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# Report to the GTAP Advisory Board 2010

The Agricultural Economic Research Institute (LEI) has been a member of the GTAP consortium since November 1996. We use GTAP for a variety of research activities related to international trade in agri-food products. The following presents a summary of our activities over 2009.

## Consortium related

Following suggestions made during the last board meeting we studied the set up of a GTAP hub in Europe at LEI. Plans are still under investigation but the interest remains high. Ignacio Perez attends the 2010 GTAP short course.

## People

In the course of 2009 Torbjörn Jansson left LEI to become a researcher at the Swedish SLU, Department of Economics and Martin Banse left to become the director of von Thünen-Institute (vTI) in Braunschweig. Ignacio Perez joined LEI from IPTS-Sevilla.

We currently have nine researchers involved in CGE-related work: Lindsay Chant, Marijke Kuiper, Myrna van Leeuwen, Hans van Meijl, Ignacio Perez, Jeff Powell, Martine Rutten, Andrzej Tabeau and Geert Woltjer. Jeff Powell started a PHD in 2010 to enhance the representation of the Biobased economy in LEITAP.

## Strategy

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. To consolidate and develop the LEITAP model, monthly meetings are used for discussing technical details of ongoing modeling work. For focused, joint work 'Noordwijk meetings' of multiple days are organized, allowing researchers to step back from the day-to-day project issues and work jointly on issues of longer term strategic relevance. In 2009 a Noordwijk meeting was again organized with Peter Dixon and Maureen Rimmer (visting LEI for the second time) to work on ORANGE (a Monash type CGE model of the Dutch economy) and the LEITAP baseline.

Next to the meetings, project funds are invested in consolidating and further developing the LEITAP and ORANGE model. By pooling together funds from several projects a sizeable investment can be made. With the modeling team at LEI becoming more international, staff turnover increases. This creates a need for model transparency (including the way in which the underlying data are created) to get new team members up to speed with LEITAP. Furthermore, the team-based modeling work at LEI created a need to improve the synchronization of work by different team members. Building on earlier work of cleaning and extending the LEITAP model, a major overhaul of the whole model was therefore started. In essence the model is taken apart and rebuild, starting from 'plain vanilla' GTAP. The GEMPACK-compatible code is derived from a large set of hierarchically ordered text files programmed in Gtree (a software package developed at LEI). The ordering of the files provides a view of the overall structure of the model. It also enhances the benefits of version control since changes in model code can be immediately traced to a limited number of text files dedicated to a specific module. Parallel to the model changes a set of programs handling data adjustment and data aggregation are developed, making all steps in model development tractable. A paper presenting some first results from this restructured version of LEITAP (exploiting the possibility of effortlessly changing the model structure) will be presented at the 2010 conference.

An in-house training is being given to train the new staff members in the (restructured) LEITAP model, perform sensitivity analyses and promote exchange of expertise among modelers.

## CGE-related research in 2009

### *Model development*

- *Restructuring LEITAP*. The standard GTAP model (V6.2) has been restructured and split in text files compatible with the Gtree program. Modules have been added to include various nested-CES production structures, endogenous land supply, nested-CET allocation of land over sectors and biofuels. All modules are steered by sets and can be switched on and off by region and/or sector and come with the necessary data preparation programs allowing a batch-based generation of data-files based on a user-defined model aggregation and model structure. Version control using a svn server has been started.
- *Land supply*.
    - Correction for differences between marginal and average productivity on newly developed land. Based on results for the IMAGE land productivity and land use model.
    - Calibration procedure for land supply functions depending on the strictness of environmental policies. Information about available land for agriculture in the different environmental scenarios is supplied by the IMAGE land allocation model.
    - Simplification of land supply function, taking into account that GEMPACK works on percentage changes, not levels. For each step an explicit land supply elasticity is updated.
- *Dynamic consumption function* calibration, where a CET consumption function is calibrated in each simulation step by a function where income elasticities depend on PPP corrected real GDP per capita.
- *Modeling EU agricultural policy*:
    - Introducing explicit real budgets for EU agricultural policy.
    - Opportunity to stabilize subsidies per hectare instead of ad valorem subsidies
    - Second pillar or rural development policies
        - Modeling vintage effects of investment subsidies in physical and human capital (second pillar EU-policy)
        - Distributing payments of Less favored Areas and Agro-Environmental schemes.
- *Including quantity information in database*. Based on FAO-data quantities of crops are included in the LEITAP database. This reveals inconsistencies in implicit prices that still have to be solved.
- *Including biofuel sectors into the database*. Ethanol and biodiesel are split in small quantities from current sectors like ofd, chemicals and sugar, and then are blown up till 2007 levels through the model. Quantities in ethanol and biodiesel are made consistent with the energy values used as inputs for the biofuel production.
- *Including byproducts* using a crude value-based approach (i.e. a fixed value relationship between input use in biofuel production and the production of the byproducts; different for different biofuels).
- *Modeled indirect consumption of meat*. Because of fixed input-output coefficients a reduction in meat consumption has in the standard model a relatively small effect on meat production. Therefore, these input-output coefficients are adjusted consistent with the change in consumption.
- *Decoupling in the EU*. A first attempt has been made to model decoupling in a different way than coupling the subsidies to land.
- *Worked on a first solution for small share problems in international trade for India*. Armington elasticities are larger when shares are small for Indian imports (only when changes imports are increased), while a nest is made for the ESUBM elasticities from non-Indian countries, where exports for India are able to increase more when current market shares are small; only for products that are potentially competitive.
- *Adjusted feed nests*, where feed inputs from primary agriculture are separated from inputs from processed agriculture (because of difference in feed value per dollar of feed). Ofd sector is split in consumption part and feed part.

### *Data and model management software*

- *DSS (Dynamic Steering System) – interface for running LEITAP to assure replicability & consistency*:
    - Implemented extra checks on model outcomes, gathered in a summarizing warning file for complete scenarios
- *Standardization and automatization of LEITAP database creation.* Creating a stepwise procedure to make the LEITAP database. This consists of biofuel and feed adjustments at the starting period on the original GTAP database, followed by aggregation with FlexAgg. LEITAP coefficients and variables are added in the next step, where some variables are aggregated based on LEITAP data on the GTAP aggregation, and some information is aggregation specific. These two types of data are strictly separated in order to know which data have to be adjusted. Then byproducts are introduced, and finally a baseline is created, with a separated program to include

land productivity developments we get from PBL based on FAO-data. This procedure saves a lot of time in changing aggregation.

- *GEMSE analyst - interface for quickly analyzing and displaying results*:
  - Program is made more flexible in comparing scenarios. Levels in specific years can be shown as a percentage difference with respect to another scenario.
  - Created more flexible ways to select data

### *Linking of models*

- In Scenar2020 II: LEITAP is linked with agricultural partial equilibrium models (ESIM, CAPRI)
- *Changes in China's agriculture:* a project is ongoing to analyze the impact of changes in China's agriculture on the world economy and the EU in particular. In this project GTAP runs provide the basis of estimating trade response functions that will be included a detailed model of China's agriculture (CHINAGRO developed by SOW and CCAP) and to a model of EU's agriculture (FEA). This work is part of CATSEI, an EU FP6 project.
- *Linking LEITAP with biophysical models*: In EUruralis LEITAP is linked with the biophysical IMAGE model of PBL and the land allocation model CLUE-s of WUR-LAD.

### *Bioenergy*

- *In the area of bioenergy we extended the scope of our analysis from a more focused approach on biofuel to a wider analysis of biomass use in petrol, electricity and fine chemicals.*
  - For DG Environment several biofuel scenario's are done with a focus on land use (including sustainability criteria.

### *Future of (EU) agriculture*

- LEI is one of the partners in the SCENAR2020 II project for the EC (DGAgri). In this project the future of EU agriculture and rural development is central. GTAP will be used in combination with two EU agricultural models (ESIM and CAPRI). The future of the Common Agricultural Policy after 2013 is a central theme in this study.

### *Common Agricultural Policy:*

- In 2009 an impact study on the Dutch proposal for the future of the CAP ("Houtskoolschets") is performed for the Dutch government. The work is presented during the High level CAP conference in Scheveningen, Netherlands. In the study money is shifted from first pillar to measures that enhance competitiveness, valuable areas and ecosystem services.

### *ORANGE – a CGE model of the Netherlands*

- A first version of a national CGE model for the Netherlands (ORANGE) has been built and a baseline has been calibrated. The ORANGE model was used to examine the impact of a shift towards biobased inputs in the Plastics industry in the Netherlands. This model can in the future be linked to LEITAP

### *GTAP-related publications*

Banse, M. A. Faaij, R Hoefnagels and V. Dornburg (2009) Analysis of the Economic Impact of Large-Scale Deployment of Biomass Resources for Energy and Materials in the Netherlands. Study commissioned by the Dutch Ministry of Agriculture, Nature and Food Quality. The Hague, Netherlands. http://www.lei.wur.nl/NL/nieuwsagenda/nieuws/Gevolgen_toename_biomassagebruik_op_de_economie

Banse, M., P. Nowicki, and H. van Meijl (2009), The rise and fall of world food prices, in P. Berkhout, Voedselzekerheid een beschouwing vanuit drie dimensies, LEI report 2009-86.

Eickhout, B., H. van Meijl, A. Tabeau and E. Stehfest, (2009). The impact of environmental and climate constraints on global food supply. In: "Economic Analysis of Land Use in Global Climate Change Policy", edited by T. Hertel, S. Rose and R. Tol, Routledge, USA.

Jansson T., M. Kuiper, M. Adenaeuer (2009) Linking CAPRI and GTAP. SEAMLESS D3.8.3 (www.seamless-ip.org).

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Kuiper, M. (2009) Documentation of procedures and model components. SEAMLESS D3.8.7 (www.seamless-ip.org). Note: technical description of model changes to include AEZs

Nowicki, P., V. Goba, A. Knierim, H. van Meijl, M. Banse, B. Delbaere, J. Helming, P. Hunke, K. Jansson, T. Jansson, L. Jones-Walters, V. Mikos, C. Sattler, N. Schlaefke, I. Terluin and D. Verhoog (2009) Scenar 2020-II – Update of Analysis of Prospects in the Scenar 2020 Study – Contract No. 30–CE-0200286/00-21. European Commission, Directorate-General Agriculture and Rural Development, Brussels.

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Prins, A.G., B. Eickhout, M. Banse, H. van Meijl, W. Rienks and G. Woltjer. Global impacts of European agricultural and biofuel policies, Ecology and Society (forthcoming).

van Meijl, Hans, Torbjörn Jansson, Martin Banse and Geert Woltjer (2009). The impact of modulation; modeling first and second pillar CAP policies. GTAP 2009 Conference Paper, Global Trade Analysis Project, Purdue University, West Lafayette, IN.

Tabeau, Andrzej, Martin Banse, Hans van Meijl and Geert Woltjer, Impact of the EU Biofuels Directive on the EU food supply chain, Journal of Food Products Marketing (forthcoming).

Woltjer, Geert (2009), "Economic Development and Biodiversity: the environmental Kuznets curve in a policy assessment tool" , in: F. Brouwer and C.M. van der Heide (ed.), Multifunctional rural land management: economics and policies, Earthscan, London, pp. 125-142.