Impact of Climate Change Mitigation Policies on Food Consumption Patterns

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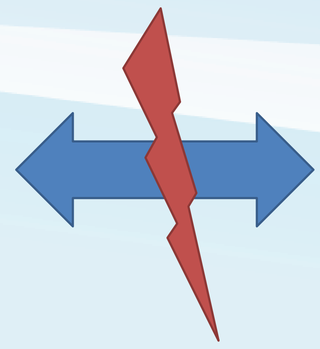
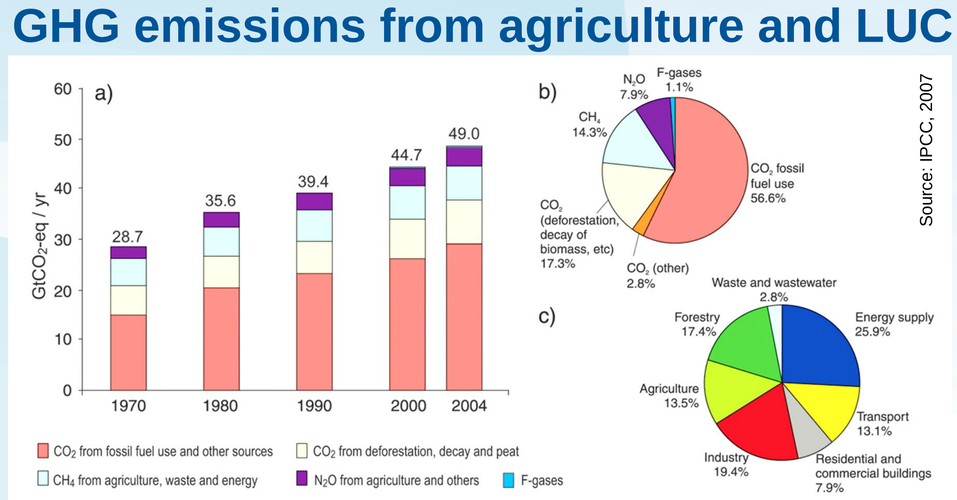
CONTEXT

More food to feed future population conflicts with GHG emissions from agriculture and LUC

- **Population**: from 6.1 in 2000 to 8.4 billion in 2030
- +50% of average increase in agricultural production towards 2030 with **strong shift in consumption patterns** (Alexandratos, 2006)
  - +27% meat per capita, +17% milk and dairy per capita
- Expected land use expansion effect
  - +6 to 30% expansion up to 2050 (depends on demand and technology) (Smith et al., 2010)





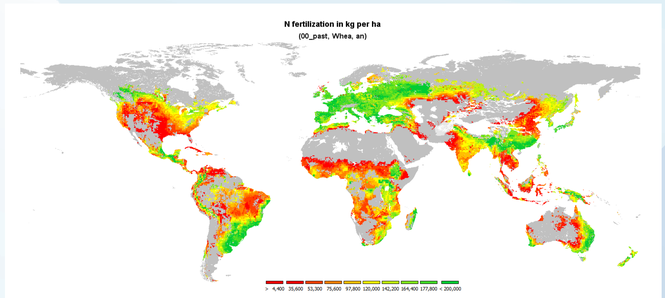
Mitigation in agriculture: Opportunity or false solution ?

- For 20 USD / t:
  - -30% in agricultural activities (Smith et al., 2008)
  - -50% in forest anthropogenic emissions (Kindermann et al., 2008)

How can mitigation objectives conflict with food security considerations?

The supply side of GLOBIOM… INTEGRATED …with a flexible food demand system

Bottom-up grid-based land use optimization model

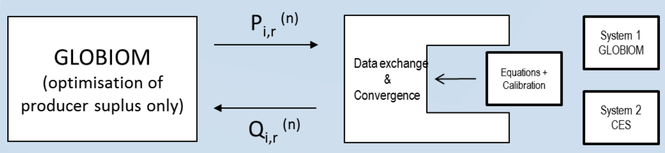


AGRICULTURE | **FORESTRY** | **BIOENERGY**

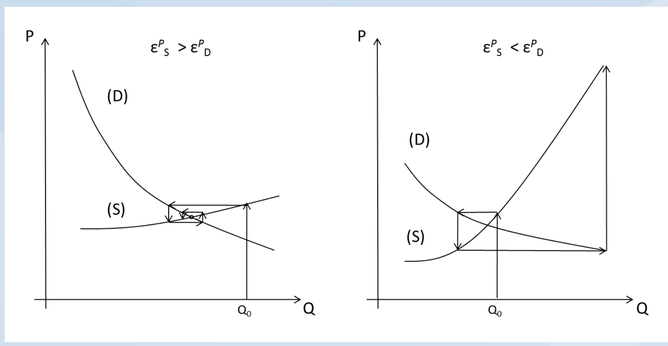



Wheat Rice Maize Soybean Barley Sorghum Millet Cotton Dry beans Rapeseed Groundnut Sugarcane Potatoes Cassava Sunflower Chickpeas Oil Palm Sweet potatoes	Buffalo Cattle Sheep Goat Pig Poultry ⇩ Beef Lamb Pork Poultry Eggs Milk	Biomass for log production Fuel wood Other wood ⇩ Pulp wood Logs	Ethanol FAME Methanol Heat Electricity Biogas

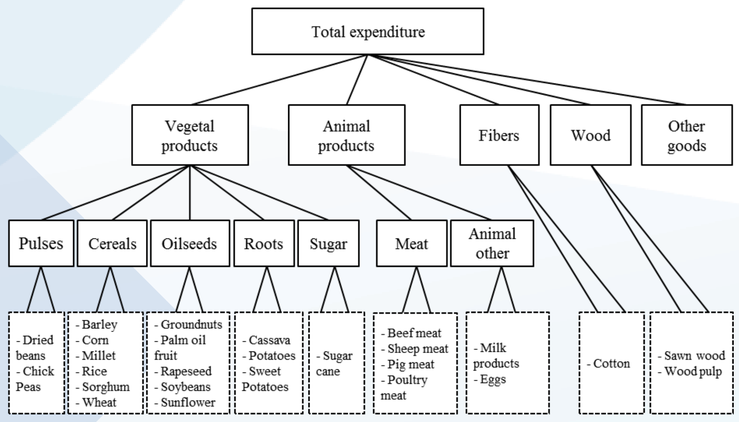
LINEAR PROGRAMMING



Iteration on price and quantities to reach equilibrium with specific treatment of unstable points



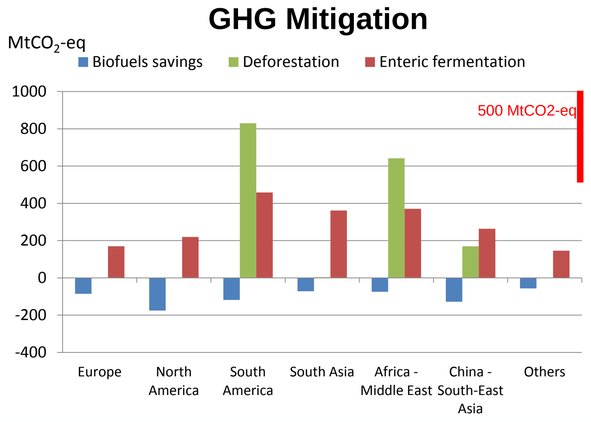
NON-LINEAR MODEL

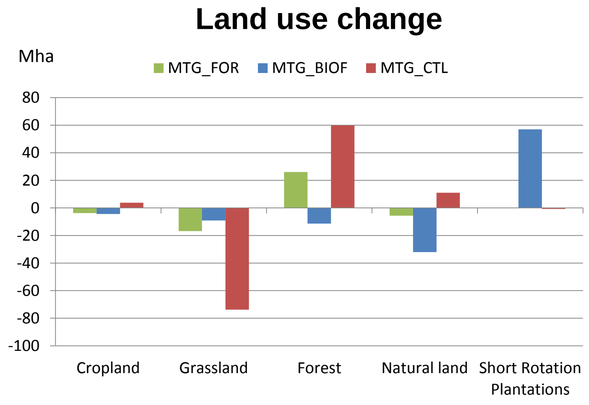


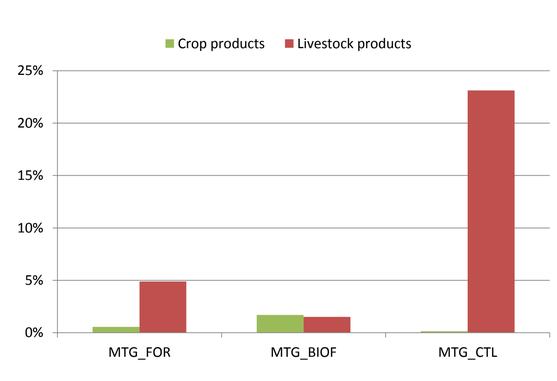
- **Nested LES-CES functions** (Brown and Heien, 1972)
- **Substitution effect** (own and cross price elasticities)
- **Non linear Engel curves** (income elasticities)

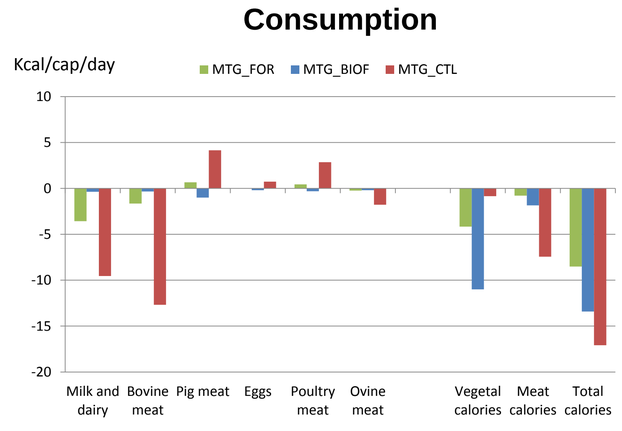
COMPARING EFFECTS OF THREE MITIGATION POLICIES

(1) Reduction of deforestation, (2) Bioenergy deployment, (3) Less methane emissions from livestock



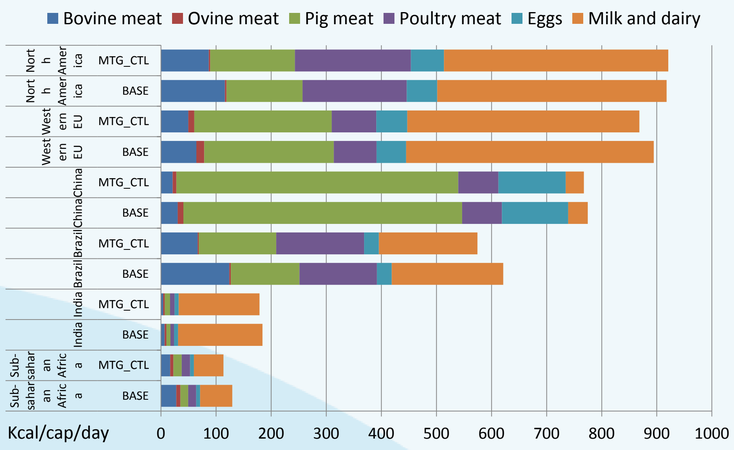






WHY DIETS ACROSS REGIONS MATTER?

Consumption per capita in the livestock mitigation scenario



CONCLUSIONS

- Linkage between systems allows to better understand the **impact of supply oriented policies** on demand with the benefit or a refined bottom-up description
- **The impact of mitigation policies reflect the hierarchy of mitigation costs**: preventing deforestation appears potentially better if not considering co-benefits of cattle intensification
- Impacts are very **differently distributed depending on the policies:** the most crop oriented could put at risk the poorest sensible to crop prices whereas meat based would impact more specific regions

REFERENCE

Valin, H., Havlík, Petr, Mosnier, A., Obersteiner, O. (2012) "Impacts of Alternative Climate Change Mitigation Policies on Food Consumption under various Diet Scenarios", Paper presented at the 14th GTAP Conference, 2012, Geneva.

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SEVENTH FRAMEWORK PROGRAMME