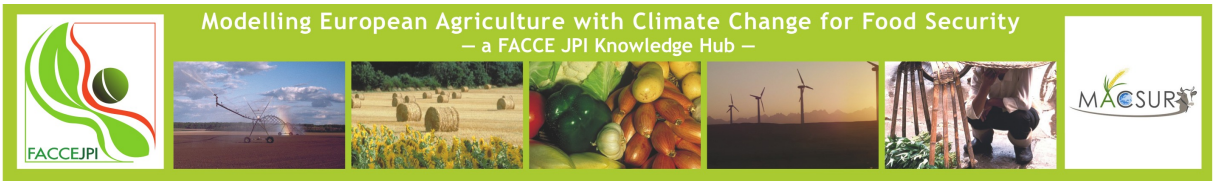

FACCE-MACSUR

Modelling Food Security and Climate Change: Scenario Analysis

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Abstract/Executive summary

Developing scenarios is a common interest within MACSUR researchers. This report outlines the main results of a survey of TRADE-M participants with respect to the scenarios used within modelling, the time frame and the importance of factors in their development. Most researchers are generating their own regionally defined scenarios, though some are basing these on IPCC scenarios. Generally, they adopt a short-term time frame of up to 2020 to estimate impacts. Most see food production as the main driver behind the scenarios followed by climate change mitigation and adaptation. The main weakness seems to be lack of interest in modelling variability due to weather effects, these may be an argument for stronger cross-collaboration between different MACSUR consortia within the crops and animals groups.

Introduction

Societal challenges are translated into scenarios for application into models. The goal is to use a subset of models to analyse problems and allow comparison of results. In order to reach that goal, storylines are needed to be developed which address challenges of adaptation and mitigation. This report represents collection of scenario details within the MACSUR project.

Methods

A web-based survey was administered to members of the TRADE-M team of the MACSUR project with the aim of understanding scenarios being adopted within the range of models being used in the MACSUR project and the scenarios which are being applied. The purpose of the survey was establish a baseline scenario for modelling within the TRADE-M suite of models. A questionnaire was administered during December 2012. The data collected in this survey was the basis for performance T1.2 task.

Table 1 shows the responses by institutes. In total 22 responses were gained, though notably a number of institutes responded more than once, reflecting the diversity of some of the participants. Notably, out of the 25 institutes within the MACSUR mailing list, we managed to gather responses from 16. The remainder had been reminded but may reflect different interests with respect to crop and livestock modelling.

Table 1. Institutional responses to survey

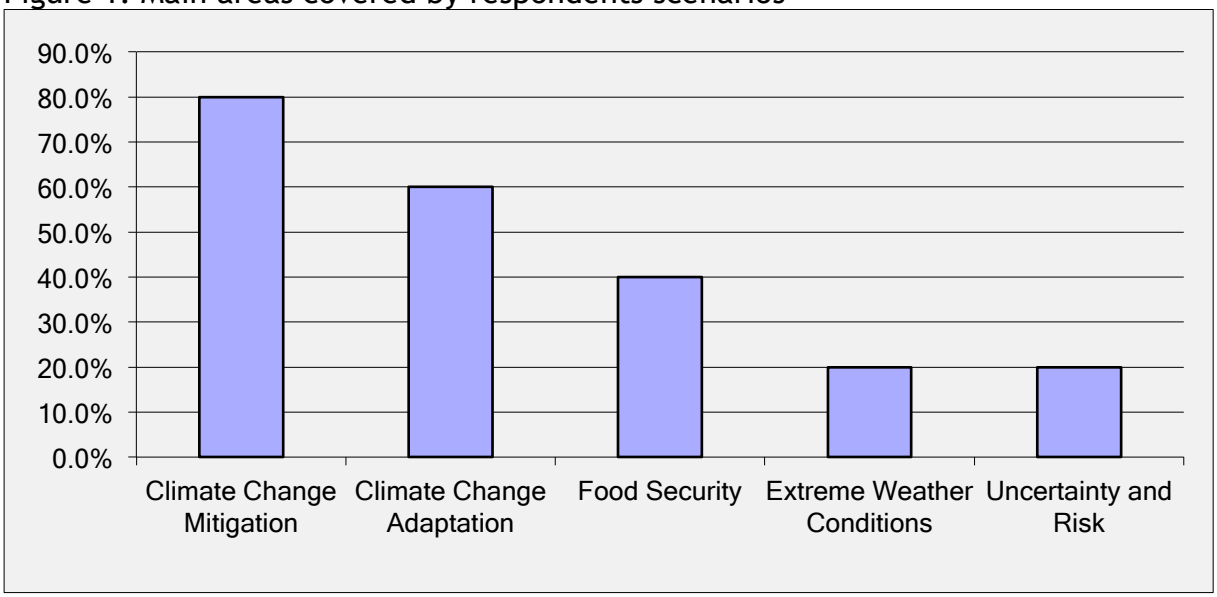
Partners	Responses
Leibniz-Zentrum für Agrarlanschaftsforschung (ZALF) e.V	3
Centro de Investigación y Tecnología Agroalimentaria (CITA), Spain	2
University of Bologna, Italy	2
University of Haifa, Natural Resource and Environmental Research Center, Israel	2
Wageningen UR	2
IRTA - Institute for Food and Agriculture Research and Technology	1
SRUC, United Kingdom	1
University of Tuscia, Italy	1
Potsdam Institute for Climate Impact Reserach (PIK), Germany	1
MTT Agrifood Research Finland	1
University of Technology & Life Sciences, Bydgoszcz, Poland	1
University of Bonn, Germany	1
Cranfield University, United Kingdom	1
LERNA-INRA	1
University of Natural Resources and Life Sciences, Vienna	1
Austrian Institute of Economic Research (WIFO)	1

Results

The web-based survey was structured to follow a number of sections. The first section gathered information on scenarios being used. In total,27% of respondents stated that published scenario is adapted for use in the model and 73% of them said that new scenario is implemented in the model. A textual analysis of the scenarios used found a mix of standard and domestically generated scenarios. The most common of the standards were IPCC (A2, B2, A1B, SRES), several have identifiers around CAP reform applied to a country level, whereas others were specific, e.g. ‘uCC3 (utilised cereals crop yield potential, BAU 3’

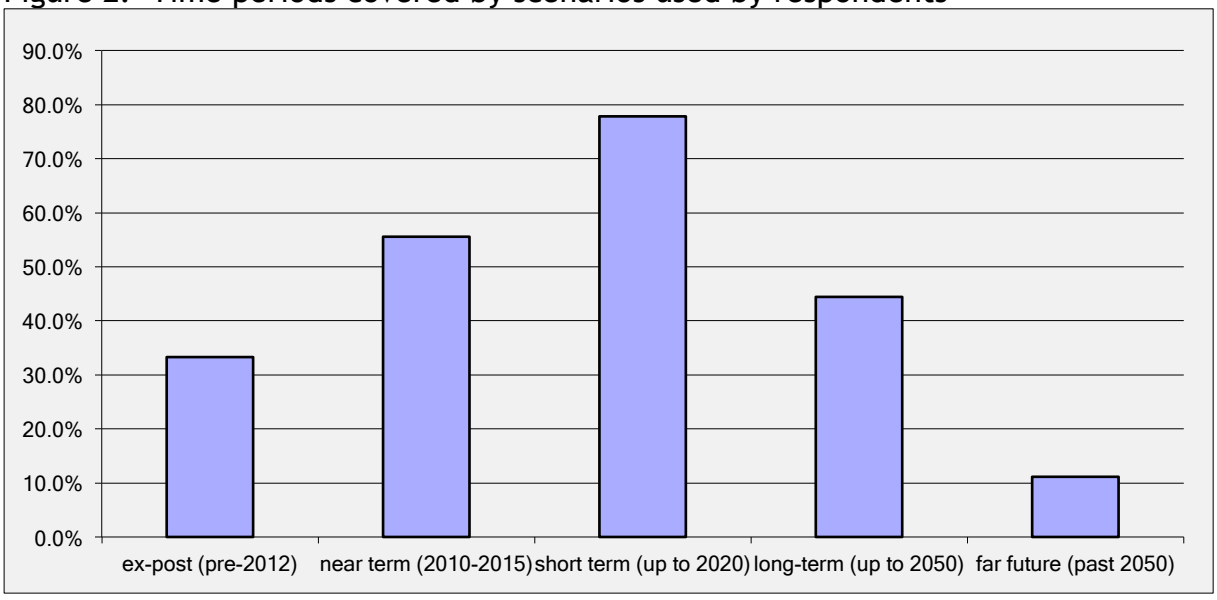
Figure 1 shows these main areas covered by scenarios, and around 80% of the scenarios have some focus on climate change mitigation. This is followed closely by adaptation. Only 40% of researchers were examining food security issues, with only 20% focused on weather and risk related factors.

Figure 1. Main areas covered by respondents scenarios



Then participants were asked to outline the time frame of their models. Notably most were working in the short-term, up to 2020 (around 80%), with some modelling extending to longer time periods.

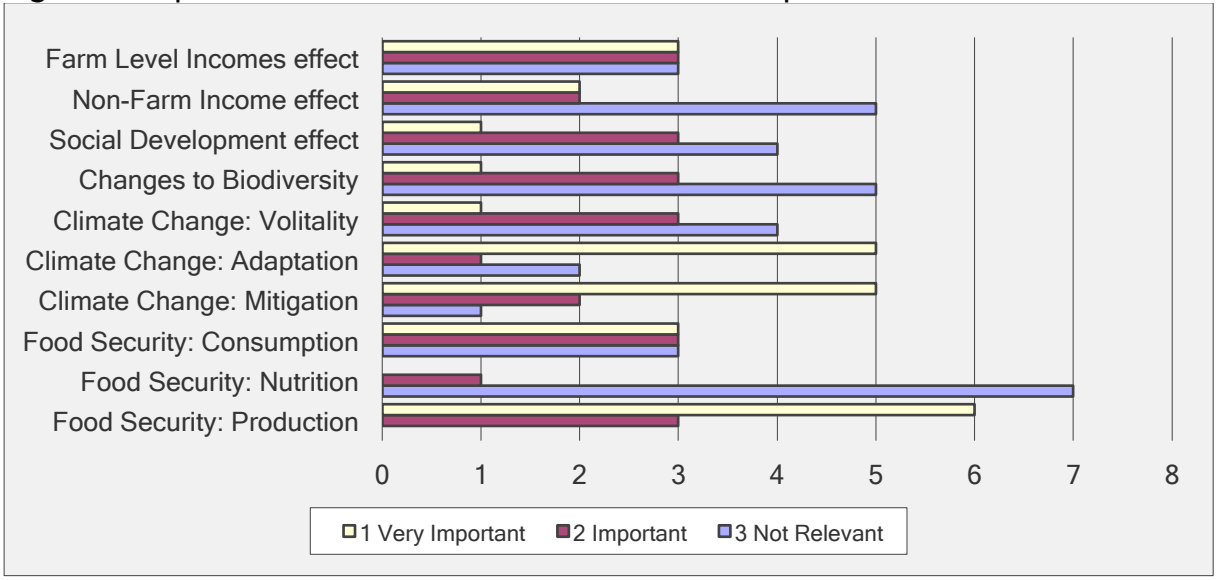
Figure 2. Time periods covered by scenarios used by respondents



For most of the participants, estimates of exogenous price forecasts within the models were from OECD (83%), whereas 33% had used FAO data. Notably, only a third of participants used consumption patterns within their model, and these were mostly from the FAO. In addition, most of the researchers did not use exogenous indicators of structural change.

In terms of scenario areas, the researchers were asked to identify how important they saw a number of items for integrating into their models. Figure 3 shows these in detail.

Figure 3 Importance of factors within scenario development



Very few researchers rated biodiversity, social effects, and volatility due to climate change as very important. However, food security, specifically production, as well as climate change adaptation and mitigation were rated the most important.

Finally, participants were asked 'in relation to the MACSUR project itself, could you provide some examples of the sort of questions that you hope to address with an improved modelling framework (i.e. after interaction with other MACSUR researchers)' . This garnered 8 responses and are presented as straight textual outputs::

> *'With more informed input on potential mitigation strategies (based on biophysical data) in livestock and crop sectors, we would hope to improve the economic impact assessment in Spanish sectors when facing restrictive emissions targets'.*
>
> *'What is the overall economic impact of climate change on the Israeli economy? 2. What adaptation strategies are economically efficient in reducing the negative impacts of climate change on the Israeli economy? 3. What are economically preferable adaptation strategies for the Israeli agriculture? 4. For a small open economy like Israel, what is the preferable mixture of mitigation and adaptation strategies?'*
>
> *'Improved crop modelling and forecasts of changes in world prices of agricultural outputs'*
>
> *'- integrate aspects on structural change into the model - strengthening the link between land use and bio-physical effects - integrate tools to asses risk and vulnerability of land use - integrate tools/interfaces to integrate a*

consumption perspective (partial equilibrium model with details in production patterns)'

'1. What are available FORECASTS OF RAW FOOD MATERIAL PRICE GAP CHANGES in the past and in the future 2. What are available FORECASTS of changes of yields because of genetic and/or technological progress - possible rates, indicators, indexes from CAP'

'I would mainly like to address variability of production (quantity, quality) as an effect of climate change.'

'Effects of extreme events and increased volatility of weather conditions on crop productivity Climate impacts on livestock productivity and production Exploring measures of agricultural risk management Policy measures for agricultural mitigation Policy measures for agricultural adaptation Agricultural trade as an adaptation option Developing quantitative indicators on food security'

' story lines for climate change in Europe - development of scenarios that can be used as a reference - best practices: how to come from crop-model results to yield coefficients in the model - aggregation - how to deal with volatility'

A textual analysis of these statements identified 'climate change' as the most frequent phrase used, followed by both 'adaptation', 'economic impact' and 'forecasts of change'.

Discussion

This deliverable represents a survey of Trade-M members to understand modelling approaches and scenario development. Clearly, it seems that most modellers are working on shorter time frames (up to 2020), and most are focused on food production, with only a few focused on variability and weather related shocks. Accordingly, gaps emerge with respect to understanding fully the effect of variance across geographical levels and perhaps provides a strong platform for collaboration across other consortia within MAC-SUR.

This survey approach has been explored for other consortia under the MAC-SUR banner and may provide a repository for policy makers and researchers to understand drivers behind scenario development and modelling approaches using a consistent format.

Further work

The existing tools and models will be applied to analyse defined scenarios that are consistent with the storylines developed in Task T1.2. WP3 geographical areas of interest existing tools and models can be applied the following scenarios: Mediterranean, Northern Europe, Central Europe and Others. The findings from T1.2 let also to define more precisely the knowledge gaps to identify problems that need to be addressed in future research efforts within T1.4 commitments. There will be put an effort towards model integration. Regional case studies need to be set up in a coherent manner. Some global models (e.g. MAgPIE, GLOBIOM, MAGNET) have results based on agreed upon base line scenarios – selected results can be

made available. The results will also be compared to the outcome of some global models on the same set of scenarios. In light of this exercise also limitations and potential solutions will be identified.

Acknowledgments

We thank all TradeM partners for their contribution to the survey.

References

http://macsur.eu/index.php/internal-documents/TradeM/TradeM-Newsletters/ (TradeM Newsletter 2013 June - App. 1)

http://macsur.eu/index.php/internal-documents/TradeM/TradeM-Newsletters/ (TradeM Newsletter 2013 June - App. 2)

Mitter, H., F. Sinabell, E., Schmid, 2013. Assessing climate change and policy impacts on protein crop production in Austria Paper presented at the Impacts World 2013, International Conference on Climate Change Effects, Potsdam, May 27-30 see: http://www.macsur.eu/index.php/internal-documents/func-startdown/135/.