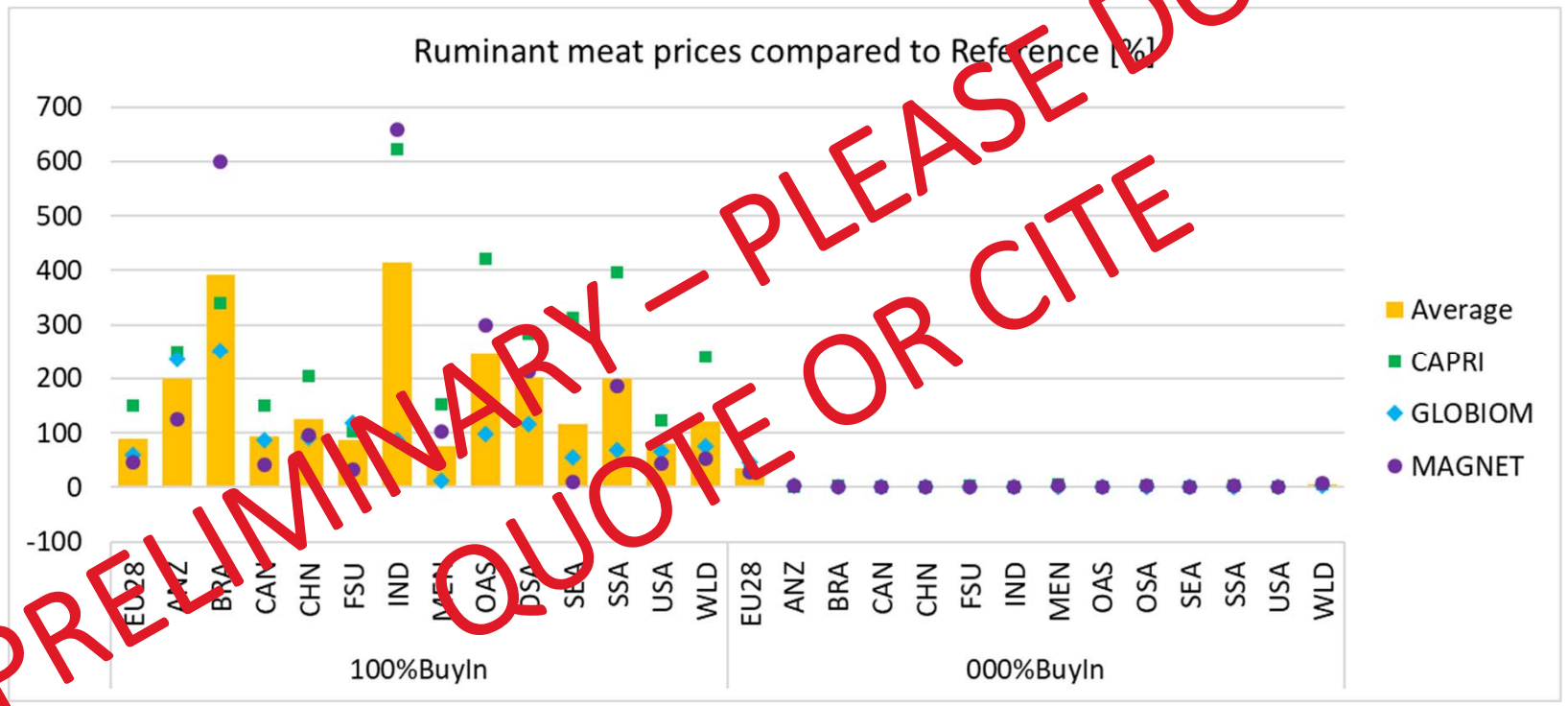
Beef production across the world

- Global action: Farmers inside the EU benefit



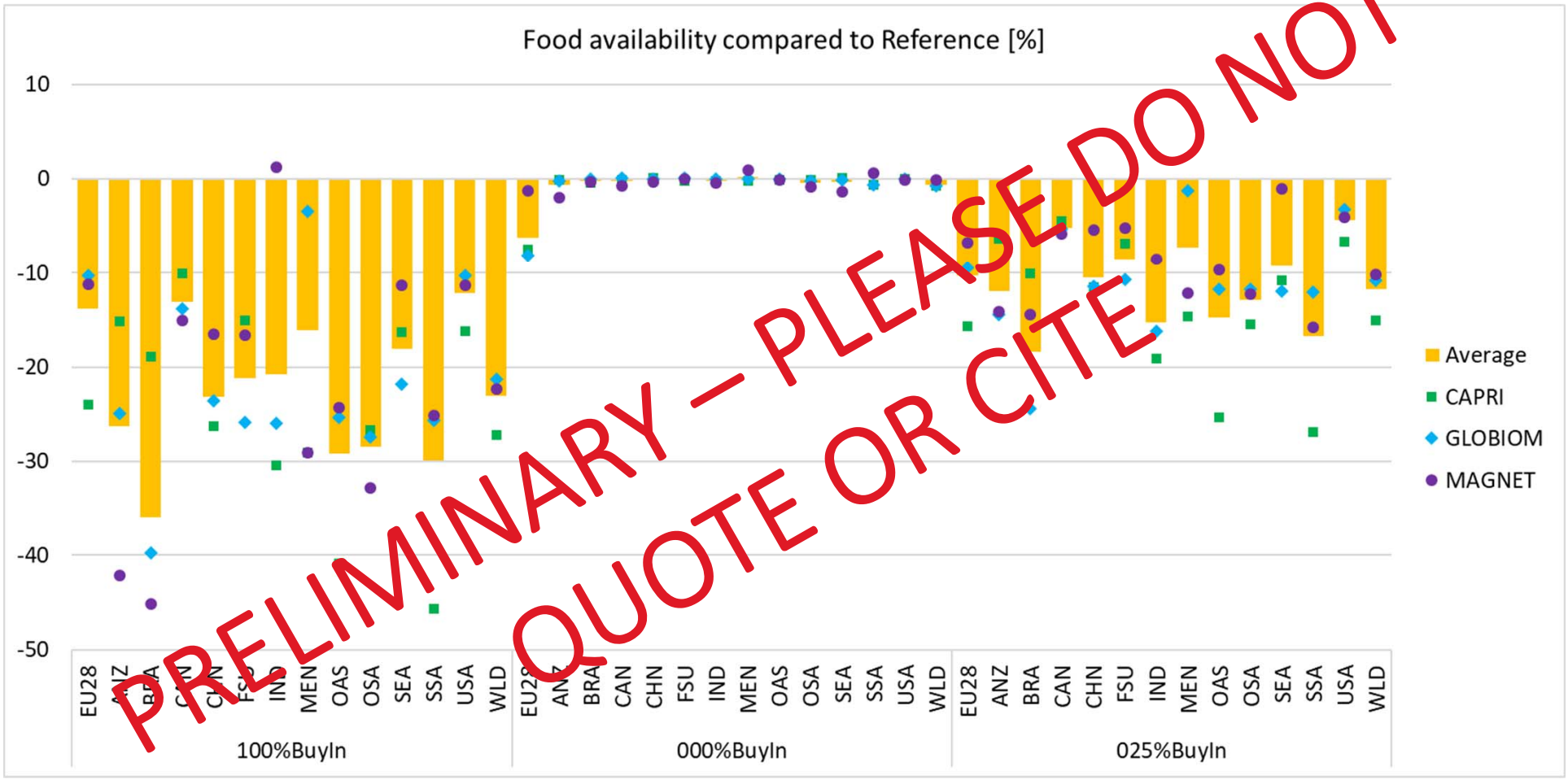
Global beef prices

- Unilateral action without major effect, uniform carbon price would affect the least developed worst



Mitigation and food availability

- Differentiated approach is justified



Model divergence… and convergence

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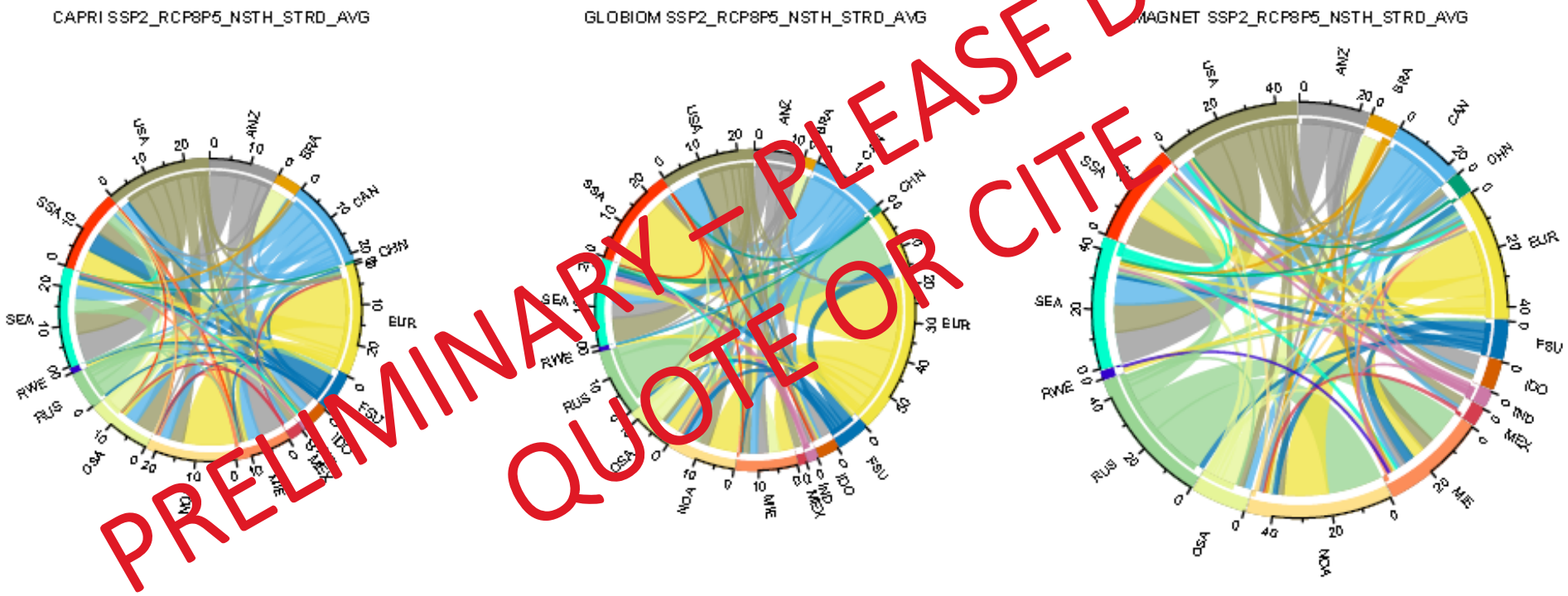
Soft linking through comparison

- AGCLIM50.3: Bilateral trade flows of wheat for baseline in 2030



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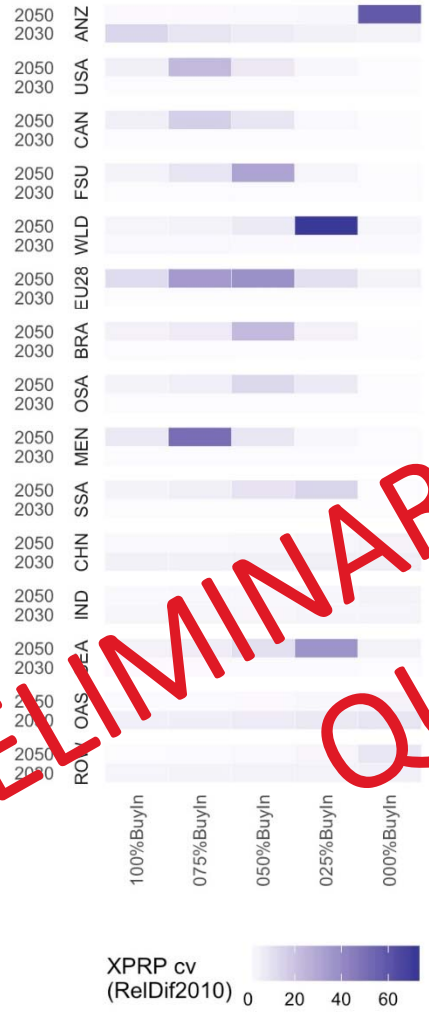
Divergence quantification

- Absolute coefficient of variation in producer prices across CAPRI-GLOBIOM-MAGNET



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Benefits of linkage: Convergence tracking

- Difference in absolute coefficient of variation

- Method can be extended to aggregates of items, regions or scenarios
- Can be used to measure harmonization efforts (i.e. is CV decreasing)
- Specifically across multiple indicators

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Roadmap Exploring Future Directions for Agricultural Modelling in the EU: some preliminary observations

Issues and needs for future modelling

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Outline

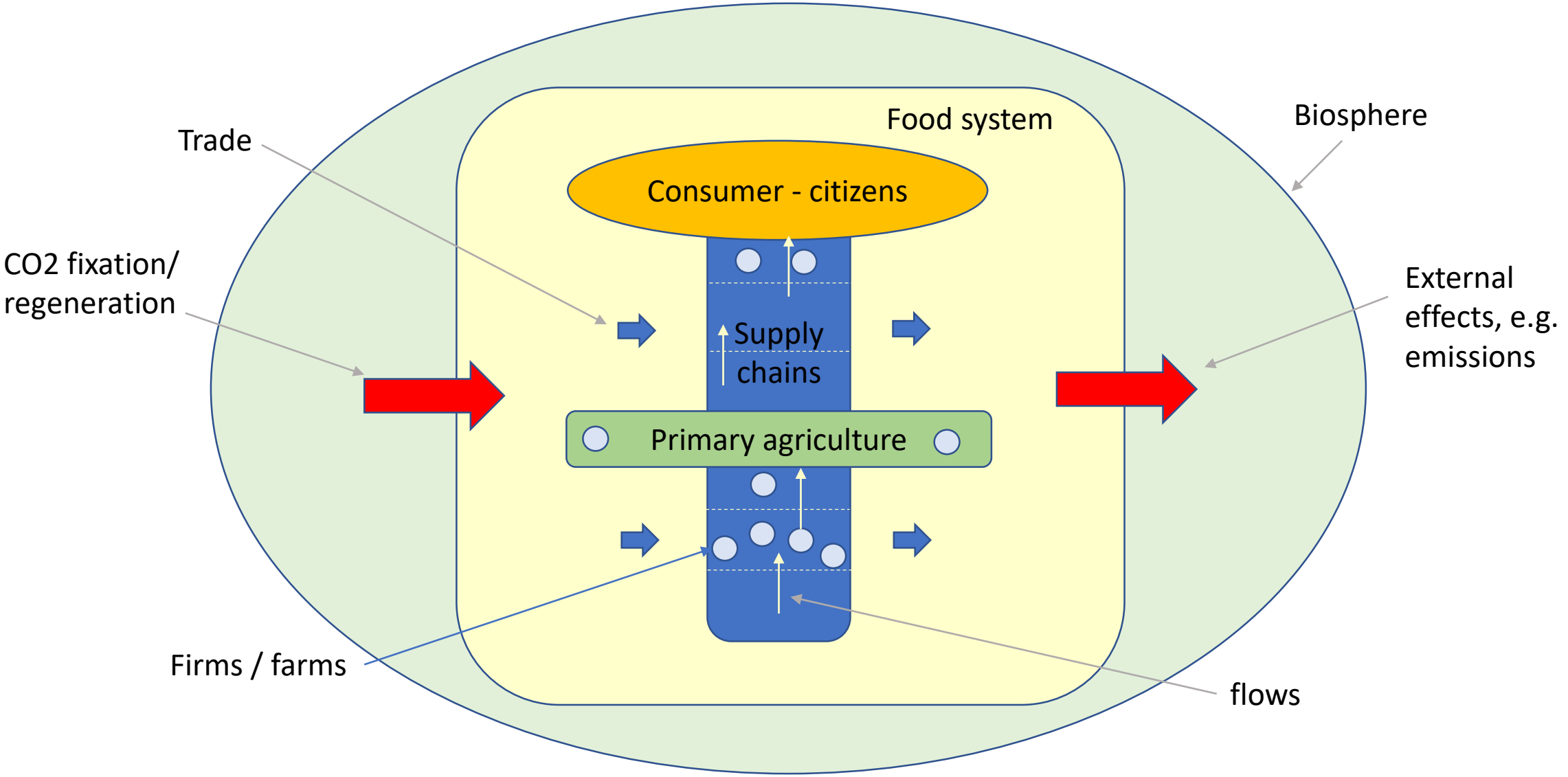
- Key societal and policy challenges
- The food system as a starter
- Modelling: issues and challenges
  - Primary agriculture
  - Supply chains
  - Bio-economy
  - Food system
  - Sustainability & circularity
- Concluding remarks / inputs for discussion

Key societal and political challenges

- Strategic Development Goals (SDGs) which cover a very wide set of aspects
- EU Climate policy (Paris agreement)
- EU new Green Deal
- Agriculture and food
  - CAP and its orientation to sustainability
  - Farm to Fork (more sustainable food syst.)
- Additional from stakeholder sessions
  - Supply chains (incl. international parts)
  - Land and water
  - Adaptation and mitigation responses to Climate change

- Consumer concerns regarding environment, health and animal welfare
- Prospects for the rural environment
- Trade issues

Food system - framework

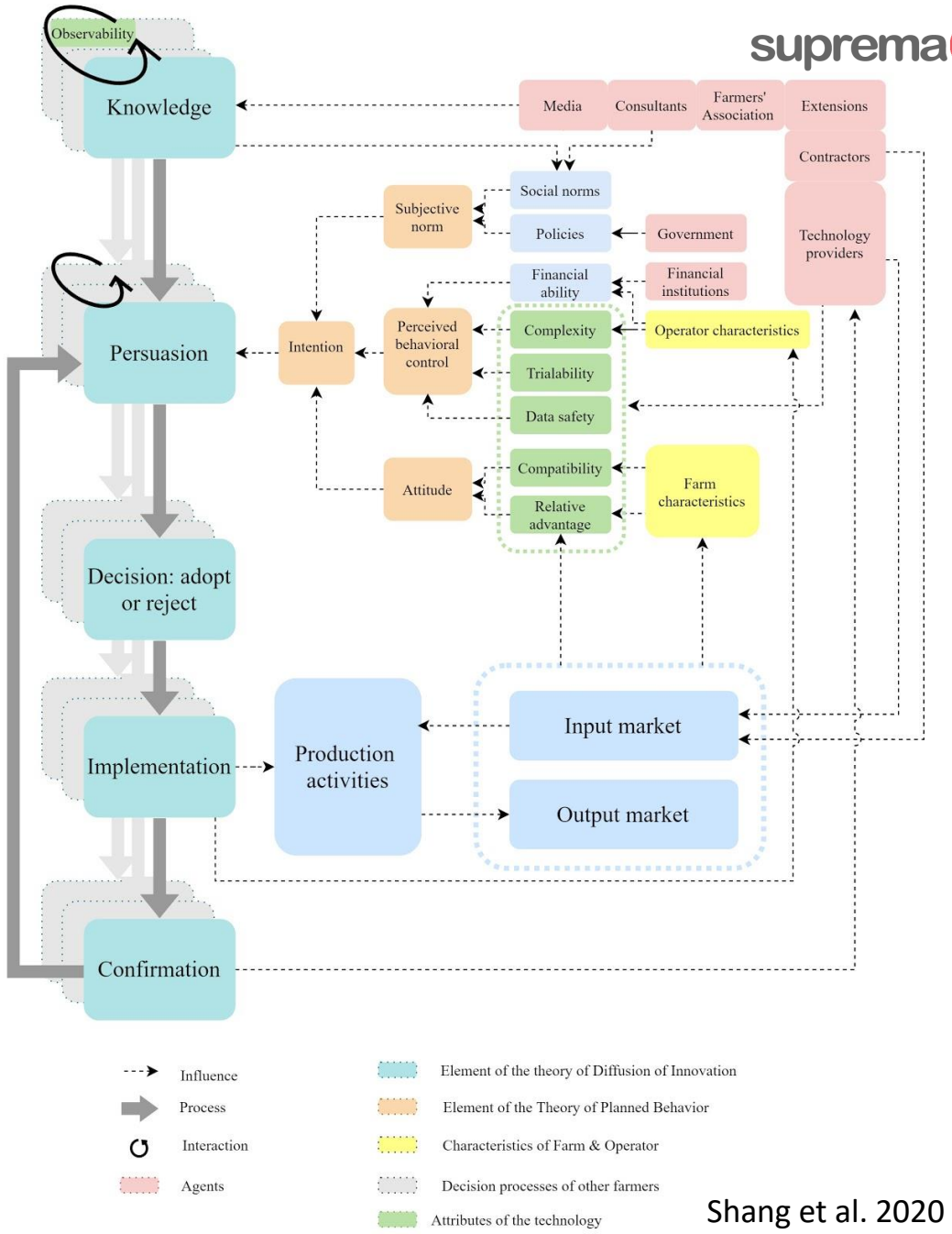


Primary agriculture

- Economics and ecology (general)
  - E.g. ecological economics criticism (lack of embeddedness)
- Agriculture and climate issues
  - Yield evolution / CO2 fertilisation
  - Adaptation & mitigation (including innovation)
  - Risk management
- Understanding farmer behaviour and uptake of AEC-measures
  - Farmer adoption behaviour (AECS, risk management tools)
  - Farming / biodiversity interactions
  - Links to performance indicators
  - Farmer strategies (w.r.t. investment, farm scale increase)
  - See examples: Technology adoption and Eco-schemes

Adoption of new (smart) technologies

- Adoption of new digital and automated technologies at farm level determined by multiple factors
- Farm characteristics, technology attributes, norms & institutions…
- Diffusion of technology over space and time additionally involve feedback processes within technology system



Shang et al. 2020

Adoption of new (smart) technologies – modelling issues

- The models currently incorporate new technologies to be taken up under fitting scenario conditions by endogenous model mechanism
- Uptake potentially restricted over time by some assumed technology diffusion rate
- Question: Can we use a stronger empirical base for scenario design or model specification
- Intensive literature review is ongoing for precision agriculture as well as digital and automated technologies
- Concept to be developed to link diffusion rates to technology attributes

Example Enhanced conditionality, MS choices and eco-schemes

Define artificial eco-scheme and assume a sufficient 'provider gets'-incentive to induce a 2% effective EFA increase

	GAEC	Main objective	Choice for MS
Climate	1 maintenance of permanent grassland	General safeguard against conversion to other agr. uses to preserve carbon stock	Decide on scale of monitoring (share of PG / UAA)
	2 protection of wet- and peatlands	Protection of carbon rich soils	Designation of areas
	3 ban on burning stubbles.	Maintenance of SOM	-
Water	4 bufferstrips along waterlines	Protection of river courses against pollution and run-off	Requirements concering width of bufferstrip and type of water course
	5 use of farm nutrient tool	Sustainable mangement of nutrients	Decide on which tool to be used
Soil	6 tillage management reducing risk of soil degredation	Minimal land management to limit erosion	Specify conditions for soil mangement and areas concerned
	7 no bare soil during sensitive periods	Soil protection	Specify management requirements
	8 crop rotation	Maintenance of soil fertility	Specify management requirements
Bio-diversity	9 Minimum share of unfarmed features / landscape elements	Maintenance of non productive elements	Decide on minimal share of unfarmed features
	10 Ban on plouging / converting permanent grassland in N2k areas	Protection of habitats and species	Decide on areas concerned (N2k +)

Eco schemes, AECMs and modelling

- Models have a focus (bias) on market impacts, while to a large extent ignoring other impacts (schemes now largely create ‘black hole’ for budget expenditure)
- Given the increasing prominence of sustainability and climate schemes there is a significant modelling challenge to improve policy representation
- Challenge 1: explain farmer participation as the outcome of a cost-benefit calculation under ‘constraint’ from the farming system (this should include transaction costs/admin burden- and trust-issues)
- Challenge 2: handle issues / differences in scheme contract lengths (e.g. Eco-schemes 1 yr; AECMs could have duration of 6 yrs)
- More generally strengthen public good/externalities modelling

Supply chains (SC)

- Current state of modelling
  - Real supply chains are generally missing/lacking
  - Embryonal / partial SC treatment
  - CGE-approach is inclusive of all goods and services flows, but often too aggregated
  - Assumption of perfect competition is violated in practice
- Challenges
  - Market power, price transmission representation
  - Properly understanding the position of farmers in the chain
  - Role and impact of standards, contracts, and vertical integration along supply chains
  - Supply chains and sustainability (e.g. role of Producer Organisations)
  - See example .....

Dairy case

- Concentration is high in EU dairy chains at the level of processors and retailers
- Price transmission depends on demand and supply elasticities, but also on market power, contracts, integration and strategic behaviour of firms
- Dairy consumer prices are found to adjust more slowly to farm prices than e.g. eggs and poultry (Hassouneh et al. 2013)
- Increase in specialisation and market power of firms decreases extent and speed of price adjustment

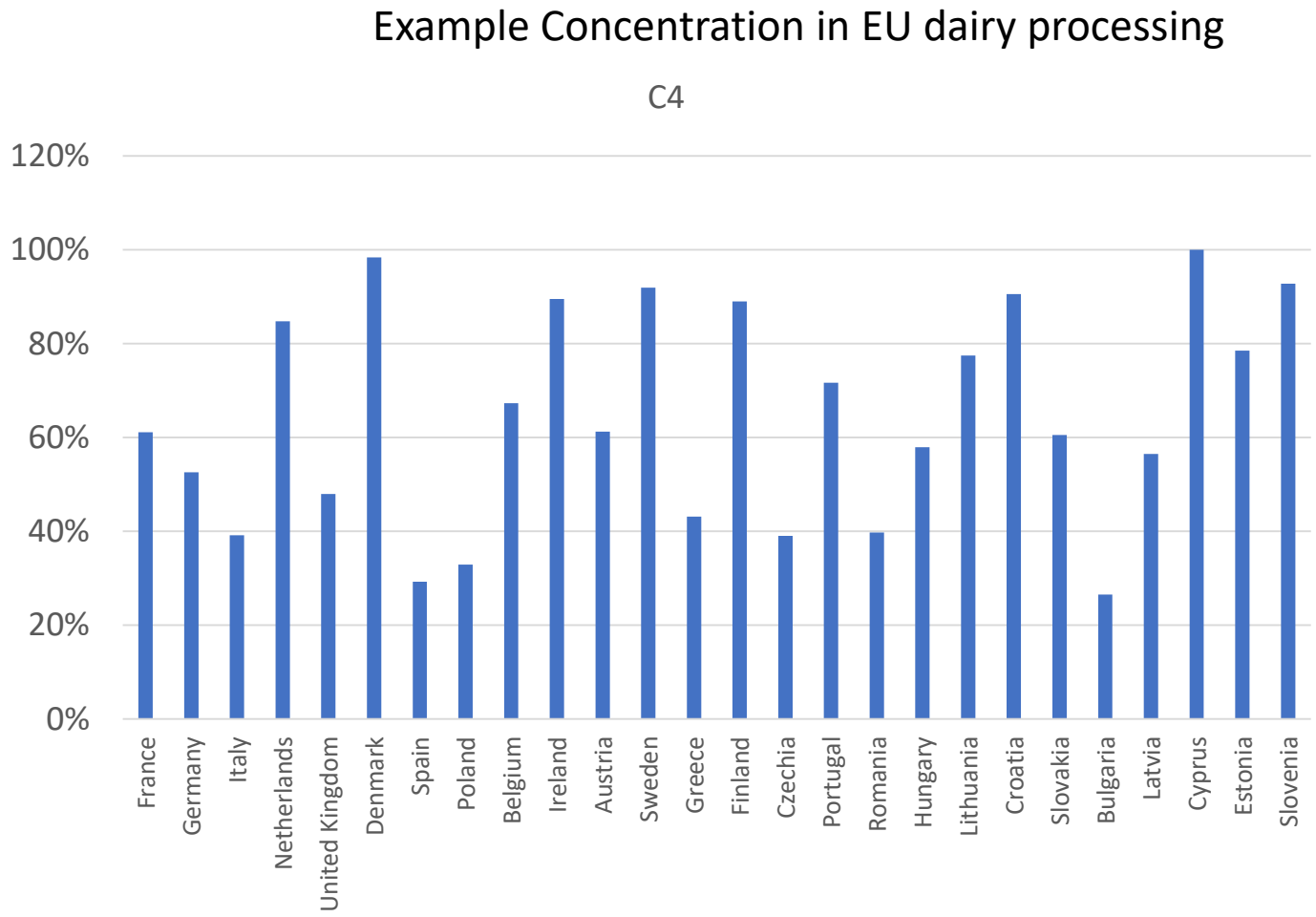


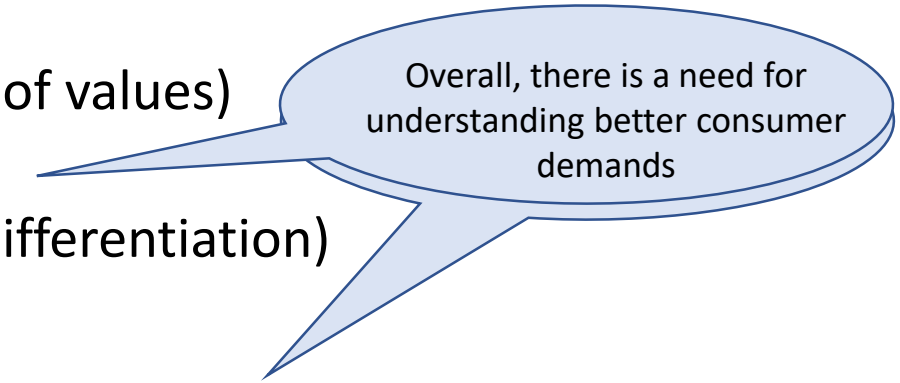
Figure: Concentration ratios, C4, in the dairy processing industries, in EU countries, 2016-2018 estimates based on company accounting data. Source: ORBIS Bureau van Dijk, calculations Wageningen Economic Research.

Dairy case

- With market imperfections, cost changes may affect mark-ups; cost-pass-through is a strategic decision of firms. And cost pass-through may be even greater than 1 (in the short and medium term)
- Bonnet et al (2015) find an effect of market shares on cost-pass through for milk in the Netherlands: higher market share lead to lower pass-through.
- Madua et al (2019) find oligopsonistic buyer power in the Italian dairy supply chain. Effects on farmers may also depend on existence of cooperatives
- Private labels also have effects on price transmission: because of different contracts between brand and private label manufacturers and retailers
- Better understanding the nature of competition in the markets and testing the implications for the results of the models is suggested

Consumer - citizen

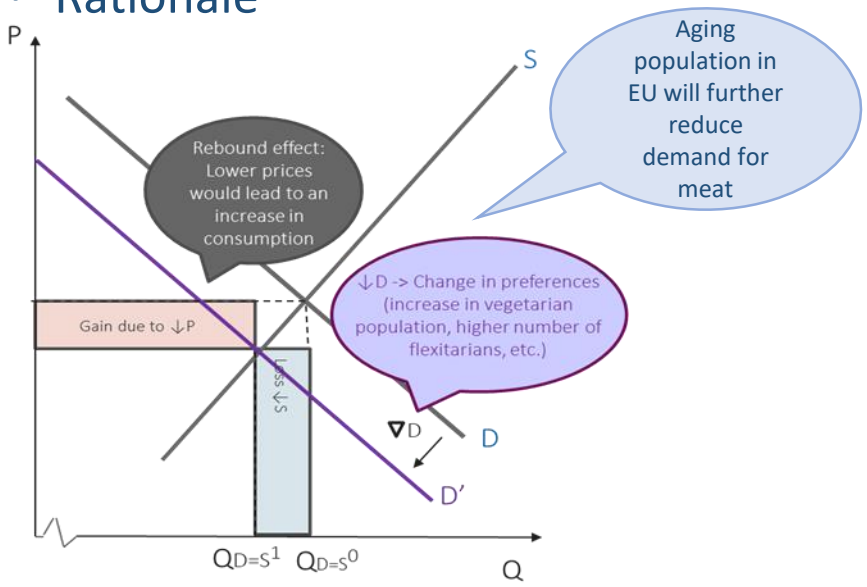
- Consumer population and expectations
  - Consumer age profile is not included as explanatory variable
  - Footprint (climate) & animal welfare
  - Ethics of consumer behaviour (includes wide set of values)
- Consumption patterns and life style changes
  - Organic products & high quality foods (product differentiation)
  - Protein transition
  - True price / true cost
- Increasing product differentiation and short supply chains
  - Changing demand patterns (challenging homogeneous good assumption)
- Better modelling of health outcomes of consumers' choices
  - Consumer health concerns (real / virtual, disease-related)
  - Food intake and health: implications for public health system



- See example

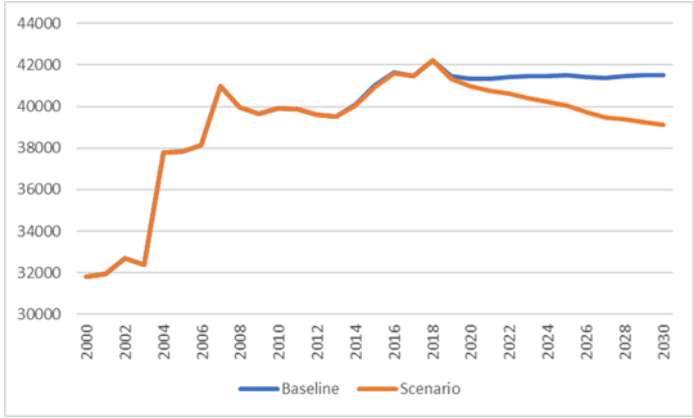
Consumer scenario

- Rationale



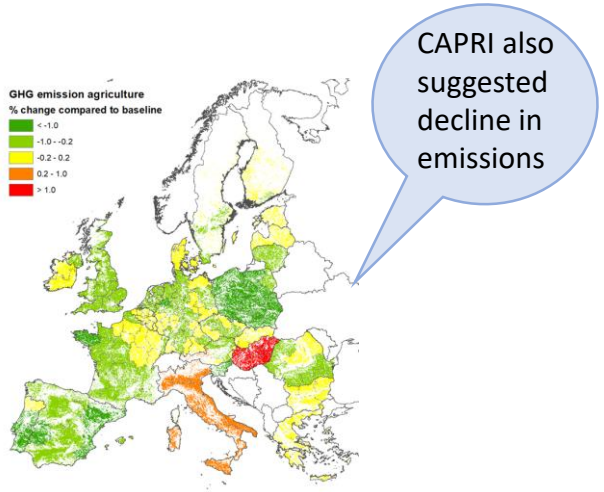
- Meat preference shift impacts: i) on consumption (direct) and ii) on price
- Due to inelastic supply the negative price effect dominates the volume (reduction) effect
- Impacts on farm revenue (negative) are stronger than on farm sales

- Assumptions
  - Some MS (below average) follow their current trend
  - For other MS (above average) decline red meat consumption by 1.0% per annum is assumed
  - For MS with average meat consumption a decline of read meat consumption by half the amount of by 0.5% per annum is modelled



Source: AGMEMOD

- Key findings
  - Some substitution between red and white meat is expected, reflecting concerns about health impacts on consumer choices
  - Market reactions (effects on production) are mainly driven by prices changes
  - Consumption scenario decreases emissions in livestock sector



Source: MITERRA-Europe

Bio-economy

- Bioeconomy representation in models is still at its infancy
- Bioenergy (biofuels, bioelectricity) often represented but biobased materials and biobased chemicals are hardly covered.
- ‘Circular flows’ and ‘substitution effects with fossil based substitutes’ are key

Challenges

- Data on biobased materials and chemicals is very scarce (Biomonitor project).
- Modelling of waste\residues is key for circular processes (including human waste)
- Material flows are important to identify leakages and model circularity
- Technological progress in new biobased technologies and fossil prices are uncertain and both are key for competitiveness.

Bioeconomy:

Increase demand for biobased plastics

Trade-off and synergy effects

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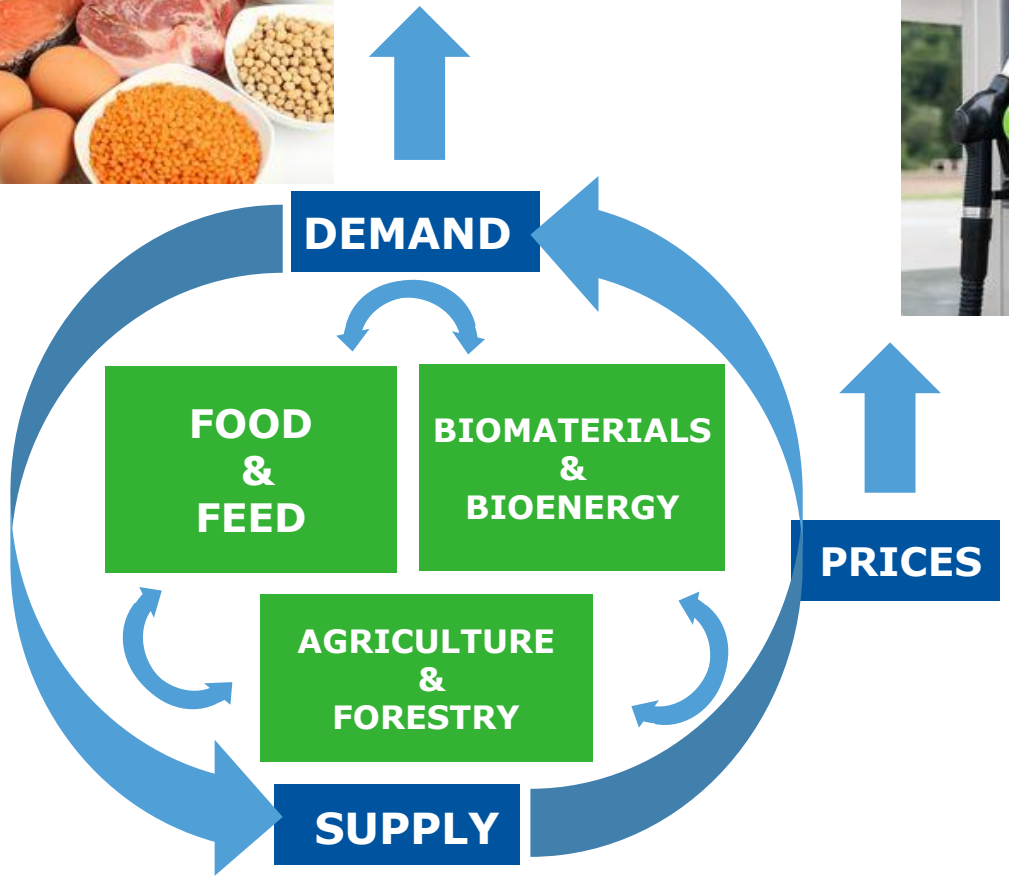


SOCIETAL CHALLENGES

- Employment and value added
- Dependency on non-renewables
- Greenhouse gas emissions
- Food security
- Biodiversity

Food system

- The food system is an encompassing whole, but still itself a subsystem (biosphere) and consisting of subsystems
- No model is covering the food system; it is also not possible to do so without overstretching tools
- Food system representation needs collaboration of models
- Food systems have national as well as international components

- Example: trade and value added?

Shifting nature of global food challenges:
From solving economic and social problems (food productivity and food affordability) at the expense of the environment towards a phase of simultaneously solving economic and environmental problems (precision farming) with potentially increasing social costs

Example trade and value added??

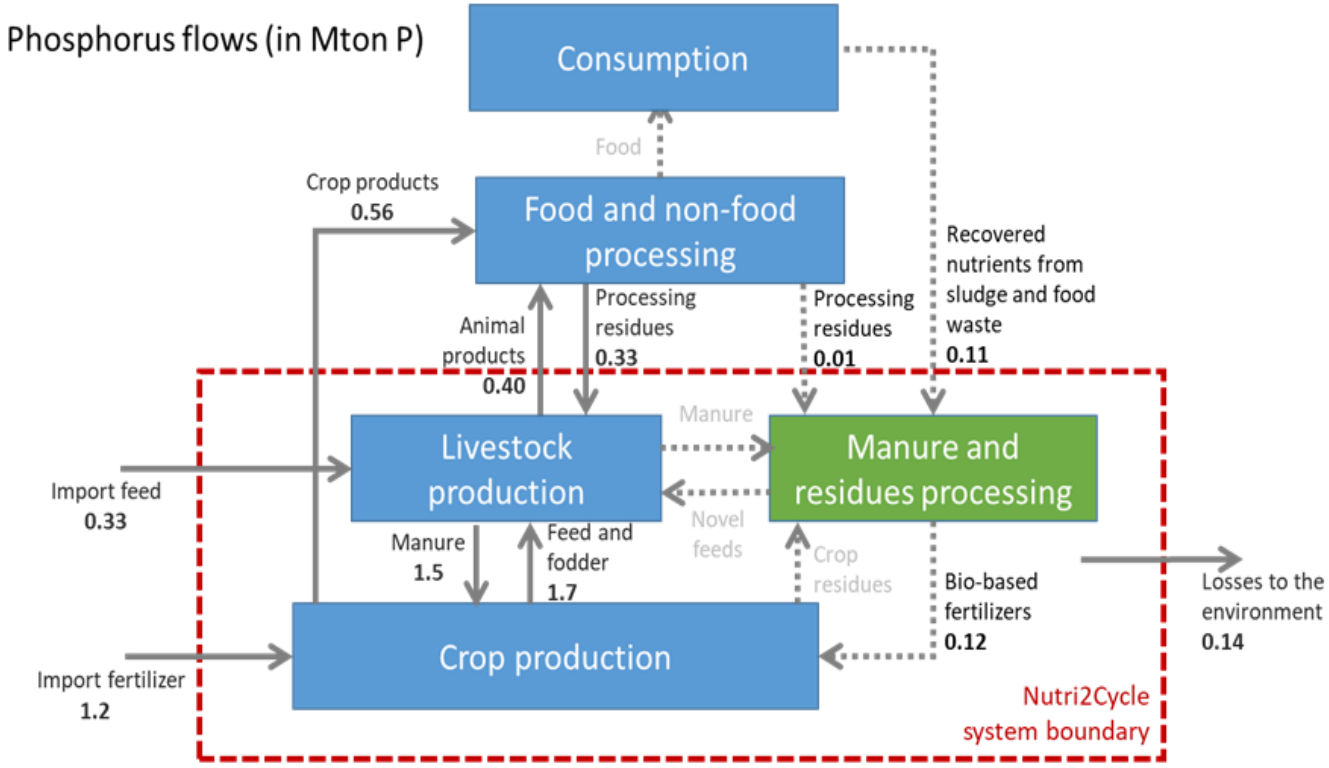
- global manufacturing through international supply chains has become a major characteristic of the international economy in the recent decades
- the bulk of international trade (+60%) is in intermediate products, which not consist mainly of raw material or primary inputs but of products that had already received some value-added (Mirodout et al, 2009)
- ‘vertical trade’ aims at measuring sequential trade in vertical production chains by looking at the import content of exports (Hummels et al, 2001; Koopman et al, 2008, 2011)
- Modelling
  - Except for GTAP, no models do currently take VA-trade into account
  - Development of databases is still a problem and weak point
  - General improvements in trade modelling w.r.t climate change response issues (see climate scens presented by Petr Havlik)

Sustainability and circularity

- Sustainability gets increasing priority from policy makers (e.g. EU's new Green Deal and Farm to Fork strategy), including more attention to strengthen circularity
- Assessing sustainability requires a good biophysical representation of agricultural production, including its interaction with the biosphere
- The current strength of the models identified in the context of SUPREMA is the availability of a set sustainability indicators at mainly primary production level.
- For climate there is a set of models which is able to account for the CO2-equivalent emissions related to production of agriculture, notably the LULUCF and could account for international (trade related) impacts
- The coverage of footprints associated with complete supply chains and the consumer by models is hardly existing (separate LCA studies?)
- Circularity requires a detailed representation of product-flows (including by products, intermediate products, re-used products, product waste), as well as brining these flows together in a coherent framework (e.g. nutrient balances, Sankey diagrams).
- Example

Example sustainability and circularity

- Closing nutrient cycles in agriculture
  - Reduce mineral fertilizer
  - Reduce import of feed
  - Reduce losses to environment
- Application of MITERRA-Europe in H2020 Nutri2Cycle project
- Current P use efficiency in EU:
  - Crops (incl. fodder): 80%
  - Livestock: 17%
- Modelling effect of solutions on nutrient flows and emissions



Short summary-overview

- Summary Table

Topic/subject	Strength	Weakness	Examples
Primary agriculture econ	Response to market signals and trad.policies	Expl. Risk management behaviour and scheme/techn adoption	Techn. Adoption and eco-schemes
Supply chains (SC)	-	Poor representation of SCs (stages, firms, flows)	C4 of EU dairy processing industry at MS level
Consumer-citizen interests	Consumer demand (apparent cons), other demands	Consumer profiles, consumer age structure	Consumer red meat preference shift
Bio-economy	Bio-energy reasonably covered	Bio materials and chemicals its infancy	Biobased plastics
Food-system: trade	Trade value well represented (bilateral trade and net trade)	Value added 'trade' poorly represented	GTAP involvement, data issues
Sustainability and circularity	Models have set of sustainability indicators, including GHG/climate	Circularity and C-linkages poorly represented, but work ongoing	EU P balance (Nutri2Cycle)

What else? What missing?

- Link to other sectors/models: energy sector
- Try to get externalities in (broader coverage)
- Ag modelling of pesticides uses and impacts is weak

- Research infra structure
  - Have well-functioning networks
  - Have basic financing (maintenance) and consultancies/projects (directed development)

Potential solutions to cover gaps

- Improve or extend (parts) of existing models
  - E.g. improve policy representation
  - Improve estimates
- Use models in a combined way to get a better coverage of issues
  - E.g. biophysical and economic models
  - Micro and (meso) sectoral models
- Develop new models
  - E.g. real supply chain models, tailored EDM-models
- Improve data
  - E.g. with respect to trade and value added and trade and sustainability
  - Idem w.r.t bio-economy

End

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