
Report to the GTAP Advisory Board 2014

The Agricultural Economic Research Institute (LEI) has been a member of the GTAP consortium since November 1996. We use the GTAP database and model for a variety of research activities related to the agri-food sector and beyond. In particular, we use the MAGNET model as a variant of the GTAP model. The following presents a summary of our activities in 2013/2014.

People

In 2013/2014 Gideon Kruseman, John Helming, Diti Oudendag and Marie-Luise Rau joined the team. New team members will get involved in the data work, the coding/programming and/or the application. Furthermore, Zuzana Kristkova will be working within the team as a Marie-Curie fellow.

Aikaterini Kavallari unfortunately left the team and went to FAO. This makes a total of 17 researchers currently involved in CGE-related work at LEI. The other team members are: Heleen Bartelings, Michiel van Dijk, Marijke Kuiper, Myrna van Leeuwen, Hans van Meijl, Jeff Powell, Martine Rutten, Edward Smeets, Lindsay Shutes, Andrzej Tabeau and Geert Woltjers. In addition, John Doornbos and Barbara van Hout continued developing software tools for MAGNET.

The team members have participated in GTAP activities, such as contributing to the GTAP conference in 2013 and 2014. Furthermore, Heleen Bartelings will attend the GTAP short course in summer 2014.

The annex contains an overview of the team with their main GTAP-related research interests.

Marie-Curie fellowship

Zuzana Kristkova has been granted Marie-Curie fellowship April 2014 – April 2016, IEF Project METCAFOS which significantly enhances the transfer of knowledge in a training-through-research framework. Hans van Meijl is the senior scientist, contact and coordinator of the project. METCAFOS stands for Modelling Endogenous Technical Change in Agriculture for Food Security. The project aims to investigate the links between drivers of technical change and agricultural growth and integrates the empirical results into a global CGE model with the purpose of improving projections of food security. The main research objective of METCAFOS is to endogenize the drivers of technical change in the global CGE model MAGNET, with a particular focus on the following partial objectives:

1. To gain understanding of the type of technical change that occurred in agriculture in relation to other sectors in last 50 years and to quantify the drivers of endogenous technical change.
2. To incorporate the linkage between the drivers of the technical change and the technology parameters into the global CGE model MAGNET.
3. To provide projections of agricultural production and food security indicators based on the outputs of the MAGNET model with the endogenized technical change and to assess the effects of various scenarios affecting the food security.

The relevancy and timeliness of this research is enhanced by its contribution to the EU FP7 Project on Food security (FoodSecure) that draws on an expert, multi-disciplinary, scientific team to inform and guide decision makers and other stakeholders in formulating strategies to alleviate food shortages. METCAFOS namely contributes to the Working Package 7, which aims at providing foresight towards 2050 on Food and Nutrition Systems (FNS) by modelling the impact of long-term supply drivers.

MAGNET consortium

The GTAP model constitutes the basis of the MAGNET model, which has been developed by converting LEITAP in a modular CGE model approach and has been used at LEI. Hence the name MAGNET that stands for Modular Applied GeNeral Equilibrium Tool. MAGNET has the standard GTAP model at its core with all extensions added in a modular fashion. It allows the user to select which additional modules he/she wishes to include by adjusting the model settings and by including the relevant data.

The group of developers and users of MAGNET has been extended beyond LEI and includes also researchers from TI and IPTS. A MAGNET consortium has been created which regularly meets to discuss areas where the different member institutes can join forces in developing parts of the model.

Strategy – MAGNET production version

The sizeable group of researchers involved with GTAP work makes it worthwhile to exploit potential economies of scale, overcoming limits posed by project-driven research as done at LEI.

In order to facilitate the LEI team working with GTAP/MAGNET, Andrzej Tabeau and Lindsay Shutes have been given the task of coordination and programming on a day to day basis. Hans van Meijl remains the scientific leader and contact person for GTAP/MAGNET work.

To consolidate and develop MAGNET, we continue to hold regular update meetings and research seminars at LEI to present research and address specific issues in depth..

Following the full release of MAGNET 2.0 with full documentation, the respective MAGNET modules have been proven operational and documentation was updated in order to better support users. More specifically, material to acquaint new modelers with MAGNET and learn the details of CGE modelling in general has been developed. An internal training course was arranged for the new team members, given by Martine Rutten, alongside a course on building a CGE model from scratch given to both LEI and IPTS colleagues by Heleen Bartelings.

The application of MAGNET 2.0 proved the enormous flexibility of MAGNET, which carries the drawback that there is a potential danger to use settings which make less economic or empirical sense (for example production trees and implied elasticities). The empirical underpinning has been attempted to be tackled by several (on going) activities, namely the model validation and estimation of parameters.

Furthermore it is very helpful to have a benchmark at the start of a project, since many project entail comparable baseline scenarios and so on. Building on a tested and documented set-up can greatly reduce the work efforts. Hence we are currently testing a model version that offers users a predefined set-up of the whole system from which to start a project.

For MAGNET, we are developing a website (www.magnet-model.org) that will introduce the approach, including acknowledging GTAP, as well as present the research of the MAGNET application.

A new release of the MAGNET model, MAGNET 3, will be released in summer 2014. The new version will include updates of the GDP, population and land use data (including those used for SSP projections) as well as bug fixes and updated versions of DSS and Gtree software.

CGE-related research in 2014/2015

Model development

Library of procedures for adjusting a GTAP based SAM when splitting regions and commodities, further developments

- Improvement of procedures to create new sectors by using a mapping towards a common commodity set at a lower aggregation level than the GTAP commodities
- Improvement of procedures to aggregate data from different data bases to the same regional and commodity level by splitting them to a detailed level and then aggregating them back.
- Splitting n, p, and k fertilizer from chemicals

Land supply

- Alternative specification of the land supply function developed jointly with Peter Dixon and Maureen Rimmer to improve performance when the land asymptote is shocked. Methodology applied for REDD criteria related to biofuel directives (RED). Recalibration and revision of land supply elasticities. Programming calibration procedure of this function.
- Improvement of agricultural land availability estimates – using newly developed data provided by PBL, Assisting PBL on this research.
- Sources for update of exogenous land productivity used in projections are exploited including the OECD-FAO agricultural outlook for the medium-term, FAO's work on long term projections, econometric estimates using time series data. New estimates are implemented in several scenarios.
- Impact of climate change on yields was estimated and its consequences for agri-food sector were investigated.

Including biofuel sectors into the database.

- IEA data are used to introduce ethanol and biodiesel data in the version 8 database
- Biofuels trade data, also based on IEA sources, are incorporated into MAGNET
- FAO volume data are used to create consistency in energy content
- Subsidies for biofuel use are based on a comparison between gasoline price and cost price of biofuels
- DDGS as a byproduct of maize ethanol.
- Biodiesel is made of crude vegetable oil instead of oilseed, where the byproduct oilcake is generated with vegetable oil production
- Molasses as byproduct of sugar is introduced
- Biofuels are now considered in MAGNET as mentioned above. Early 2014 an adjustment was made so that the feedstock mix for ethanol and biodiesel is now endogenously determined.

Consumption function

- Income elasticities function is updated using 2007 PPP GDP data and USD elasticities estimates. Parameters of this function will be re-estimated/recalibrated.

Fertilizer modeling

- Literature research on modeling approaches of fertilizers and fertilizer policies
- Splitting up the GTAP p_c sector to fertilizers and rest of p_c
- The database on fertilizers is gradually enhanced with data on fertilizer use per crop and per country
- Production trees of the production version have been modified so as to capture substitution between land and fertilizer use for crop production accounting hence for intensification vs. extensification of agricultural production systems
- Sensitivity analysis of substitution elasticity

Trade policies – tariffs and non-tariff measures

- Tariff shocks are handled at 6 digit level instead of the GTAP aggregation, applying shocks on bound tariffs instead of applied tariffs when necessary.
- Application of MAGNET for assessing trade policies (focus agri-food trade), in particular tariff and NTM liberalisation (state of the art methods)
- Data work on tariffs, with the plan to exploring possibilities to more closely cooperate with the GTAP community in a concerted effort
- External databases used are TRAINS and UN COMTRADE, which are available to MAGNET via LEI's METABASE handling system, as well as EU details on tariffs (TACIS).

Data and model management software

- DSS (Dynamic Steering System): Created possibility to add endowments to database, new tested DSS version for the trunk
- GTREE: Created possibility to substitute strings in order to be able to use subroutines where some sets, coefficients or variables are substituted with a different name.

Linking of models and long term scenario development

- **VOLANTE: Visions Of LAND use Transitions in Europe**
 - To develop a roadmap for future land resource management in Europe a number of long term development scenarios are analyzed. Four contrasting marker scenarios were defined and run to establish boundary of sustainable land use. On the top of these 4 scenarios 12 policy scenarios were run to investigate possible impact of different policy options on land use as well as to examine trade-offs and synergies between future development pathways. Currently, the scenario outcomes are confronted with stakeholder's visions of sustainable land future and LEI actively participates in this process. As the result, pathways to reach the desired future of European land development and land use management will be identified.
- AgMIP: Comparison of alternative approaches for long-term scenarios for agricultural markets and trade
 - In the project, long term projection for agricultural markets and trade made by LEITAP, IMPACT, ENVISAGE, GLOBIOM, IMAGE and 6 other global models, Projections are based on the same set of assumptions and are developed by LEI, IFPRI, IIASA and World Bank. In debt projections comparison is done to improve the global models and learn

- from each other. In comparing model results, the special attention was paid on land use development, future of food and bioenergy demand and climate change consequences. Six papers was published: one in PNAS and five in Agricultural Economics.
- o The LEI/MAGNET and PBL/IMGE teams are busy with quantification of RAPs (Representative agricultural pathways) and climate scenarios. The SSP1, 2 and 3 story lines and macro-economic assumptions are used. Teams involved are GCAM, AIM, IIASA (GLOBIOM for land use part), PIK (Remind-MagPie).
 - OECD Long-Term Scenarios food and agriculture
 - o Three scenarios describing three different futures of world economy in general and agricultural sector in particular are developed. They cover a relevant part of the possible scenario space by being sufficiently distinct from each other. They will describe very different developments for the various key uncertainties that are believed to drive food and agriculture systems. Therefore, these three marker scenarios will differ by different projected economic and population development, different levels on integration and liberalization of world economy and different future visions of climate change. The scenarios will be run using MAGNET, IMPACT, ENVISAGE and GLOBIOM models for 2007-2050 period. Key challenges/concerns related to marker scenarios are identified. Related policy options dealing with these challenges will be addressed. To quantify the potential impacts of policy strategies on key target issues, the policy related scenarios will be run on the top of previously developed marker scenarios.

Impacts of bioenergy production and use

- *BE Basic project:* Biofuel production and use scenarios have been developed and implemented in MAGNET to analyse the impacts of biofuel policies on land use changes in Brazil and to develop strategies to avoid negative impacts. MAGNET is soft-linked to a spatial allocation model PLUC, which is applied in this exercise for Brazil and uses land demand changes derived from MAGNET. Land use data for Brazil are taken from national sources and are harmonized between MAGNET and PLUC (both regarding land demand per crop and on potentially available agricultural land) and BLUM partial equilibrium model (see further also the BIOEN project). This project is carried out in collaboration with Utrecht University.
- Biofuel production and use scenarios will be developed and implemented in MAGNET to analyse the impacts of biofuel policies on food security in Ghana. Specific attention will be given to strategies aimed at reducing negative impacts on food security. The analyses will be done at household level, possibly results will be given for nutritional values. This project is carried out in collaboration with Utrecht University.
- MAGNET is used to evaluate the land use change and food security effects of the use of residues and waste, using the sustainable potential of wheat straw for energy production in the EU in 2030 as a case study. This is done based on a shock of output subsidies. This project is carried out in collaboration with the Netherlands Environmental Assessment Agency.
- MAGNET is used to evaluate the economic impacts of biobased technologies in the EU. These technologies are considered in MAGNET by means of shift in technology as also applied in the study 'Macro-economic Impact Study for Biobased Malaysia' LEI report 2012-042 <http://edepot.wur.nl/274714>. This project is done in collaboration with the Netherlands Environmental Assessment Agency and the Institute for Prospective Technological Studies of the EC.
- BIOEN project: The full title of this project is 'Integrating Partial and General Equilibrium Models to Assess Biofuels Expansion Impacts'. This project involves harmonisation of input data, scenarios, elasticities, etc. between the BLUM partial equilibrium model of the Brazilian agricultural sector and biofuel sectors with the MAGNET model. This project is carried out together with Agricultura, Energia e Sustentabilidade (ICONE) in Sao Paulo (Brazil).

Biofuels, bioenergy sector & greenhouse gas emissions, sustainability, food security...

- Knowledge Infra Structure project: Research on an impact of the rebound effect of first generation biofuels on greenhouse gas emissions in the EU. The MAGNET model is used to evaluate the rebound effect of biofuel use in the EU. A sensitivity analysis is carried out based on the range of model parameter values identified when reviewing literature. The impact of the rebound effect of biofuel use in the EU on GHG emissions was estimated. This study is completed in 2014 and results are accepted for publication in Renewable and Sustainable Energy Reviews.

- MAGNET is being expanded with several new biobased sectors: 1. Second generation biofuels gasification/thermal conversion technologies, 2. Second generation biofuel biochemical conversion technologies, 3. Bioelectricity, 4. Biochemicals, 5. Residues, 6. Dedicated energy crop plantations (woody and/or grassy crops) and 7. Biomass pretreatment sectors. Three types of residues are considered: 1. Forest harvest residues, 2. Forest industry residues, 3. Agricultural residues. A global bioenergy scenario study is carried based on projections of the TIMER energy model that follow climate change policy scenarios of the IPCC. The objective is to analyse ILUC effects and to investigate options to avoid undesirable ILUC effects. This project is done in collaboration with the Netherlands Environmental Assessment Agency and Utrecht University.
- In the Dutch Bebasic and knowledge infrastructure Biobased economy projects the economic MAGNET model will be linked to bottom up analyses of Copernicus institute and to environmental models.
- "Land use change effects of biofuel use in the EU 27" - contributions of LEI to the project: concerning 'Opportunities and threats of the biobased economy for sustainable development' of the Netherlands Environmental Assessment Agency (PBL). Project evaluate direct and indirect land use change effects of the 10% biofuel target of the Renewable Energy Directive (RED) in the year 2020 "Impact analysis of a bioeconomy in the EU" contributions of LEI to the project: concerning 'Opportunities and threats of the biobased economy for sustainable development' of the Netherlands Environmental Assessment Agency (PBL). The focus of this study is on the macro-economic impacts in the EU of emerging biobased sectors, i.e. the use of biomass for the production of second generation biofuels, electricity and chemicals. Results are expressed in terms of impact on Gross Domestic Product (GDP), trade balance and employment for the year 2030. Also the impact of the use of residues on the agricultural sector and on agricultural land use is evaluated.
- The research on an impact of the rebound effect of first generation biofuels on greenhouse gas emissions in the EU. The MAGNET model is used to evaluate the rebound effect of biofuel use in the EU. A sensitivity analysis is carried out based on the range of model parameter values identified when reviewing literature. The impact of the rebound effect of biofuel use in the EU on GHG emissions was estimated.
- An economy-wide assessment of the food security impacts of changes in bioenergy use in a framework of Global-Bio-Pact FP7 project. The illustrative MAGNET application that quantifies the impact of increased biofuel production on food prices and macroeconomic indicators in Argentina, Indonesia and Brazil. Furthermore, it studies the implications for food security in these regions and, via food prices, on selected African regions.

Household modeling

- Building on the MyGTAP code generously shared by Terrie Walmsley and Peter Minor we developed a module offering the possibility for one or more regions to replace the regional household by a separate government and one or more households.
- Model runs, efforts now focus on building a household database to use in the module.
- The household module is currently being used for two studies: the impact of climate change on the poor in Ghana and the impact of the national biofuel directive on households in Ghana.
- A technical paper outlining the data procedure for adding multiple households to MAGNET will be released later this year (Kuiper and Shutes, 2014).

Global household database

- The current version of the household module allows for the separation of the government and private household for all regions, such that all tax revenues accrue to government and factor payments accrue to the private household and government. Transfers between the government and private household are explicitly included. The next step is to develop a household database which can be used to disaggregate the single private household into multiple private households.
- Using funding from various projects, work has started on developing a household database to for the new household module. With the usual limits of funds and time we start focusing on a limited number of countries, one of which is Ghana (the focus of a USAID project).
- Our ambition is one of broad but global coverage, i.e. we aim for a global database compatible with any GTAP version, constructed from public data sources. Our intention is to make the source data and procedures we use publicly available to solicit feedback on our approach and invite others to contribute data.

- A short-list of priority countries has been developed using the criteria of data availability, food and nutrition status, whether a country is identified individually in the GTAP database and whether it is a FOODSECURE case study country (a key funder of this work). This process resulted in a short-list of Ghana (completed), Kenya, Uganda, Indonesia, Ethiopia and India.

Food security

- The introduction of a household module, using the MyGTAP theory and code, improves the representation of key aspects of food security in MAGNET.
- Replacing the single representative household with multiple households in key developing countries allows for the derivation of household-specific changes in income and prices, yielding changes in food security for different household groups and enabling the identification of vulnerable households. This also permits the evaluation of the impacts of government tax policies and subsidy programmes to redress undesirable social outcomes. This development improves the representation of the accessibility dimension of food and nutrition security in MAGNET.
- Extending MAGNET to include household specific savings, remittances and aid payments; which are all linked to the resilience of households to cope with economic and climate shocks, improves the representation of the stability dimension of food and nutrition security in MAGNET.

Consumption and nutrition

- Nutrition indicators have been added to the MAGNET model, i.e. calories, proteins, fats, and carbohydrates, associated with human consumption of agri-food products in MAGNET using data from the FAO. The methodology is novel in that it traces nutrients from farm to fork, taking into account trade flows. It thereby enables capturing where nutrients come from (e.g. from which primary sector, and whether they are domestically sourced or from abroad -and if so from which region) and so providing entry points for action along the chain. The approach, providing hands and feet to the concept of nutrition-sensitive agriculture - has been documented in Rutten et al. (2013). In 2014 work is being done to improve the outcomes of the nutrition module, including (1) data improvements, (2) improving the consumption function (income and price elasticities), (3) applying it to the SSP scenarios and (4) merging it with the household module so as to get household level nutrition indicators. The module is set-up so as to incorporate any other nutrients for which data (i.e. nutrient content in primary production) become available. Specific interest is in the addition of nutrients that are important from a food security perspective, including iron, vitamin A, iodine and zinc, in view of dietary changes and changes in FNS over time and the derivation of long-term health impacts.

Food losses and waste

- In 2013 major work has been done to model food loss and waste reductions in MAGNET, with applications to the EU and to the MENA region. These have culminated in a GTAP working paper (Rutten and Kavallari, 2013) and a LEI report (Rutten et al, 2013). The techniques used can be readily applied in other applications. The framework of analysis has been published in Agriculture & Food Security (Rutten, 2013) and Martine wrote several blogs and participated via various other media in the debate on reducing food losses and waste. Future work will concentrate on incorporating food losses and waste explicitly in MAGNET.

Technical change

- Estimation and implementation of technology shifters in MAGNET

Validation

- Development and application of a methodology to validate short to medium term projections with multi-sector and multi-country CGE models using historical data.

LEITAP/MAGNET – 2013/2014 related publications

Journal articles & book chapters:

- Valin, H., Sands, R. D., van der Mensbrugghe, D., Nelson, G. C., Ahammad, H., Blanc, E., Bodirsky, B., Fujimori, S., Hasegawa, T., Havlik, P., Heyhoe, E., Kyle, P., Mason-D'Croz, D.,

- Paltsev, S., Rolinski, S., Tabeau, A., van Meijl, H., von Lampe, M. and Willenbockel, D. (2014), The future of food demand: understanding differences in global economic models. *Agricultural Economics*, 45: 51–67. doi: 10.1111/agec.12089, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12092/pdf>
- Robinson, S., van Meijl, H., Willenbockel, D., Valin, H., Fujimori, S., Masui, T., Sands, R., Wise, M., Calvin, K., Havlik, P., Mason d'Croz, D., Tabeau, A., Kavallari, A., Schmitz, C., Dietrich, J. P. and von Lampe, M. (2014), Comparing supply-side specifications in models of global agriculture and the food system. *Agricultural Economics*, 45: 21–35. doi: 10.1111/agec.12087, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12087/pdf>
 - Nelson, G. C., van der Mensbrugghe, D., Ahammad, H., Blanc, E., Calvin, K., Hasegawa, T., Havlik, P., Heyhoe, E., Kyle, P., Lotze-Campen, H., von Lampe, M., Mason d'Croz, D., van Meijl, H., Müller, C., Reilly, J., Robertson, R., Sands, R. D., Schmitz, C., Tabeau, A., Takahashi, K., Valin, H. and Willenbockel, D. (2014), Agriculture and climate change in global scenarios: why don't the models agree. *Agricultural Economics*, 45: 85–101. doi: 10.1111/agec.12091, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12091/pdf>
 - Lotze-Campen, H., von Lampe, M., Kyle, P., Fujimori, S., Havlik, P., van Meijl, H., Hasegawa, T., Popp, A., Schmitz, C., Tabeau, A., Valin, H., Willenbockel, D. and Wise, M. (2014), Impacts of increased bioenergy demand on global food markets: an AgMIP economic model intercomparison. *Agricultural Economics*, 45: 103–116. doi: 10.1111/agec.12092, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12092/pdf>
 - Dijk van, M., 2014. Productivity growth at the sectoral level: measurement and projections (submitted).
 - Achterbosch, Thom, Heleen Bartelings, Siemen Berkum, Hans Meijl, Andrzej Tabeau, and Geert Woltjer. 2014. 'The Effects of Bioenergy Production on Food Security'. In *Socio-Economic Impacts of Bioenergy Production*, edited by Dominik Rutz and Rainer Janssen, 95–109. Springer International Publishing. http://dx.doi.org/10.1007/978-3-319-03829-2_6.
 - Meijl, H., Smeets, E., Dijk van, M., Powell, J., Tabeau, A., 2014. Macro-economic impact study for Bio-based Malaysia (submitted).
 - Banse, M., A. Rothe & L. Shutes (2013). Factor Markets in Applied CGE Models. With. Chapter in *Land, Labour and Capital Markets in European Agriculture: Diversity under a Common Policy*, J. Swinnen & L. Knops (Eds.)
 - Banse M., Rothe A, Tabeau A, van Meijl H. and Woltjer G., 2013, Will improved access to capital dampen the need for more agricultural land? A CGE analysis of agricultural capital markets and world-wide biofuel policies, Factor Markets Working Paper No. 48, FP7 The Factor Markets Project (245123-FP7-KBBE-2009-3). <http://www.ceps.be/book/will-improved-access-capital-dampen-need-more-agricultural-land-cge-analysis-agricultural-capit>
 - Schmitz, C., van Meijl, H., Kyle, P., Nelson, G. C., Fujimori, S., Gurgel, A., Havlik, P., Heyhoe, E., d'Croz, D. M., Popp, A., Sands, R., Tabeau, A., van der Mensbrugghe, D., von Lampe, M., Wise, M., Blanc, E., Hasegawa, T., Kavallari, A. and Valin, H. (2014), Land-use change trajectories up to 2050: insights from a global agro-economic model comparison. *Agricultural Economics*, 45: 69–84. doi: 10.1111/agec.12090, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12090/pdf>
 - Eloi Lennon Dalla-Nora, Ana Paula Dutra de Aguiar, David Montenegro Lapola and Geert Woltjer (2014?), Amazon conservation cannot be a deforestation end in Brazil, submitted.
 - Eloi Lennon Dalla-Nora, Ana Paula Dutra de Aguiar, David Montenegro Lapola and Geert Woltjer (2014?), Why have land use change models for the Amazon failed to capture the amount of deforestation over the last decade? Submitted.
 - Dixon, P., H. van Meijl, M. Rimmer, L. Shutes and A. Tabeau. (2013) The Impact of Global RED and REDD Policies on European Land Markets. With. Chapter in *Land, Labour and Capital Markets in European Agriculture: Diversity under a Common Policy*, J. Swinnen & L. Knops (Eds.) Also submitted as project deliverable and available in working paper form at factormarkets.eu.
 - Dixon, P. B., Meijl, H. van, Rimmer, M. T., Shutes, L. & Tabeau, A, (2013), RED vs. REDD: Biofuel policy vs. forest conservation. Submitted to *Global Environmental Change*.
 - K. P. Overmars,, Elke Stehfest, Andrzej Tabeau, Hans van Meijl, Angelica Mendoza Beltrán, Tom Kram, Estimating the costs of reducing CO2 emission via avoided deforestation with integrated assessment modeling, (second review).
 - Powell, J. and M. Rutten (2013), "Convergence of European Wheat Yields", *Renewable and Sustainable Energy Reviews*, 28, December 2013: 53–70. : Impact factor 5.6
 - Powell, J., K. Shutes and A. Tabeau, Effects of changing weather patterns on the trade of major food crops. Submitted March, 2014.

- Rutten, M., M. van Dijk, W. van Rooij, and H. Hilderink (2014), "Land Use Dynamics, Climate Change and Food Security in Vietnam: a Global-to-Local Modeling Approach", *World Development*, 59, July 2014: 29-46.
- Rutten, M. (2013), "What Economic Theory Tells Us about the Impacts of Reducing Food Losses and/or Waste: Implications for Research, Policy and Practice", *Agriculture & Food Security* 2013, 2: 13.
- von Lampe, M., Willenbockel, D., Ahammad, H., Blanc, E., Cai, Y., Calvin, K., Fujimori, S., Hasegawa, T., Havlik, P., Heyhoe, E., Kyle, P., Lotze-Campen, H., Mason d'Croz, D., Nelson, G. C., Sands, R. D., Schmitz, C., Tabeau, A., Valin, H., van der Mensbrugghe, D. and van Meijl, H. (2014), Why do global long-term scenarios for agriculture differ? An overview of the AgMIP Global Economic Model Intercomparison. *Agricultural Economics*, 45: 3–20. doi: 10.1111/agec.12086, <http://onlinelibrary.wiley.com/doi/10.1111/agec.12086/pdf>
- Shutes, L. (2013). Labour Supply Curves for EU Member States and Candidate Countries: An Applied General Equilibrium Analysis. Chapter in *Land, Labour and Capital Markets in European Agriculture: Diversity under a Common Policy*, J. Swinnen & L. Knops (Eds.)
- Woltjer, G., Rutten, M., Smeets, E. (2013) 2 book chapters TAPSIM, derived from D7.1 and D7.2

Conference papers

- Dijk van, M., Woltjer, G., Philippidis, G. (2014). Validating CGE models employing an historical approach. Presented at the 17th Annual Conference on Global Economic Analysis, Dakar, Senegal.
- Rau, M.-L. and A. Kavallari (2013). Preference erosion effects of multilateral and regional trade liberalisation: Simulating EU's trade agreements with Mediterranean countries. Contributed paper at the 135th Seminar of the European Association of Agricultural Economists, Belgrade, August 28-30.
- Shutes, L., M. Kuiper, E. Smeets & M. Rutten (2013). Biofuels & Food Security: Hope or Hindrance? Poster presentation at the Business, Environment & Society research conference, 11 July 2013, Coventry University, UK.
- Smeets, E.M.W.; Berkum, S. van; Meijl, J.C.M. van; Tabeau, A.A.; Woltjer, G.B.; Moorad, J. (2013), The impact of biofuel use on oil markets and greenhouse gas emissions, Brussels : SAT-BBE seminar, 2013-04-24/ 2013-04-25
- Van Dijk, M., Productivity growth at the sectoral level: measurement and projections, Presented at the 16th GTAP conference and IATRC conference
- Geert Woltjer, Simplifying general equilibrium analysis through a modular structure, Paper for the 16th Annual Conference on Global Economic Analysis " New Challenges for Global Trade in a Rapidly Changing World", June 12-14 2013.

Reports & working papers

- Achterbosch T., Woltjer G., van Meijl H., Tabeau A., Bartelings H., van Berkum S. 2013, An economy-wide assessment of the food security impacts of changes in bioenergy use, LEI part of Wageningen UR, The Netherlands, Report of the FP7 Global-Bio-Pact Project (FP7-245085). <http://www.globalbiopact.eu/images/stories/publications/d4.1.pdf>
- Shutes, L., E. Smeets and H. van Meijl (2014). A theoretical economic framework for measuring the food security impacts of biomass production. Report for the BE-BASIC project, *forthcoming*.
- Rutten, M., P. Nowicki, L. Amaryan and M-J Bogaardt (2013), "Reducing Food Waste by Households and in Retail in the EU: a Prioritisation on the Basis of Economic, Land Use and Food Security Impacts", LEI report 2013-035, LEI Wageningen UR.
- Dixon, P. B., Meijl, H. van, Rimmer, M. T., Shutes, L. & Tabeau, A, 2013,. RED vs. REDD: Biofuel policy vs. forest conservation. Report submitted for the Factor Market project. A working paper version is available at <http://www.factormarkets.eu/working-papers?page=3>
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Annex: overview of the structure of the MAGNET model

