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science for global insight

Regional Development *versus* Global Mitigation: Insights from GLOBIOM

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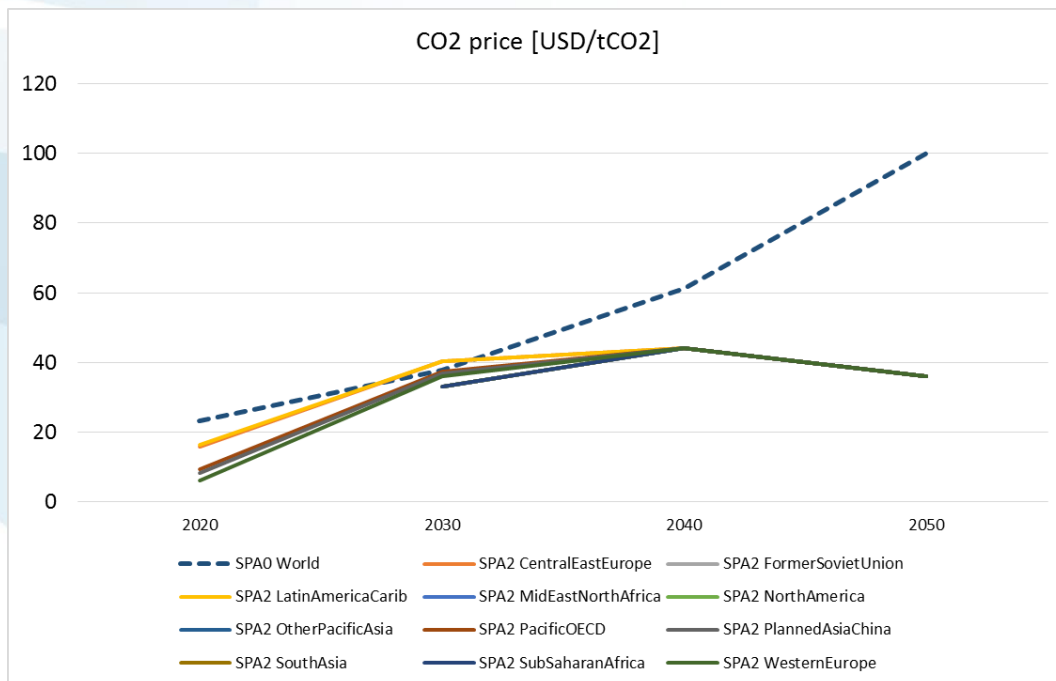
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Introduction

- ▶ Large demands for mitigation from the land use sectors
 - ▶ Direct non-CO₂ emissions reduction
 - ▶ Avoided CO₂ emissions and carbon sequestration
 - ▶ Biomass for energy
- ▶ Agriculture plays a key role in developing countries
 - ▶ Source of food in often food insecure regions
 - ▶ Source of economic growth
- ▶ Trade-offs need to be considered in mitigation policy design

Scenarios

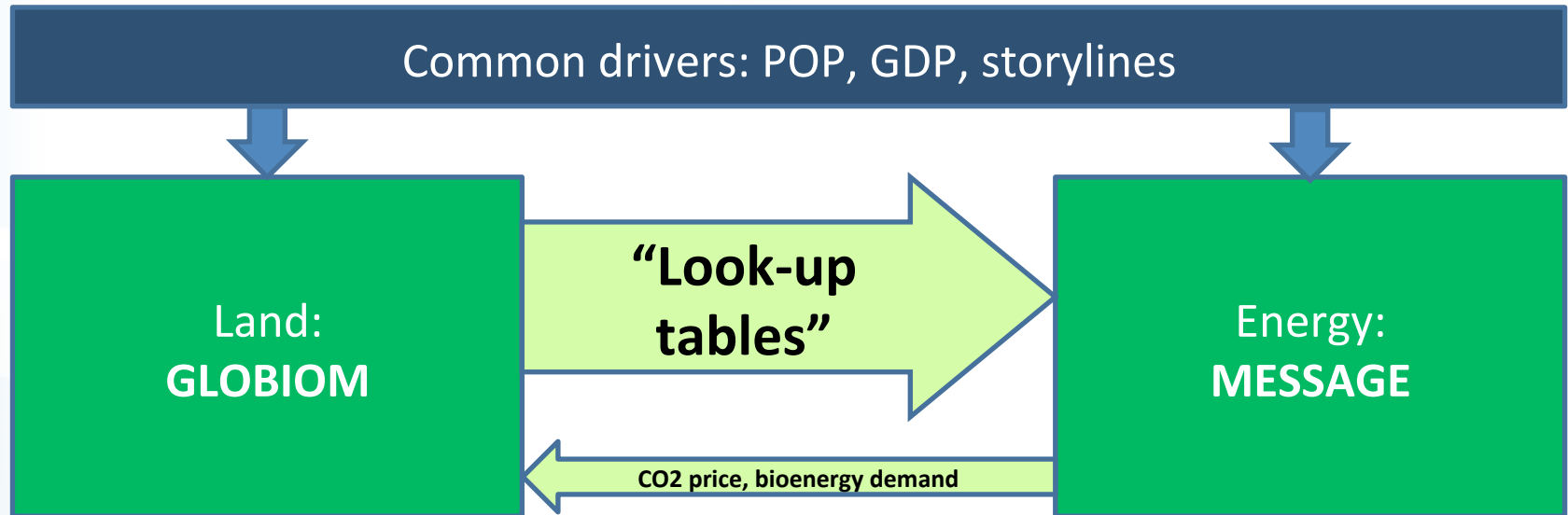
	SSP	RCP	SPA
REFL	SSP2	-	-
SPA0	SSP2	2p6	SPA0
SPA2	SSP2	2p6	SPA2



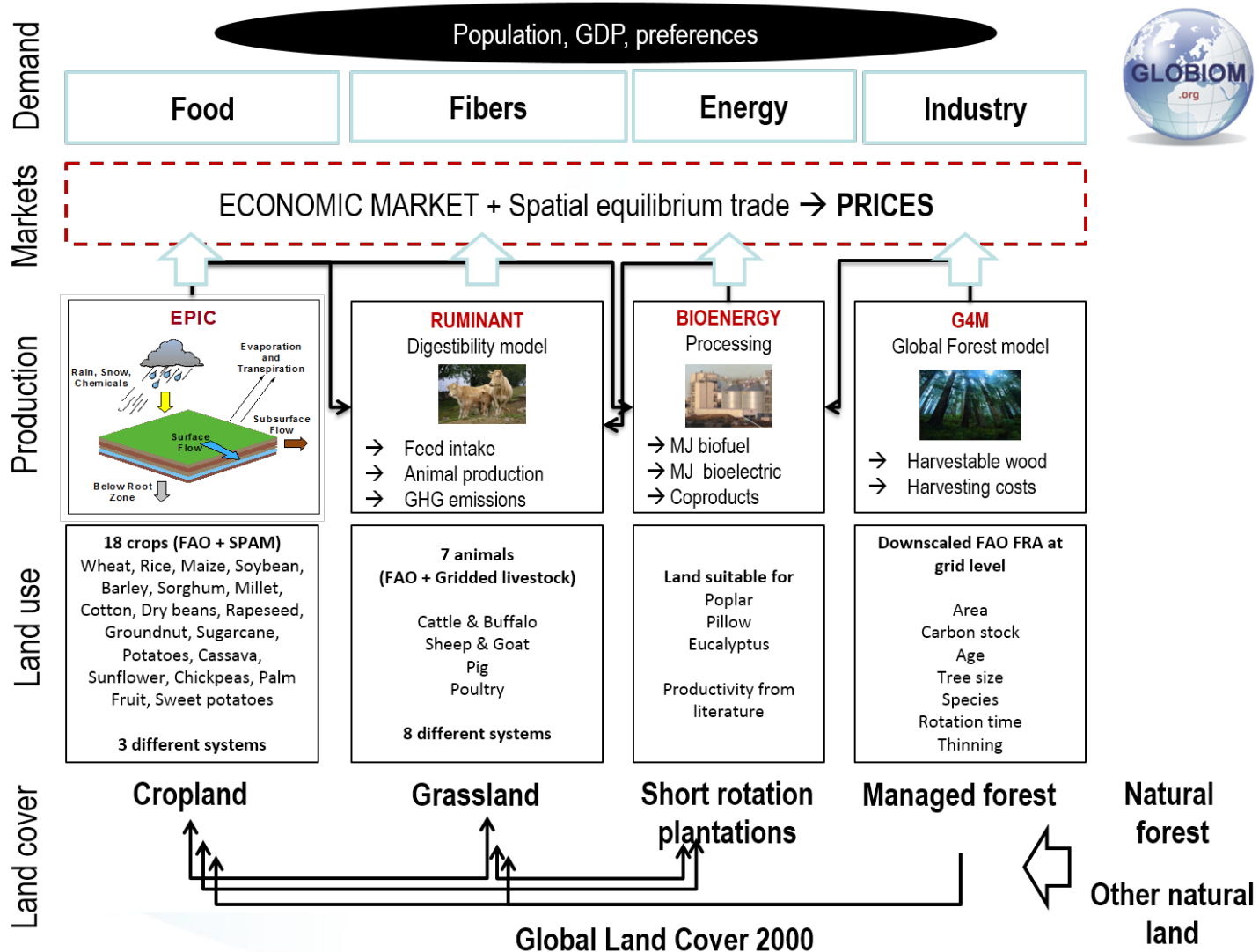
Preliminary results:

Focus on 2050

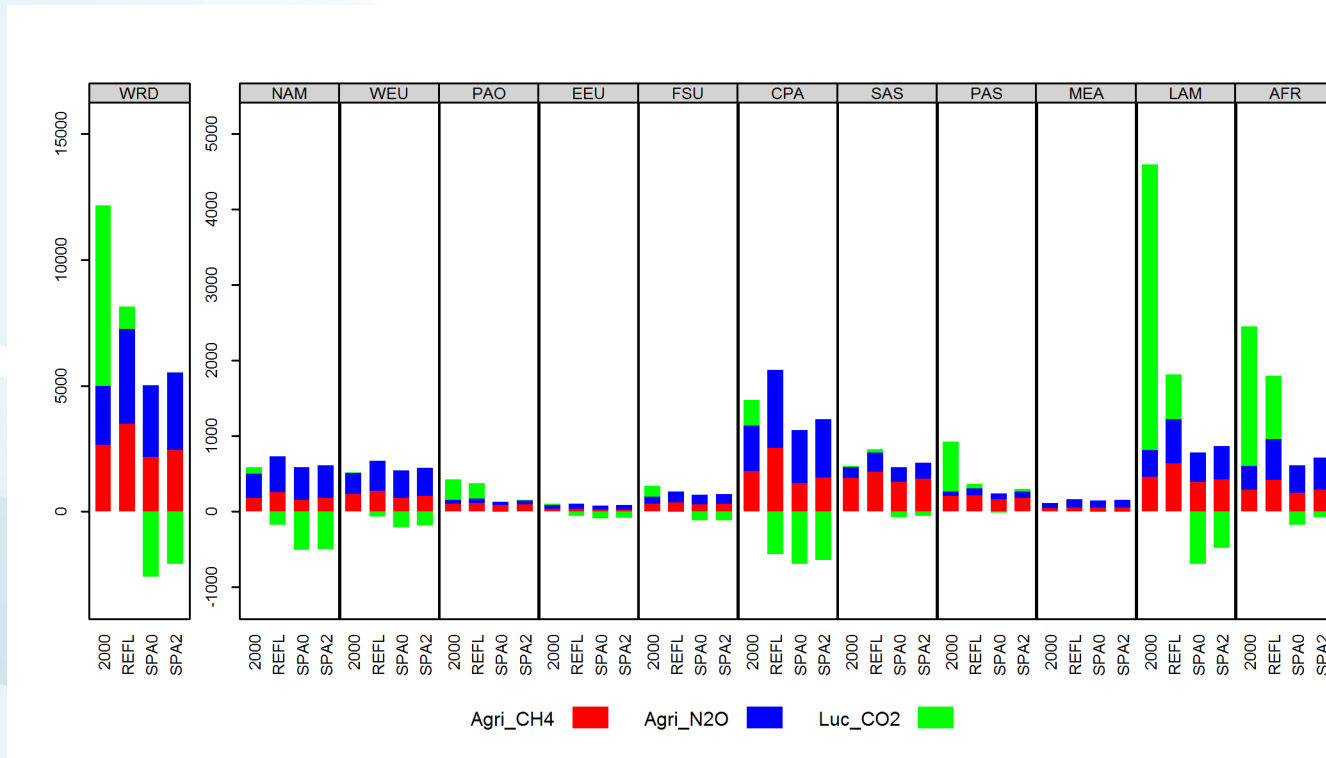
Modeling approach



GLOBIOM

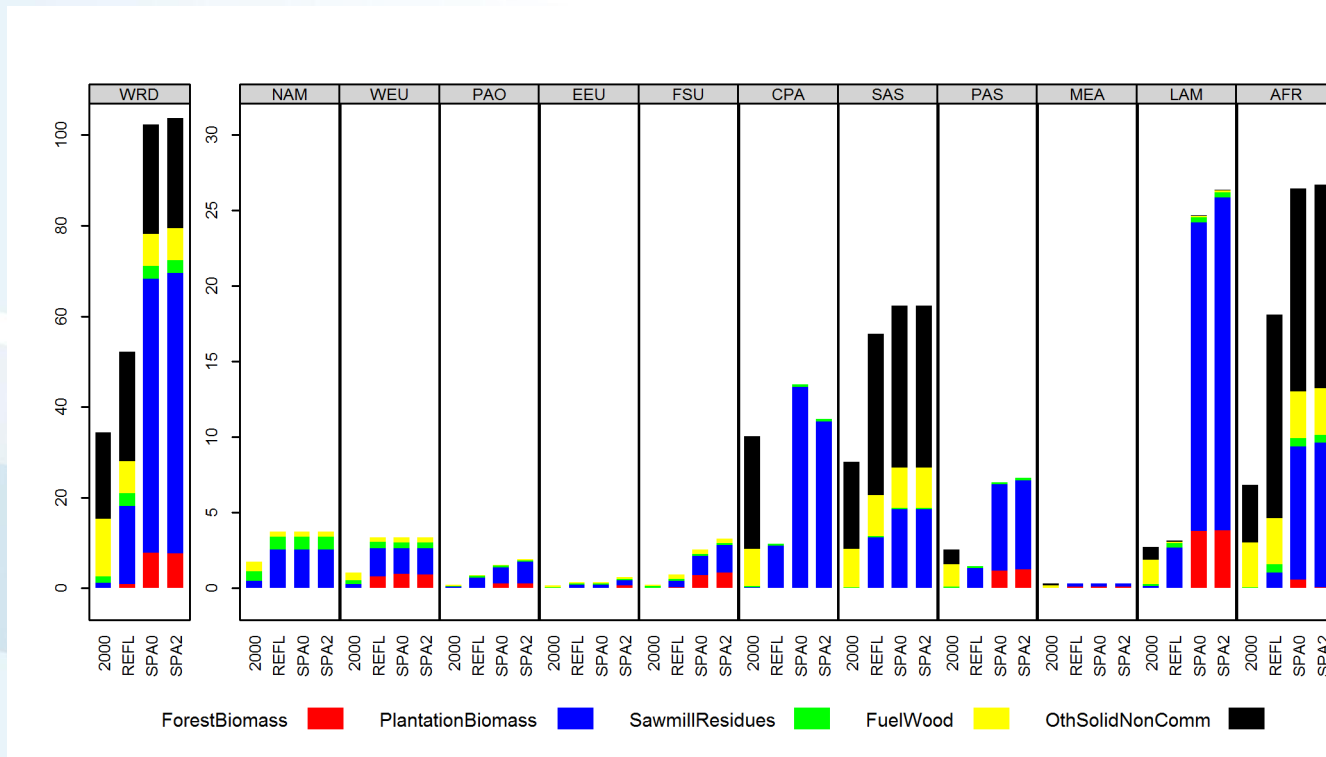


AFOLU emissions [MtCO₂eq]



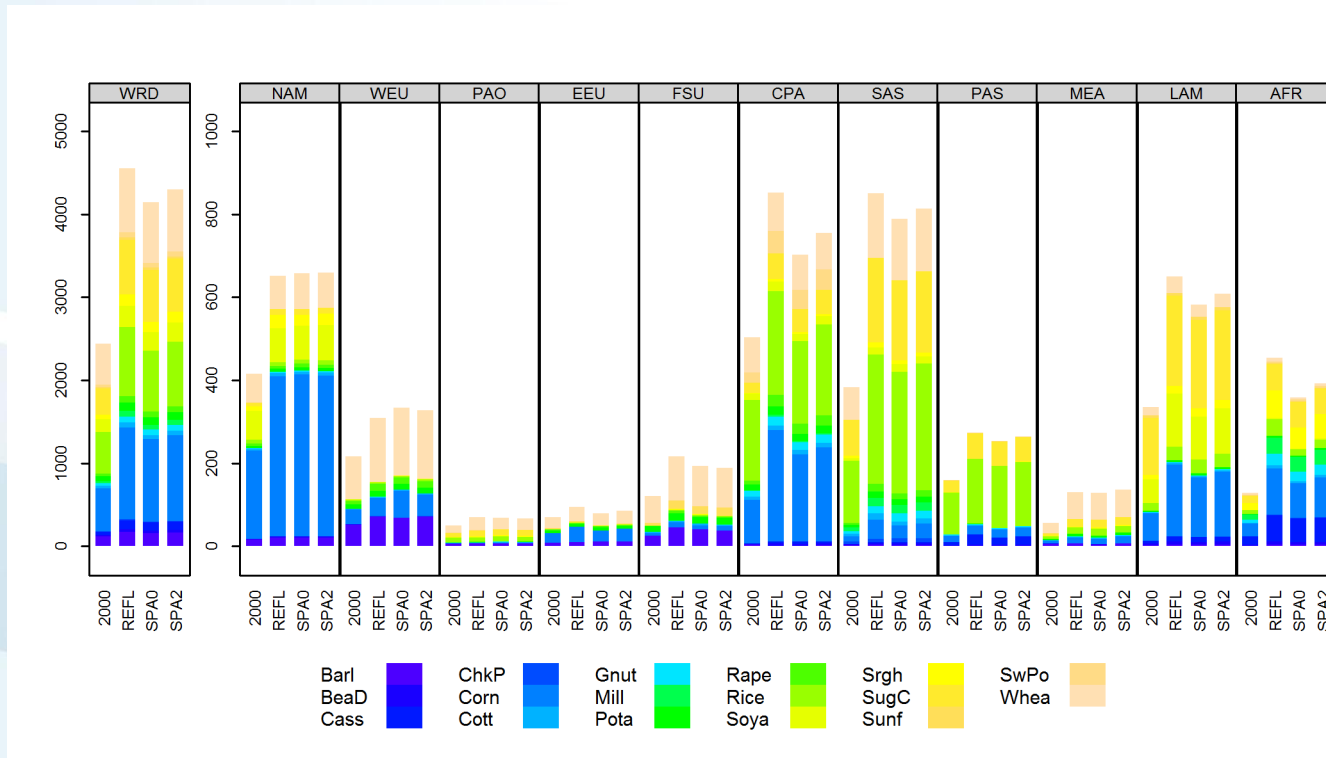
- ▶ AFOLU emissions globally to be reduced by 50% (40% in SPA2) to today
- ▶ 30% of reduction coming from LAM and 24% from AFR
- ▶ The proportional contribution does not change between SPAs

Biomass supply for bioenergy [EJ primary]



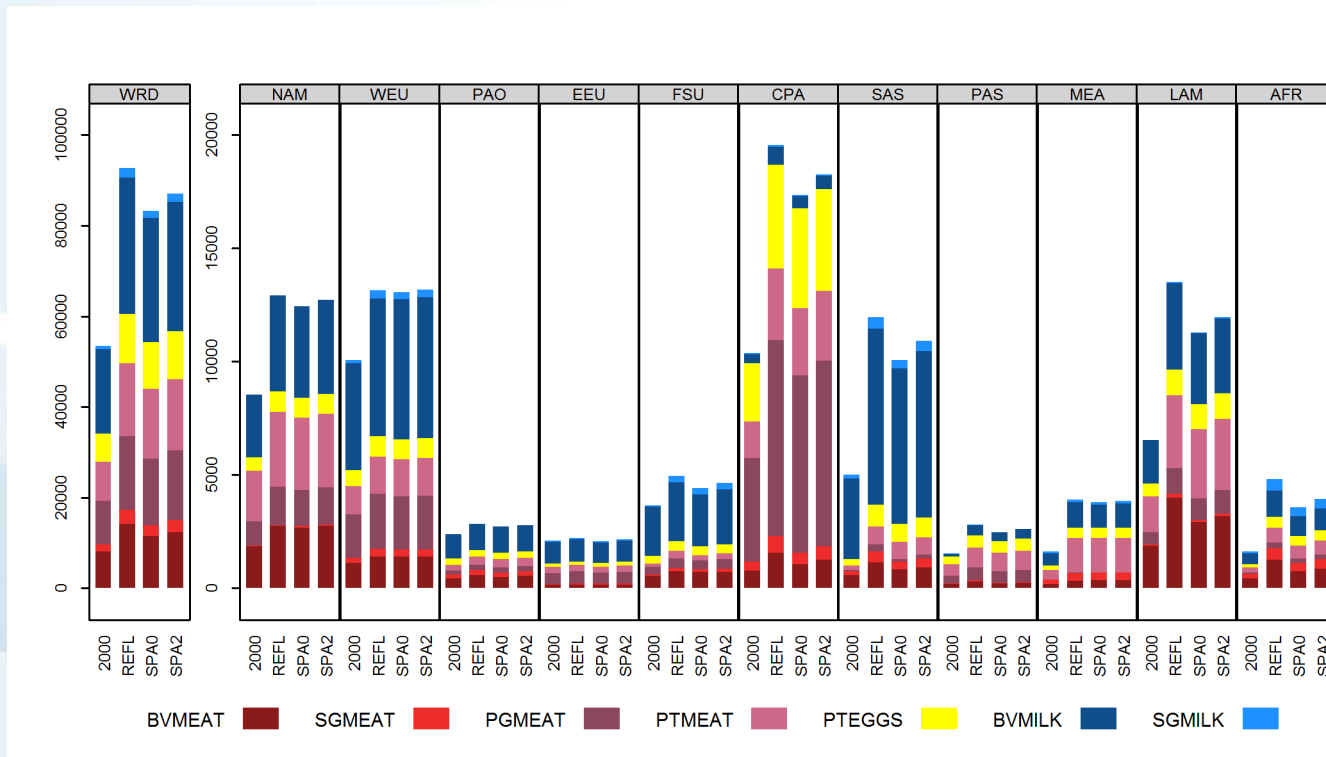
- ▶ Biomass supply for bioenergy to DOUBLE compared to reference
- ▶ 45% to come from LAM and 17% from AFR
- ▶ Potential source of new income

Crop production [tDM]



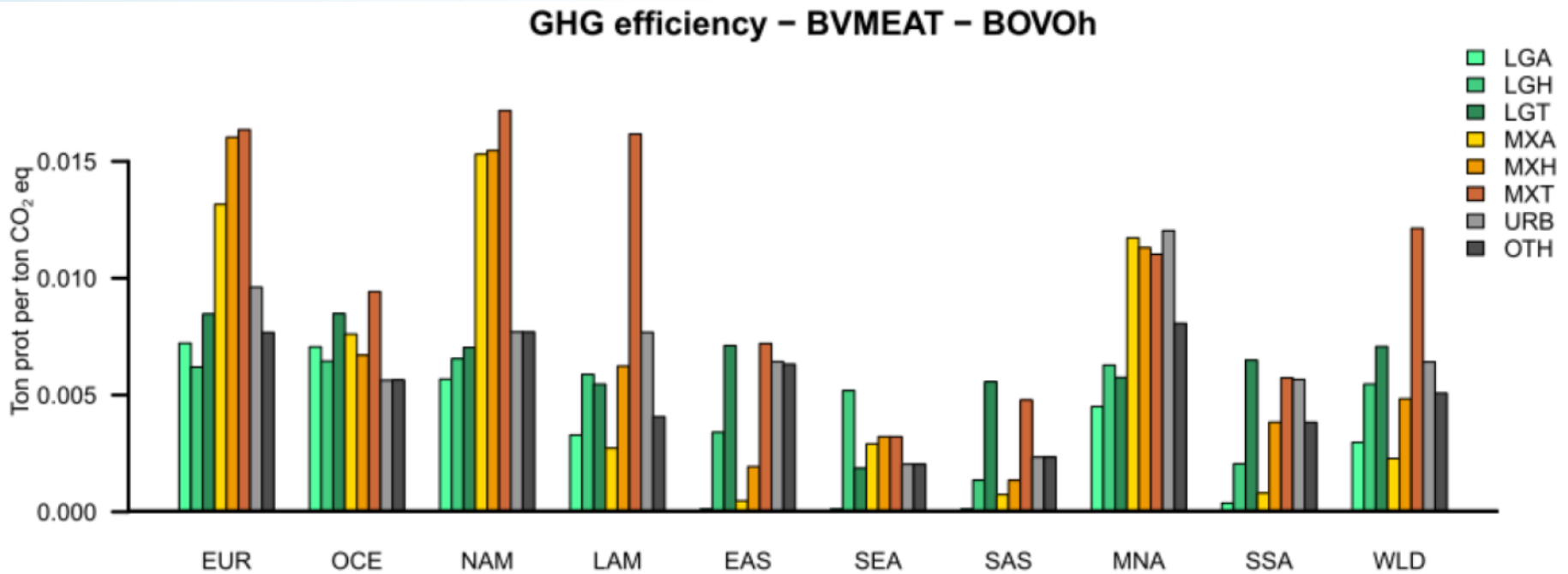
- ▶ Crop production to increase by 87% globally, 94% in LAM and 255% in AFR
- ▶ Increase lower by 22% in LAM and 29% in AFR under SPA0
- ▶ Increase lower by 13% in LAM and 19% in AFR under SPA2

Livestock production [t protein]



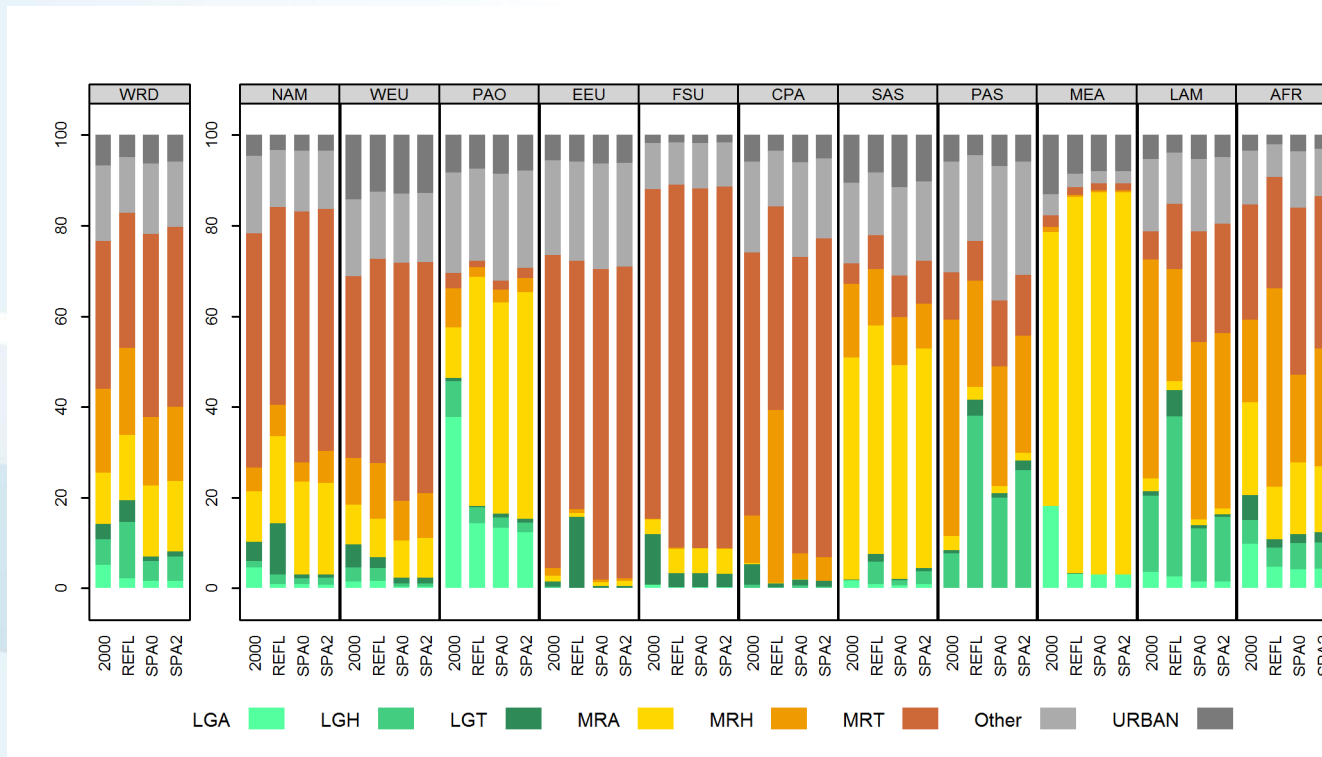
- ▶ Livestock production to increase by 73% globally, 107% in LAM and 194% in AFR
- ▶ Bovine meat, small ruminant meat, and small ruminant milk production -20%
- ▶ Poultry production -6%
- ▶ Increase in total production lower by 32% in LAM and 39% in AFR under SPA0

GHG emissions efficiency



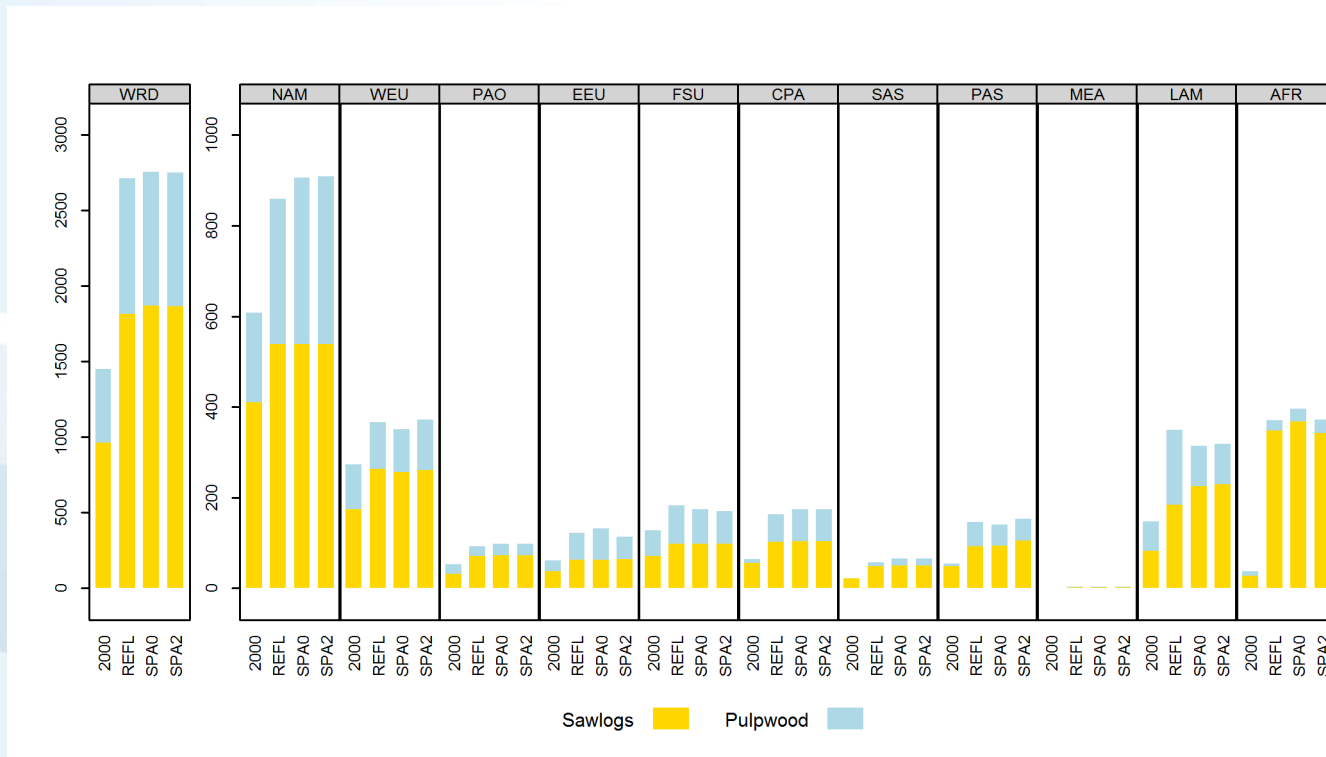
Herrero et al. 2013

Beef production systems [%]



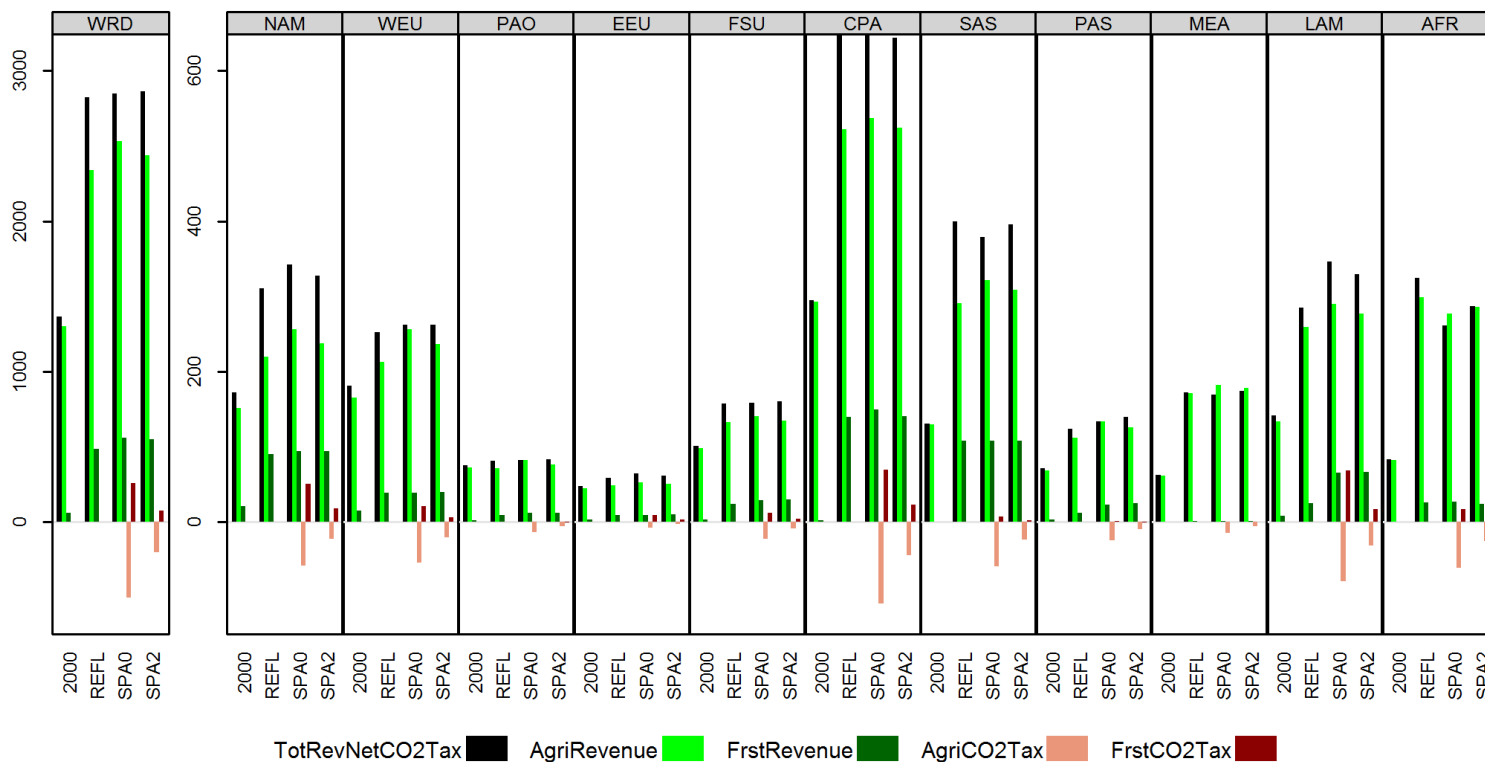
- ▶ Globally, intensive systems share increase from 30% to 40% in SPAs
- ▶ In AFR, intensive systems represent 37% under mitigation compared to 24% in the baseline

Industrial round wood production [Mm3]



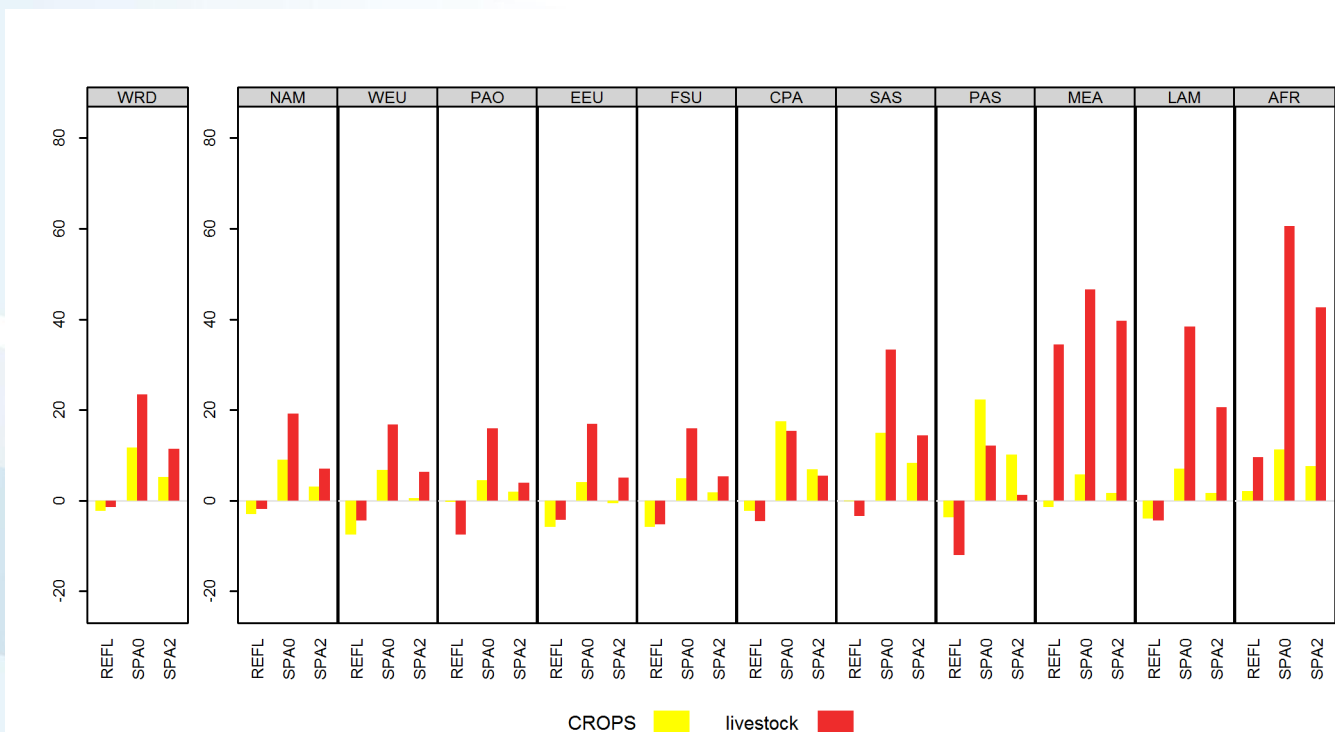
- ▶ Industrial round wood supply to increase by 87% between 2000 and 2050
- ▶ Little effect of mitigation policies (+/-10%)
 - ▶ Incentives for sequestration outweigh bioenergy demand

Sectorial revenue and CO2 tax [billion USD2000]



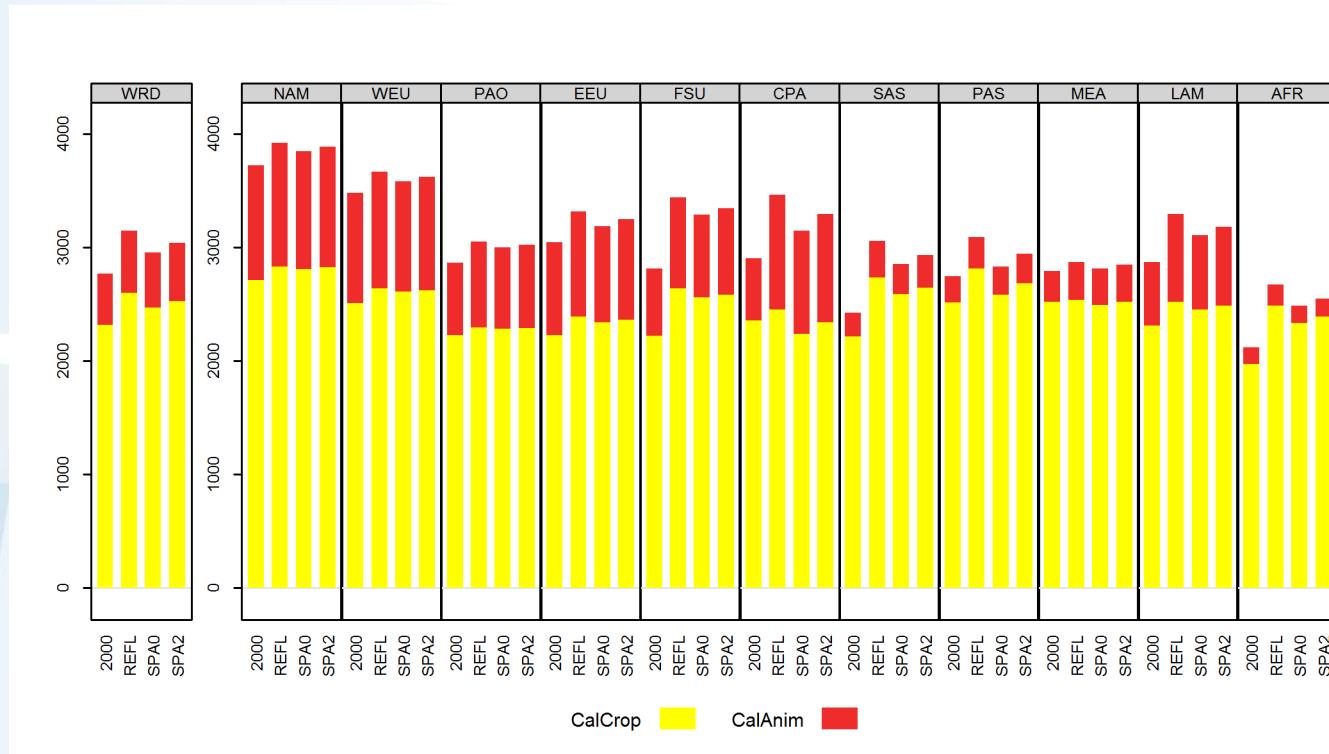
- ▶ Little effect on total global income, forestry benefits, agriculture loses
- ▶ LAM: +22% (+16% in SPA2) – agriculture and forest products + forest carbon
- ▶ AFR: -20% (-20% in SPA2) – losses in agriculture, no compensation in forests

Ag commodity prices (% change to 2000)



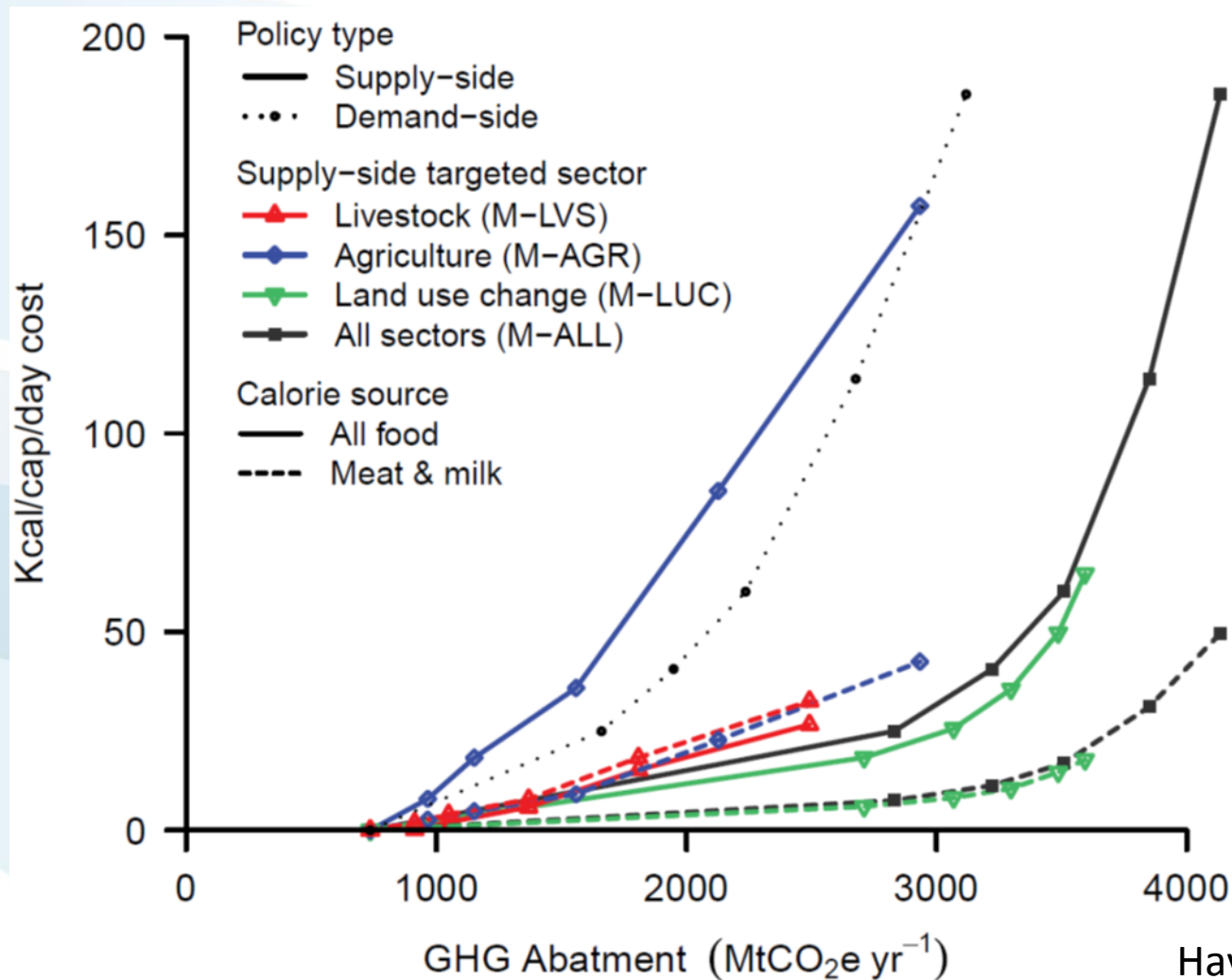
- ▶ Crop price increase by 14% (8% in SPA2), by 9% in AFR (5% in SPA2)
- ▶ Livestock price increase by 25% (13% in SPA2), by 47% in AFR (30% in SPA2)
- ▶ Opportunity for producer threat for consumers

Food availability (kcal/cap/day)



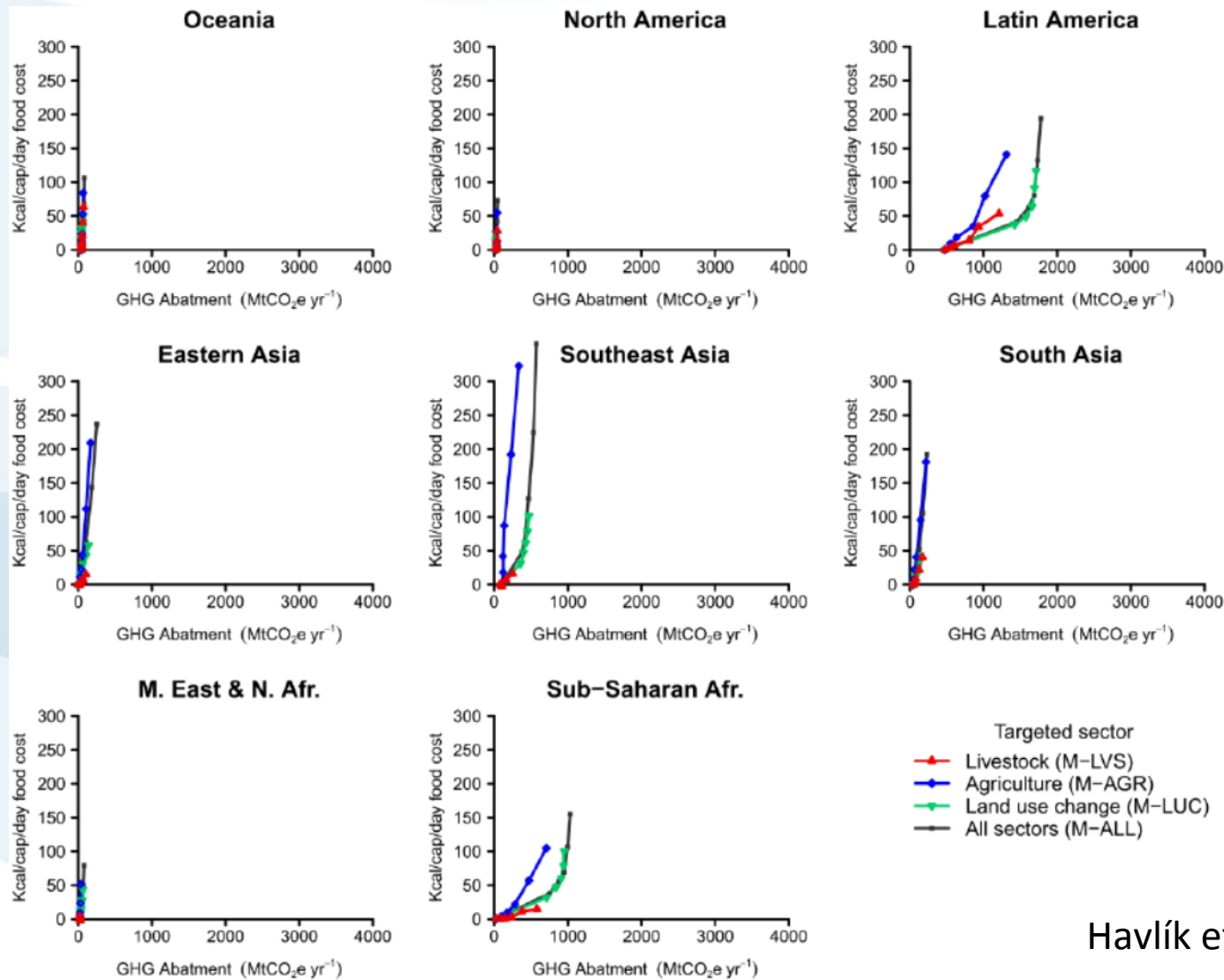
- ▶ In REFL, food availability in AFR increases by 25%
- ▶ Only 66% of increase under SPA0, 78% under SPA2
- ▶ Developed regions much less affected than developing

Total abatement calorie cost (TACC)



Havlík et al. 2014

Total abatement calorie cost (TACC)



Havlík et al. 2014

Conclusions

- ▶ Mitigation presents opportunities for land use sectors
 - ▶ New demands (biomass)
 - ▶ Payments for carbon sequestration
 - ▶ Higher prices (producers)
- ▶ Mitigation presents also challenges
 - ▶ Higher production cost
 - ▶ Restructuring of the sectors
 - ▶ Higher prices (consumers)
- ▶ Sectors and regions affected very differently
 - ▶ Forestry tends to benefit and agriculture to loose
 - ▶ Developed regions marginally affected and least developed most affected
- ▶ How to make mitigation work for least developed countries?



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Thank you !

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