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# **Assessing low emissions agricultural pathways under alternative climate policy regimes**

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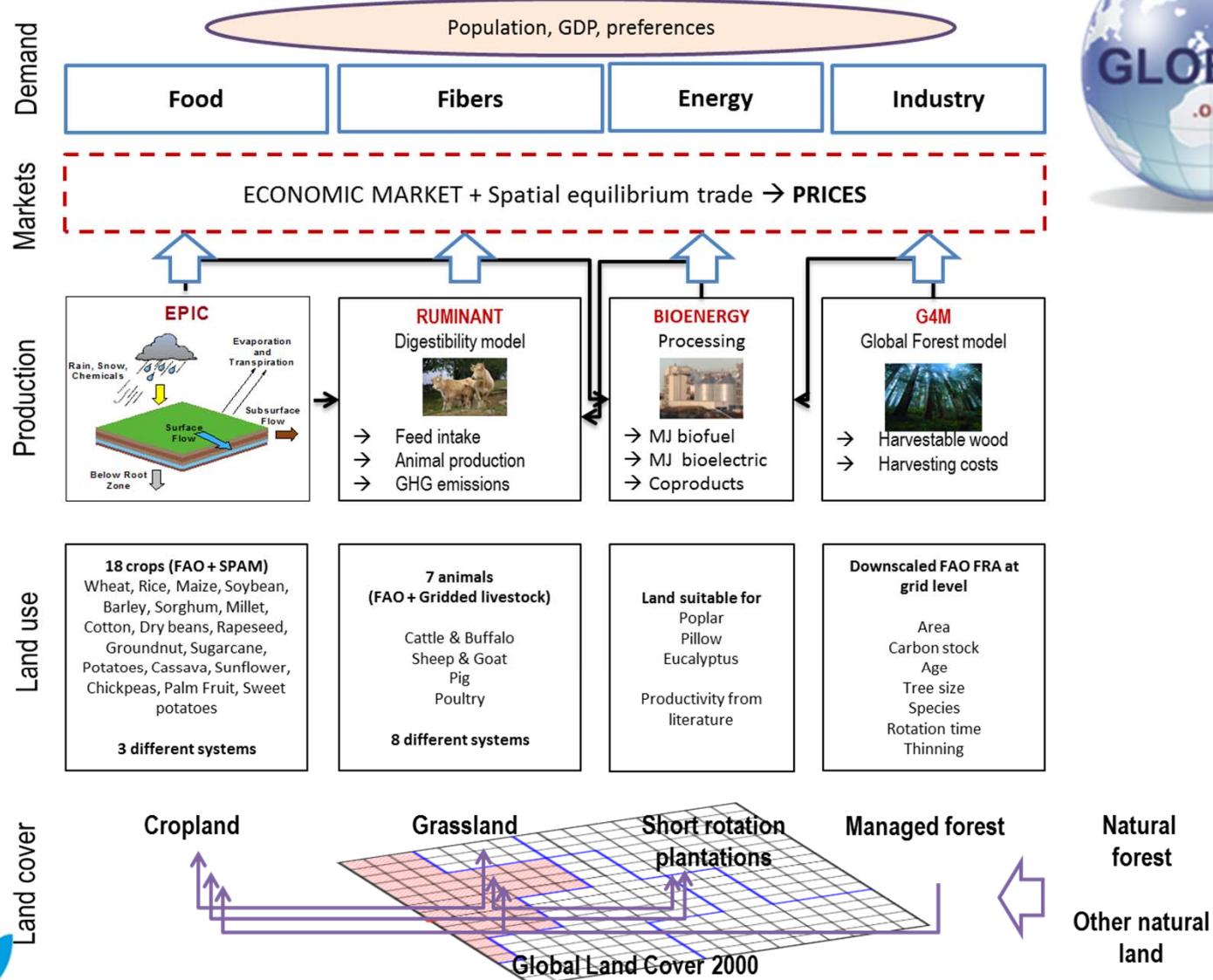
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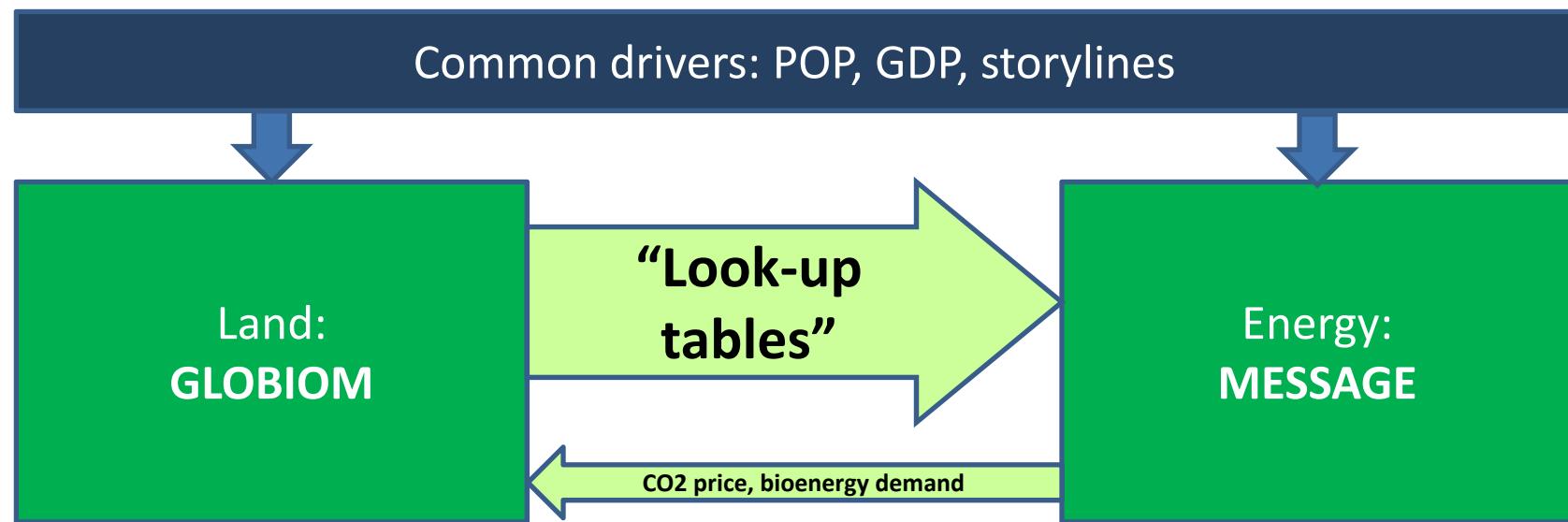
# Introduction

- ▶ **Agriculture is SMART only if it sees itself in the bigger picture across economic sectors and world regions**
- ▶ Agriculture is key in all land based mitigation wedges
  - ▶ Reduction of direct (non-CO<sub>2</sub>) emissions from agriculture
  - ▶ Land sparing for carbon sequestration (afforestation)
  - ▶ Land sparing for biomass production for energy
- ▶ Potential trade-offs between GHG emissions reduction and food availability
  - ▶ What role for sustainable intensification and international trade
- ▶ Smart mitigation policies for AFOLU
- ▶ What is the mitigation effort required from agriculture?

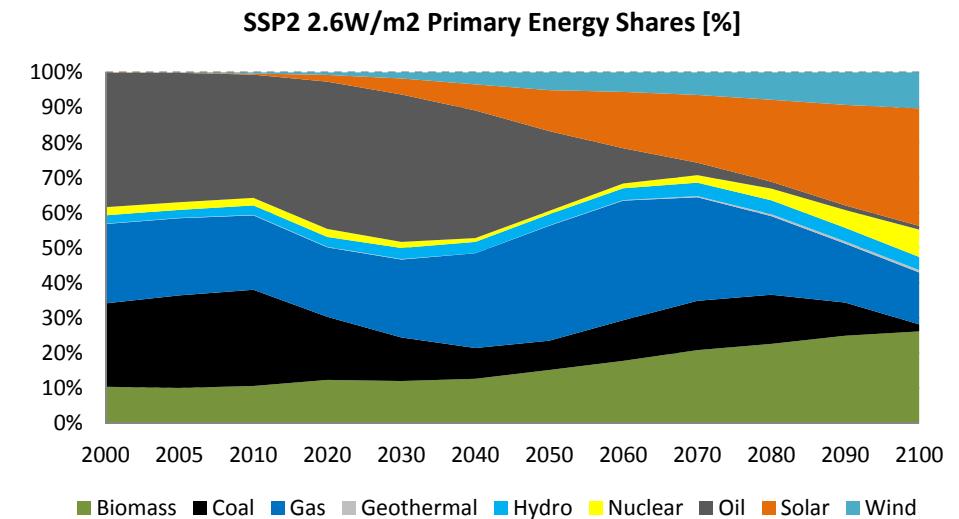
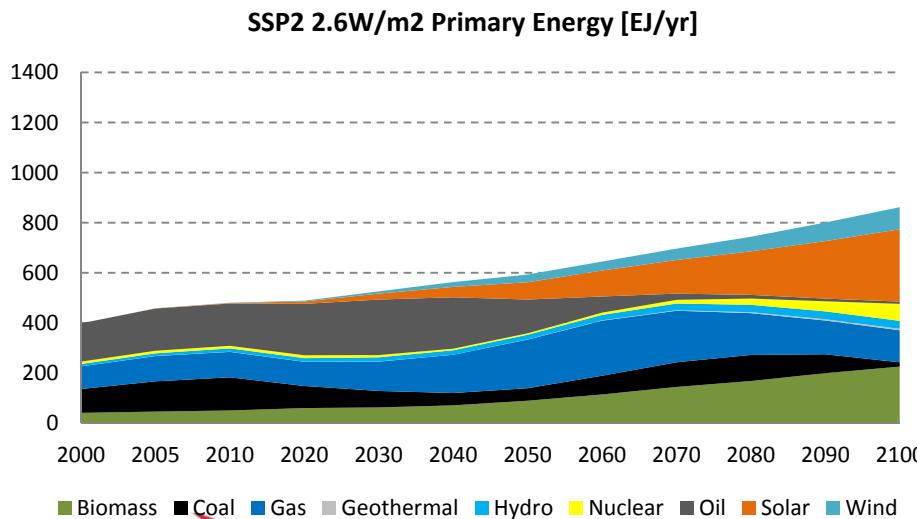
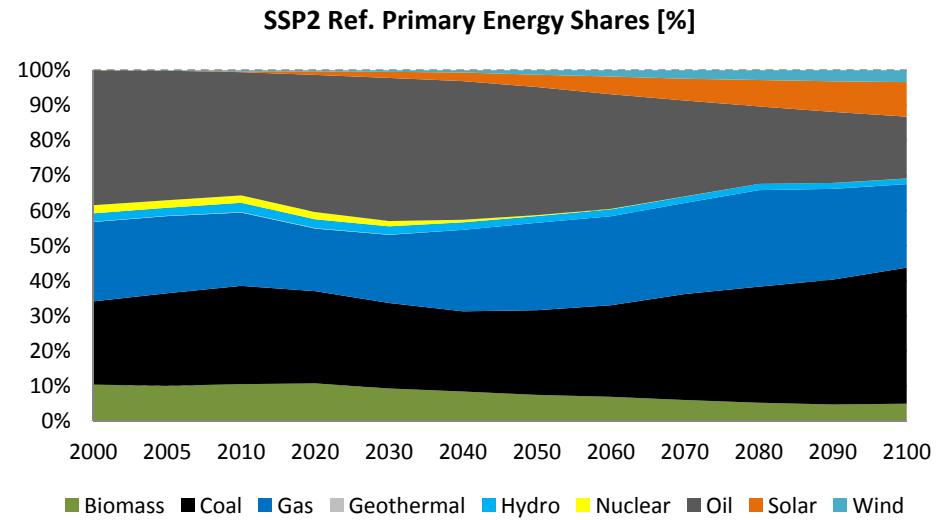
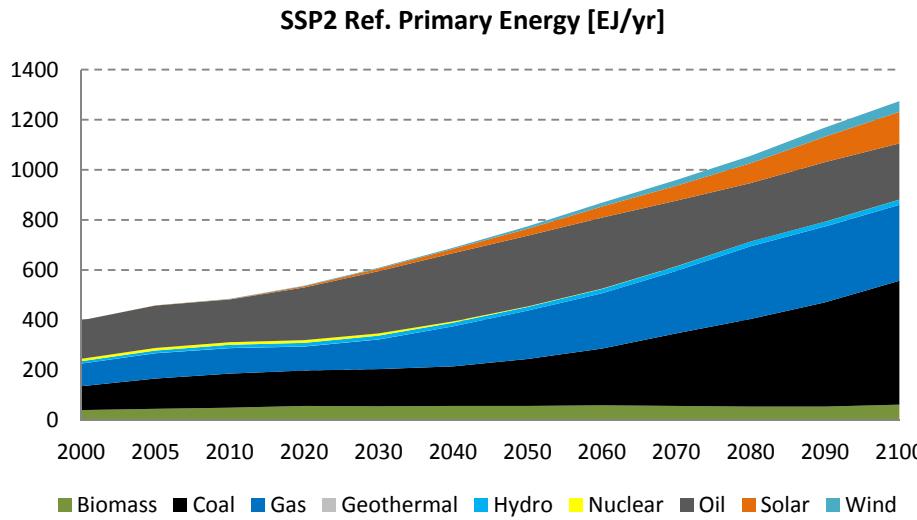
# Global ag. and forest sector model



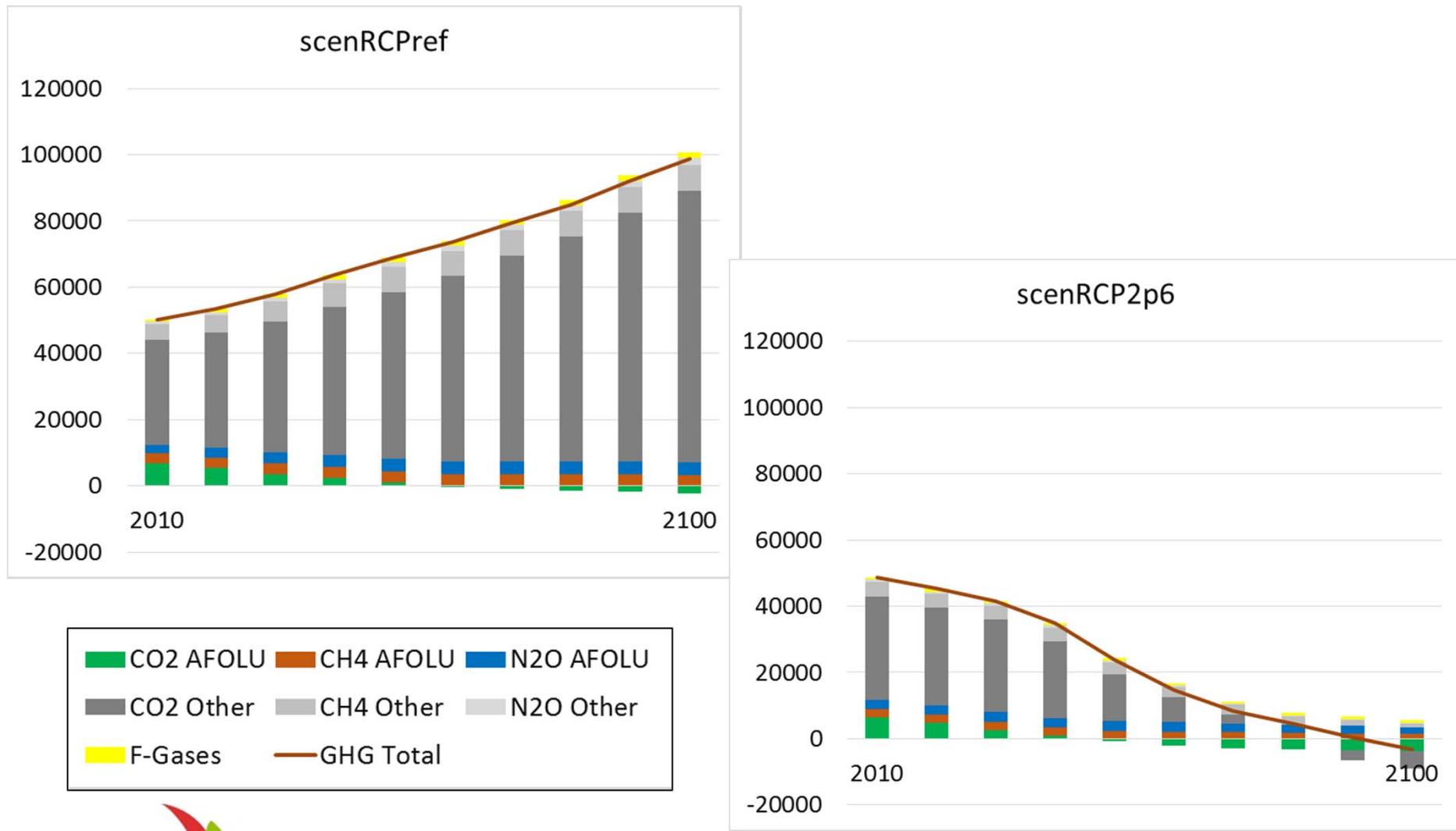
# Integrated assessment framework



# Biomass for bioenergy demand

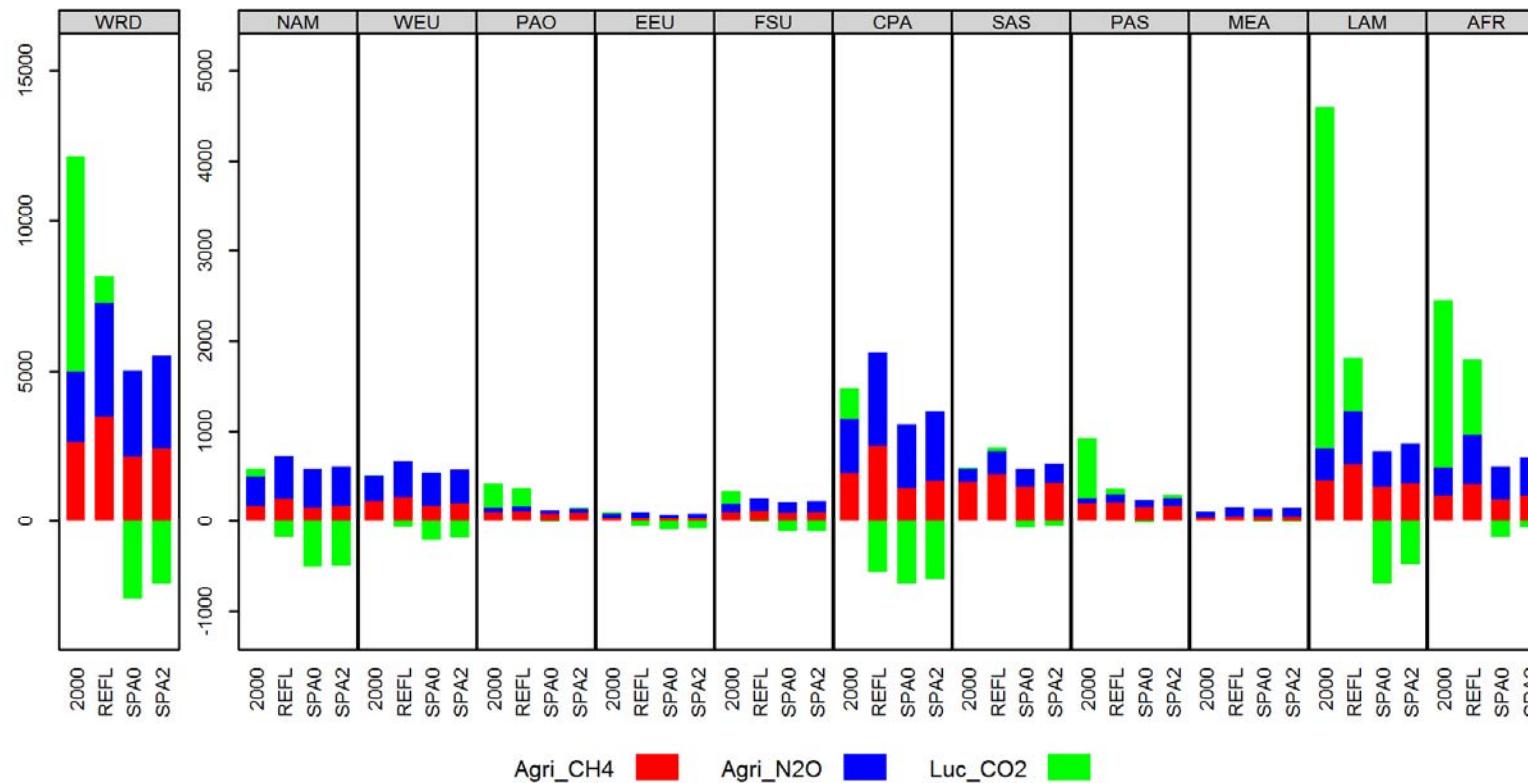


# GHG mitigation in whole economy



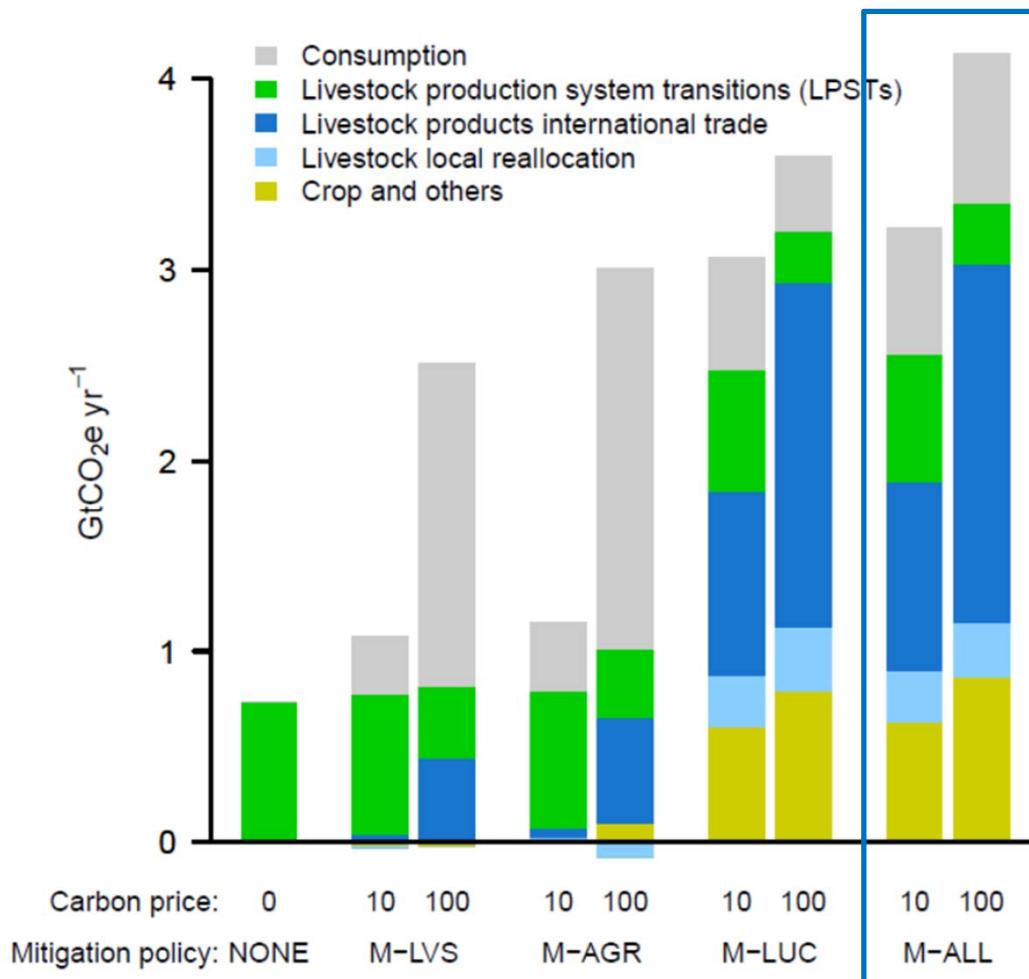
# Role of (A)FOLU key

AFOLU emissions [MtCO2eq]



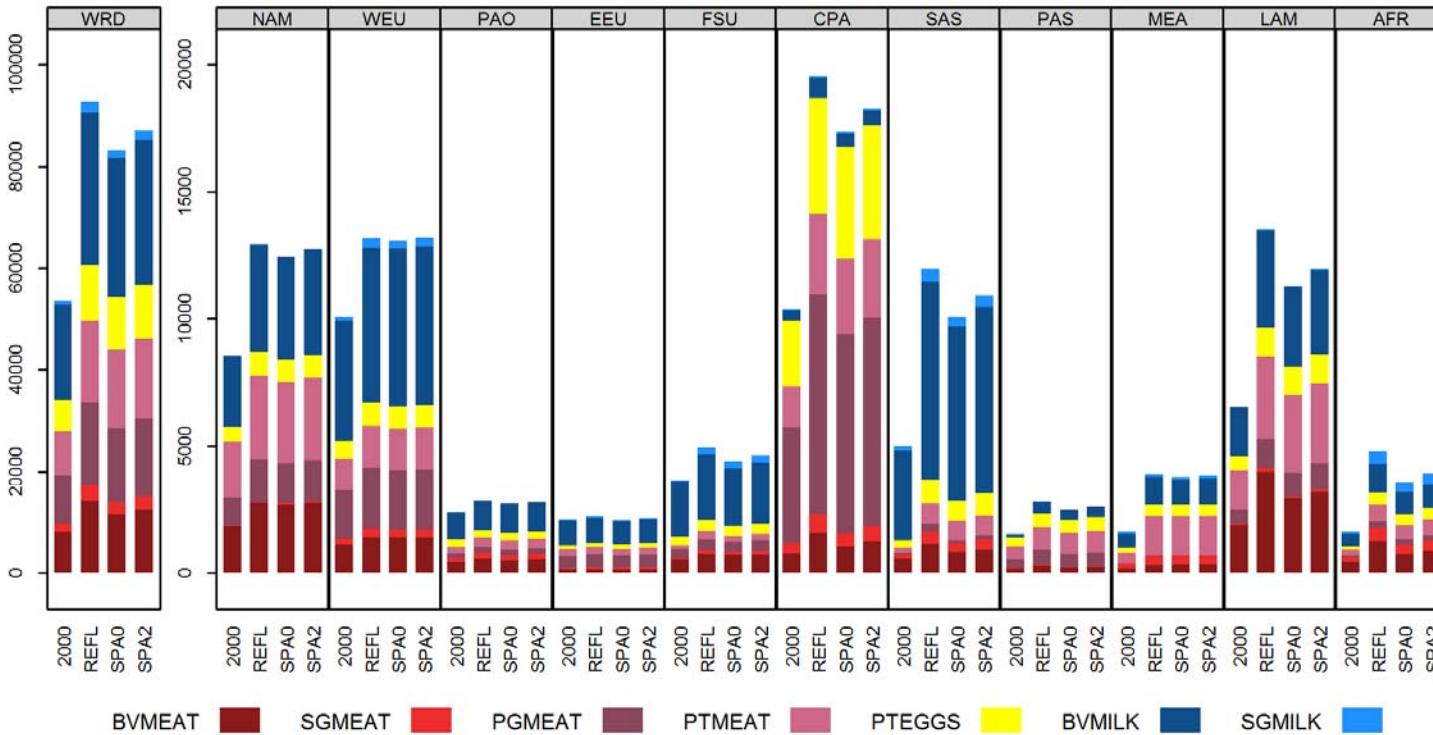
- AFOLU emissions globally to reduced by 50% to today
- 30% of reduction coming from LAM and 24% from AFR

# “Mitigation options” considered



# Efficient regional prod. structure

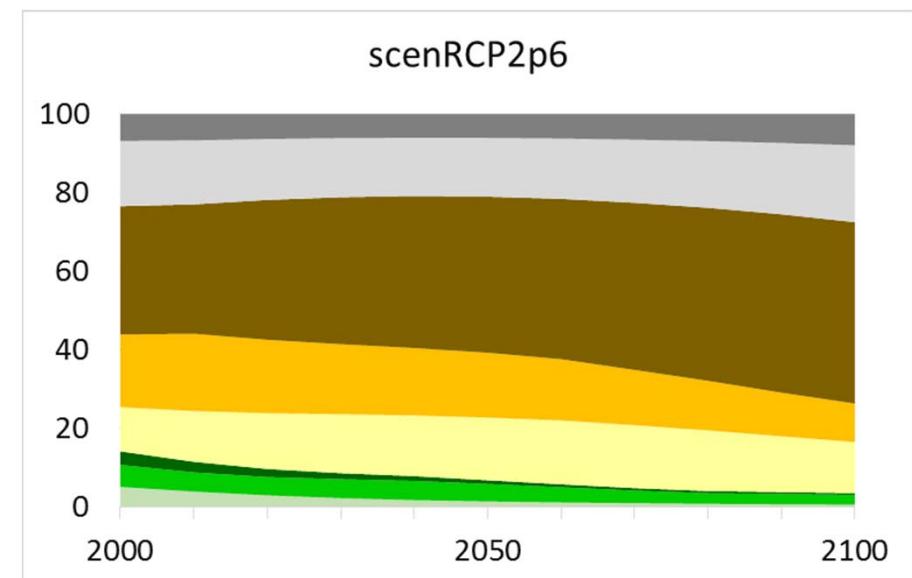
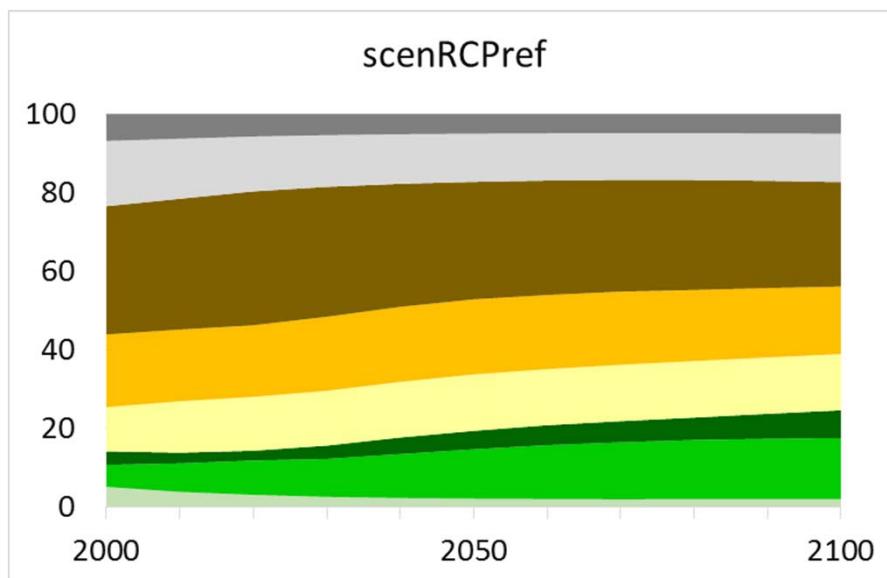
Livestock production [t protein]



- Livestock production to increase by 73% globally, 107% in LAM and 194% in AFR
- Bovine meat, small ruminant meat, and small ruminant milk production -20%
- Poultry production -6%
  - Increase in total production lower by 32% in LAM and 39% in AFR

# Efficient prod. systems structure

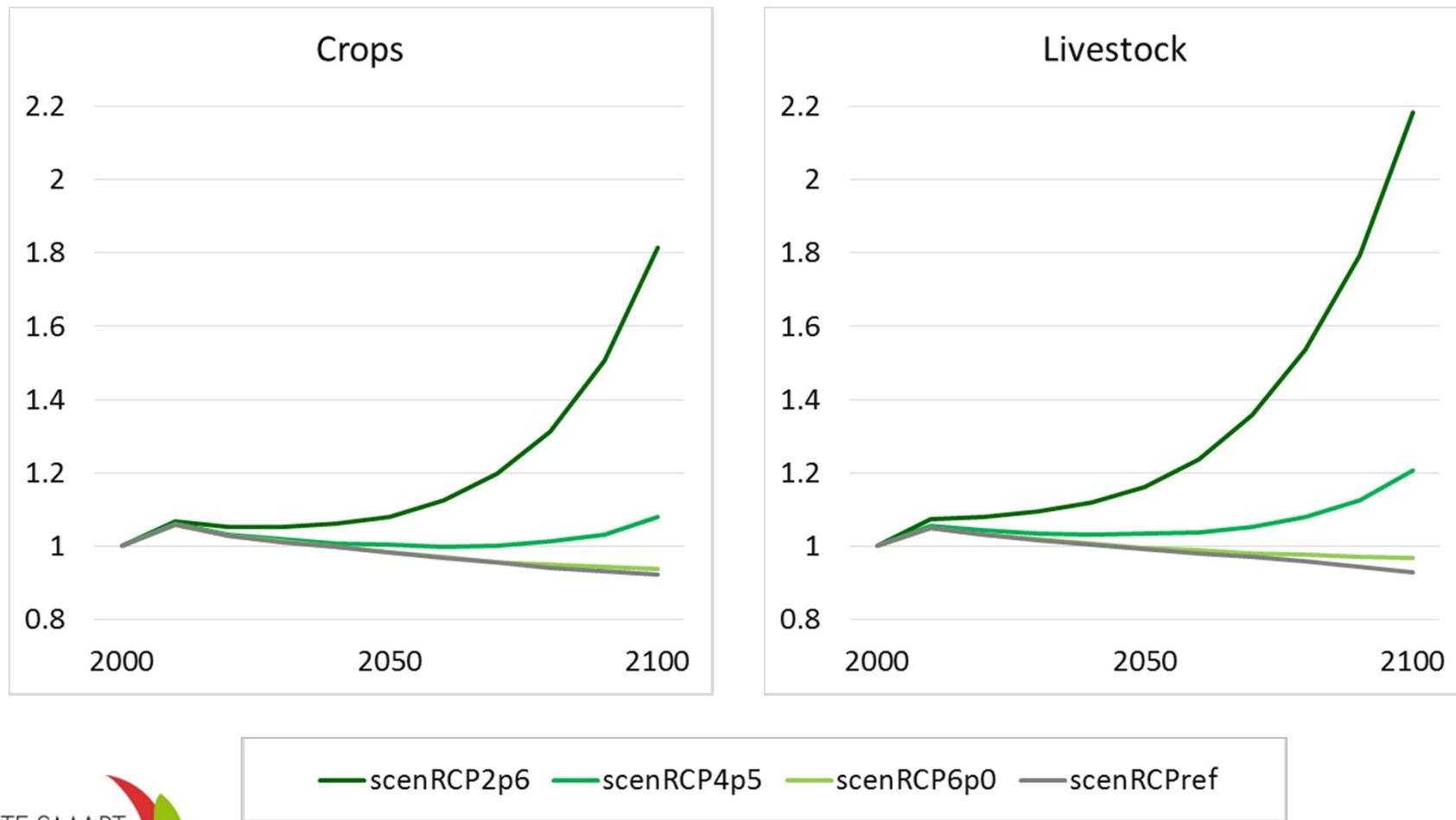
Beef production systems [%]



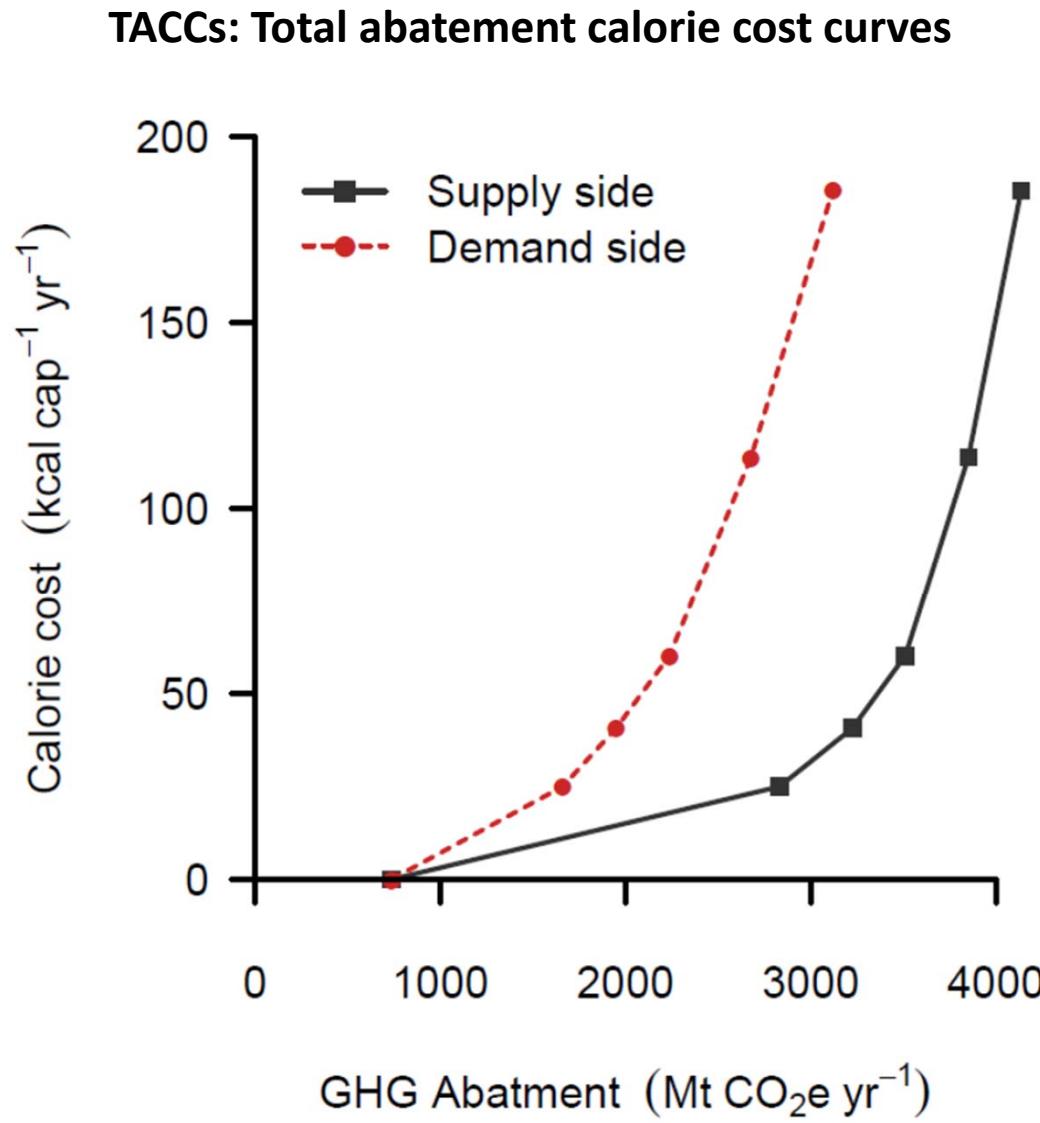
LGA    LGH    LGT    MRA    MRH    MRT    Other    URBAN

# GHG mitigation x Food availability

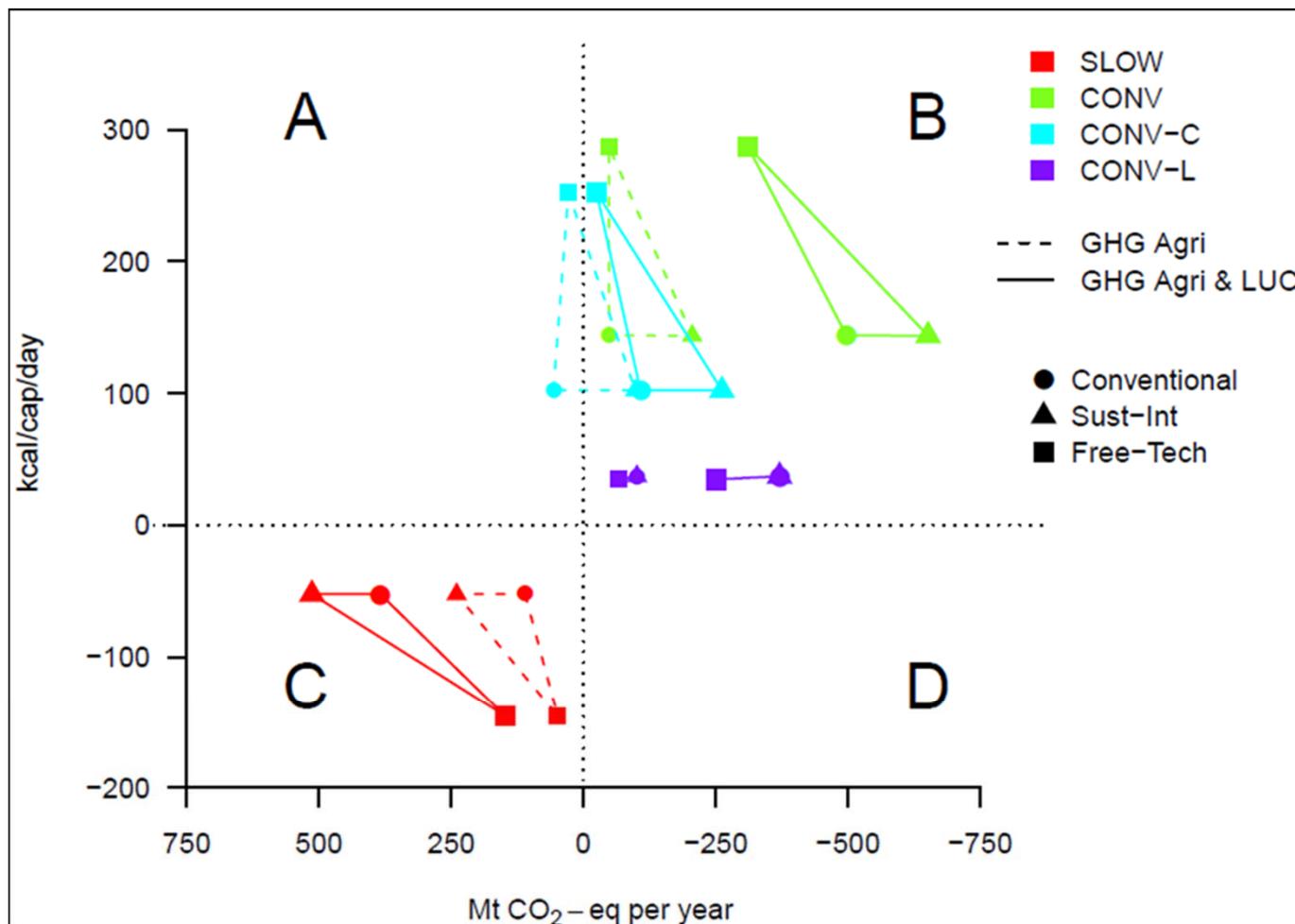
Commodity price index



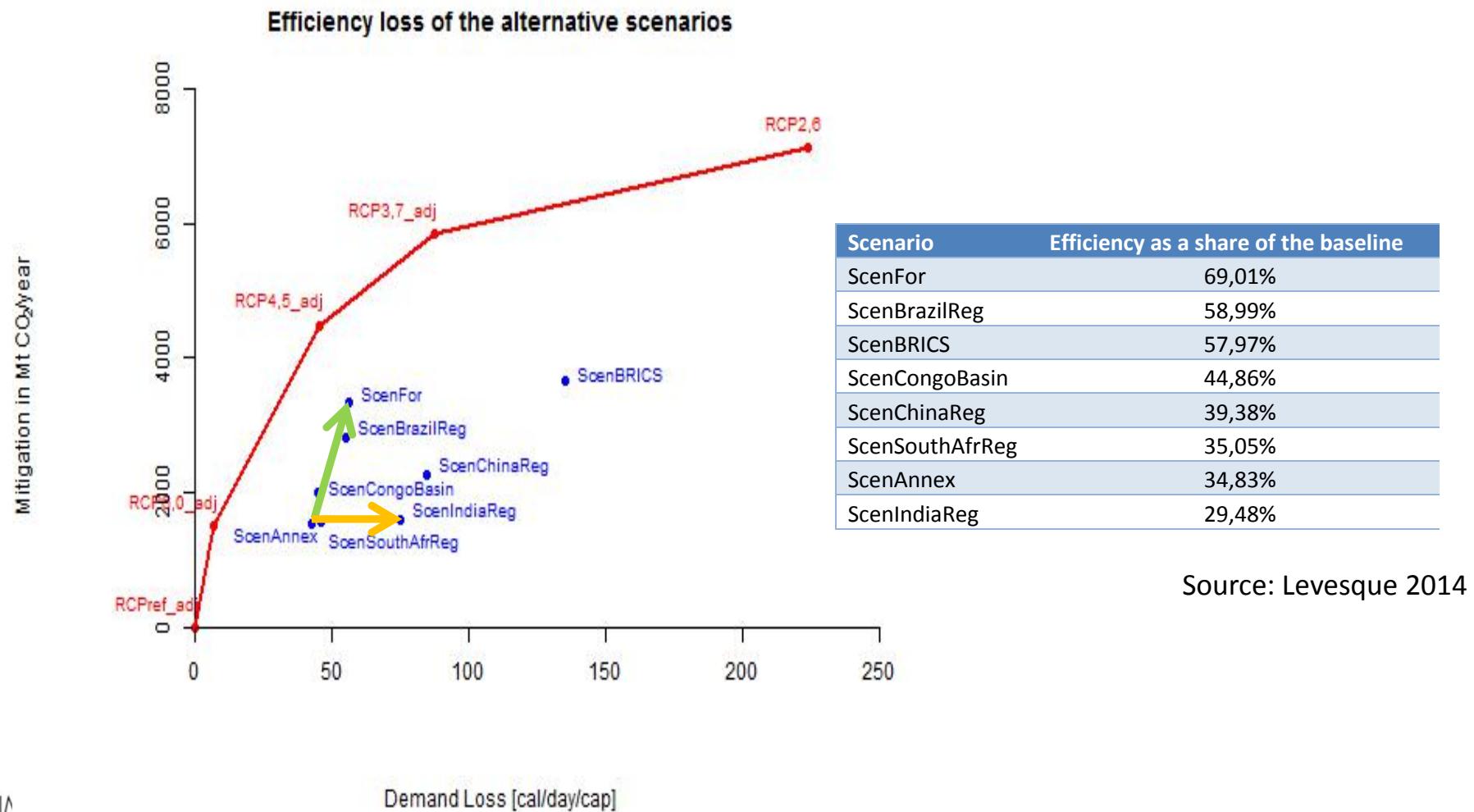
# GHG mitigation x Food availability



# Relaxing GHG x Food trade-off: Productivity growth



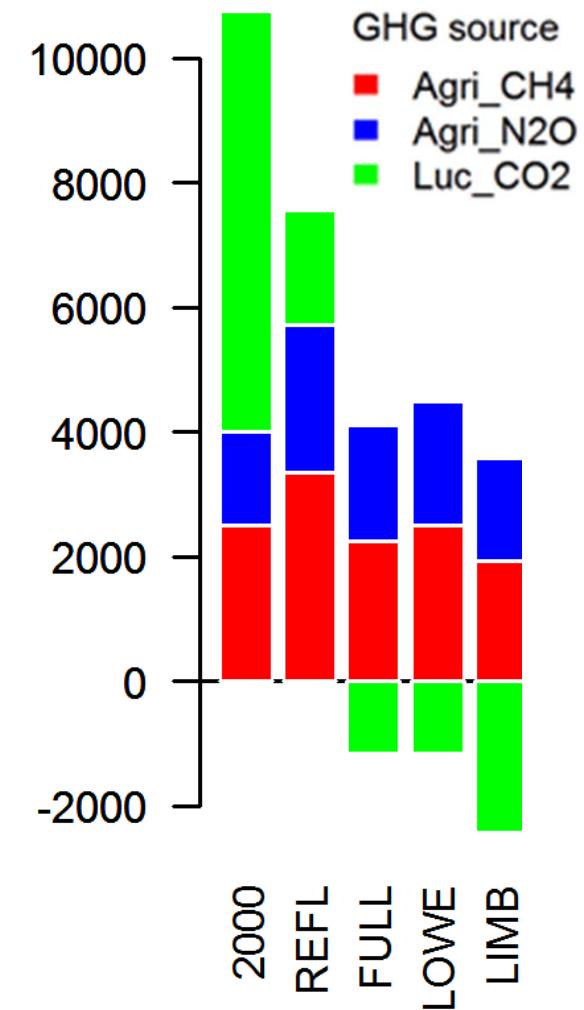
# Relaxing GHG x Food trade-off: Smart AFOLU policies



# Relaxing GHG x Food trade-off: Contribution from other sectors

- Alternative scenarios of technology developments in the other sectors  
(Kriegler et al. 2014, EMF 27)

FULL	All modeled technologies included, reference energy intensity improvements
LOWE	Low energy intensity: 20-30% lower in 2050 compared to the reference case
LIMB	Global primary bio-energy supply limited to 100 EJ/yr



# Conclusions

- Smart agriculture key for mitigation beyond the agricultural sector itself
- Efficient solutions have to look beyond field or animal
  - Adaptation in production systems structure
  - Re-location of agricultural production or production technologies?
- Potential trade-offs with food security
  - Smart effort sharing across regions and economic sectors



RESEARCH PROGRAM ON  
Climate Change,  
Agriculture and  
Food Security



Thank you!



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