Three years of collaboration in TradeM - Agricultural markets and prices

Floor Brouwer, Franz Sinabell, with contributions from the workpackage leaders: Waldemar Bojar, Øyvind Hoveid, Gabriele Dono and Katharina Helming
Work done and achievements

• ~ 50 researchers involved, mostly economists
• 2 scientific events per year
• Regional pilots through integrated assessments (South, Centre, East, North)
• Partners contributed to international model comparison (IIASA, PIK, Wageningen UR)
• special issue, papers, stakeholder events, network with new projects, improved models, …
Population growth to continue

- Total population (billions)
- Annual increments (millions)

- High variant
- Low variant

Population growth to continue
Urbanization to accelerate
Can we model long run trends?  
Can we model short run departures from long run trends?

**Real agricultural prices have fallen since 1900, even as world population growth accelerated**

Agricultural price index, 1977-79=100  
World population, billions

Source: USDA, Economic Research Service using Fuglie, Wang, and Bell (2012). Depicted in the chart is the Grilli-Yang agricultural price index adjusted for inflation by the U.S. Gross Domestic Product implicit price index. The Grilli-Yang price index is a composite of 18 crop and livestock prices, each weighted by its share of global agricultural trade (Plaffenzeller et al., 2007). World population estimates are from the United Nations.

Source: IPCC AR-5, WGII, Ch 7.
Global Ag-Food System Projections - *Projected prices in 2050 without climate change*

Still large differences in long-term price projections for agricultural aggregate, though sharp narrowing after comparison exercise.

Price index (2005** = 1)

<table>
<thead>
<tr>
<th>Model</th>
<th>2030 orig.*</th>
<th>2050 orig.*</th>
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<tbody>
<tr>
<td>AIM</td>
<td>1.1</td>
<td>1.2</td>
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<td>ENVISAGE</td>
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<td>EPPA</td>
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* original: relative to model-standard numéraire; rebased: relative to the price index for global GDP

** trended 2005, i.e. hypothetical in the absence of short-term shocks

Further reading


- Robinson, van Meijl, Willenbockel et al., “Comparing supply-side specifications in models of global agriculture and the food system”
- Valin, Sands, van der Mensbrugghe et al., “The future of food demand: understanding differences in global economic models”
- Schmitz, van Meijl et al., “Land-use change trajectories up to 2050: insights from a global agro-economic model comparison”
- Müller and Robertson, “Projecting future crop productivity for global economic modeling”
- Nelson, van der Mensbrugghe et al., “Agriculture and climate change in global scenarios: why don’t the models agree”
- Lotze-Campen, von Lampe, Kyle et al., “Impacts of increased bioenergy demand on global food markets: an AgMIP economic model intercomparison”


- Nelson et al., “Climate change effects on agriculture: Economic responses to biophysical shocks”
Agriculture: global exports

Source: COMEXT, GTA

<table>
<thead>
<tr>
<th>Country</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>EU28</td>
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<tr>
<td>Argentina</td>
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<td>32</td>
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Agriculture in EU: trade

EU agr. output 2014: 380 bn €

- Beef: 8.5%
- Pork: 9.4%
- Equids: 0.3%
- Sheep/goats: 1.4%
- Poultry: 5.7%
- Other meat: 0.7%
- Milk: 16.3%
- Eggs: 2.3%
- Other livestock: 0.7%
- Non-livestock: 54.7%

Source: EUROSTAT – Economic Accounts of Agriculture; output of agricultural products
Economic and agronomic models

• Agronomic models of soils, crops and livestock mirror physical and biological processes, and farm management is given. Economic models are concerned with initiation and management of these processes.

• Integration of agronomic and economic models are possible and fruitful, have been improved and will be improved further.

• In general, economic responses tend to level down and smooth out the impacts from the agronomic models.
Economist's wish-list for agronomic models

• Models that perform well in statistical tests with regard to experiments
• Models with relatively large time scale
• Models for main processes with a continuous scope of varieties and breeds
• Models that allow management to be varied.
Northern Savo, Finland

- Increasing grass growth benefits dairy and beef
- Inter-annual volatility of grass yield increases. Managing grassland yield variation at the farm level - cost of drought risk may increase
- Positive market development and more flexible and encouraging policies needed for adaptation
Farmers may benefit from climate change in several regions of Austria; effects seem to be mixed for farmers specialised in crop production. Climate change induced intensification of land and benefits result from participation in agri-environmental programs.

Benefits of climate change (through productivity gains) will increase opportunity costs for participation in AEP. Payments may have to increase for such farmers.
Sardinia, Italy

- Yields of forage crops are reduced from climate change, causing income drops for livestock farming. Rainfed hill sheep farming is under threat of abandonment.
- Irrigation costs increase in regions with collective water networks and volumetric water pricing.
- Higher temperatures during autumn and winter will provide income opportunities, but farmers need to understand the crop yield changes.
Brandenburg, Germany

- Climate change may aggravate water stress for plant growth
- Rising prices for agricultural commodities can make irrigation profitable
- Irrigation may reduce seasonal variations of crop yield and may increase crop yields by up to 40% for maize and up to 20% for wheat and sugar beet
Training on Integrated Impact Assessment

- Topics: Policy Impact Assessment, identification of policy instruments, goals and scope, Methods and tools for participatory approach, user interaction
Training on Integrated Impact Assessment

• Training for Master & PhD Students conducted at University of Haifa, March 2014: „Sustainability assessment of land use scenarios: what needs to be considered and how can it be done?” A Practical Policy Example Biosphere Reserve Ramat Menashe
Concluding remarks

- Some farmers may claim that climate change adaptation is easy compared to the difficulties caused by policies.
- Action based on weather observations only, is insufficient for farmers to respond to climate change. Researchers need support from farmers in understanding the responses in practice.
- Policies might be too slow to respond to needs for change in agriculture.
Concluding remarks

- Winners and losers seem to be observed everywhere. The impacts of climate change is heterogeneous among farm types and regions.
- Effects beyond 2050 remain largely unclear, mainly because the effects of extreme events are not considered.
- Variability of yields is important to farm incomes, but most studies only consider average changes.
- Farmers are ready to design their site-specific adaptation response providing that new knowledge and learning spaces are available. A learning process based on integrated models, assessment of short- and long-term effects, is needed for farmers to adapt to climate change, price fluctuations and policy change.