Assessing the world-wide effects of a shift towards vegetable proteins: a General Equilibrium Model of Agricultural Trade (GEMAT) and the Global Trade Analysis Project (GTAP)

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Introduction

- PROFETAS project
- Characteristics of the problem
- GEMAT: focus and description
- Some simulation results for GEMAT
- GTAP: focus and adjustments
- Some simulation results for GTAP
- Conclusion
PROFETAS

- Meat demand will rise sharply in near future
- Feed demand will rise even more
- Price rises in meat will not be able to counter the increase in demand
- Therefore: lasting change in preferences is needed
- Start with transition in EU
- Therefore, PROtein Foods, Environment, Technology, And Society (PROFETAS) project
Characteristics of agricultural production

- land has to be made suitable for crop production
- maximum yield per ha; not possible to ‘feed the world out of a flowerpot’, by increasing the use of other inputs
- Because of dietary requirements of animals, substitution between feed inputs is limited
- the production of by-products is technically unavoidable
- The processing of crops and meat for human consumption leads to the production of byproducts that are not suited for human consumption
Characteristics of food consumption

- For meat demand, three regimes can be distinguished:
  - low incomes: low committed level, low elasticity
  - medium incomes: low committed level, high elasticity
  - high incomes: high committed level, low elasticity
- Demand for novel protein food is low in high-income countries
External environment

- Reform of the EU common agricultural policy
- Eastern enlargement of the EU
- Reform of WTO
GEMAT: focus and description

- **Focus:** production and consumption characteristics
- **Description of major deviations from standard modeling**
  - Investments in land are needed before crop production can start
  - Feed module is included to ensure dietary requirements of animals are met
  - Production of by-products is taken into account
  - Lifestyles are endogenous and react to changes in the distribution of income associated with increases in average per capita income
GEMAT model exercises

- BAU Business as Usual (reference)
- SHIFT (only shift in preference from meat to NPF)
- GREEN (SHIFT and increased preference for nice landscape)
- DIET (GREEN and respect for animal diets)
- LIFESTYLE (DIET and endogenous lifestyle shifts)
Some results: GDP per capita in 2020
Some results: pressure on cropland in 2020
Some results: growth rate meat demand

[Bar chart showing growth rate deviation from BAU across different income levels (Lowinc, Midinc, Highinc) and EU, with categories shift, green, diet, life.]
Conclusions for GEMAT

- Adding diet constraints heavily influences results
- Allowing for endogenous lifestyles also has a substantial impact
- Results should be interpreted cautiously because of institutional weakness and empirical shortcomings
GTAP: focus and adjustments

- **Introduction of new product**
  - Split in GTAP product VOL (vegetable oils and fats) using DAGG software

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VOL
  99.9 : 0.01
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- Introduction of necessary elasticities (based on theoretical assumptions)
- Introduction of possible political measures (no political instruments in the baseline scenario)
GTAP scenario description

- **AG**: Agenda 2000 reform package of the EU
- **2006**: macroeconomic projections for 2002-2006
- **ENLG**: Eastern enlargement of the EU:
  - adoption of all border and domestic instruments incl. direct payments
- **2010**: macroeconomic projections for 2007-2010
- **CAP**: possible Common Agricultural Policy reform:
  - reduction in direct payments by 30% and abolition of quotas
- **WTO**: possible next WTO round:
  - a reduction of all border instruments worldwide by 20%
- **2020**: macroeconomic projections for 2011-2020
Some results: changes in GDP
Some results: Changes in NPF (in %) under macro-economic projections

Production

Consumption
Some results: Changes in NPF (in %) due to political developments:

Production

Consumption
Conclusions for GTAP

- Macroeconomic projections have a strong impact on results
- Expected policy developments relevant for the agricultural sector have minor impacts on results for NPFs
- Next steps:
  Improved simulation of diffusion process of NPFs
  Introduction of NPF specific policy measures
Overall conclusions

- **Methodological**
  - “One size fits all” not capable of covering all aspects of a complex problem
  - Effects of alternative assumptions on model structure can be very large

- **Policy conclusions**
  - Policy measures seem to matter much less than macro-economic trends.