Livestock, GHG and global models for integrated assessment

Petr Havlík & Mario Herrero & M. Obersteiner

A. Mosnier, Erwin Schmid, P. Thornton

F. Kraxner, S. Fritz, K. Aoki, R. Kruska, A. Notenbaert

AND MANY OTHER COLLABORATORS

International Institute for Applied Systems Analysis (IIASA),
Forestry Program, Austria
International Livestock Research Institute (ILRI), Kenya
University of Natural Resources and Applied Life Sciences, Vienna (BOKU),
Department of Economics and Social Sciences, Austria

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I. Introduction

LIVESTOCK

- complex sector itself

- strongly connected to other sectors

and to the environment (GHG)

LULUCF mitigation options and policy assessment cannot ignore it

An integrated modeling framework

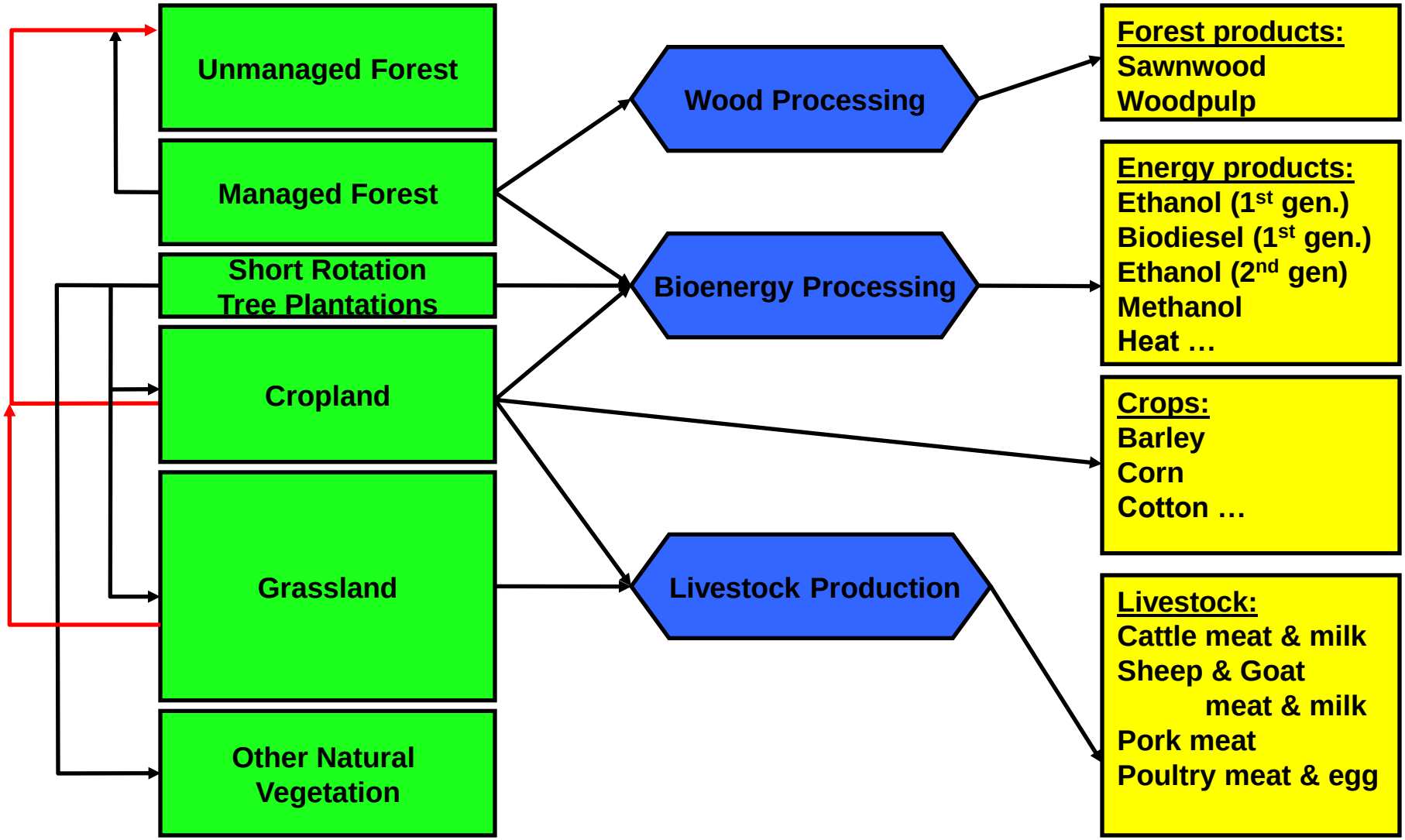
- detailed enough to capture local constraints

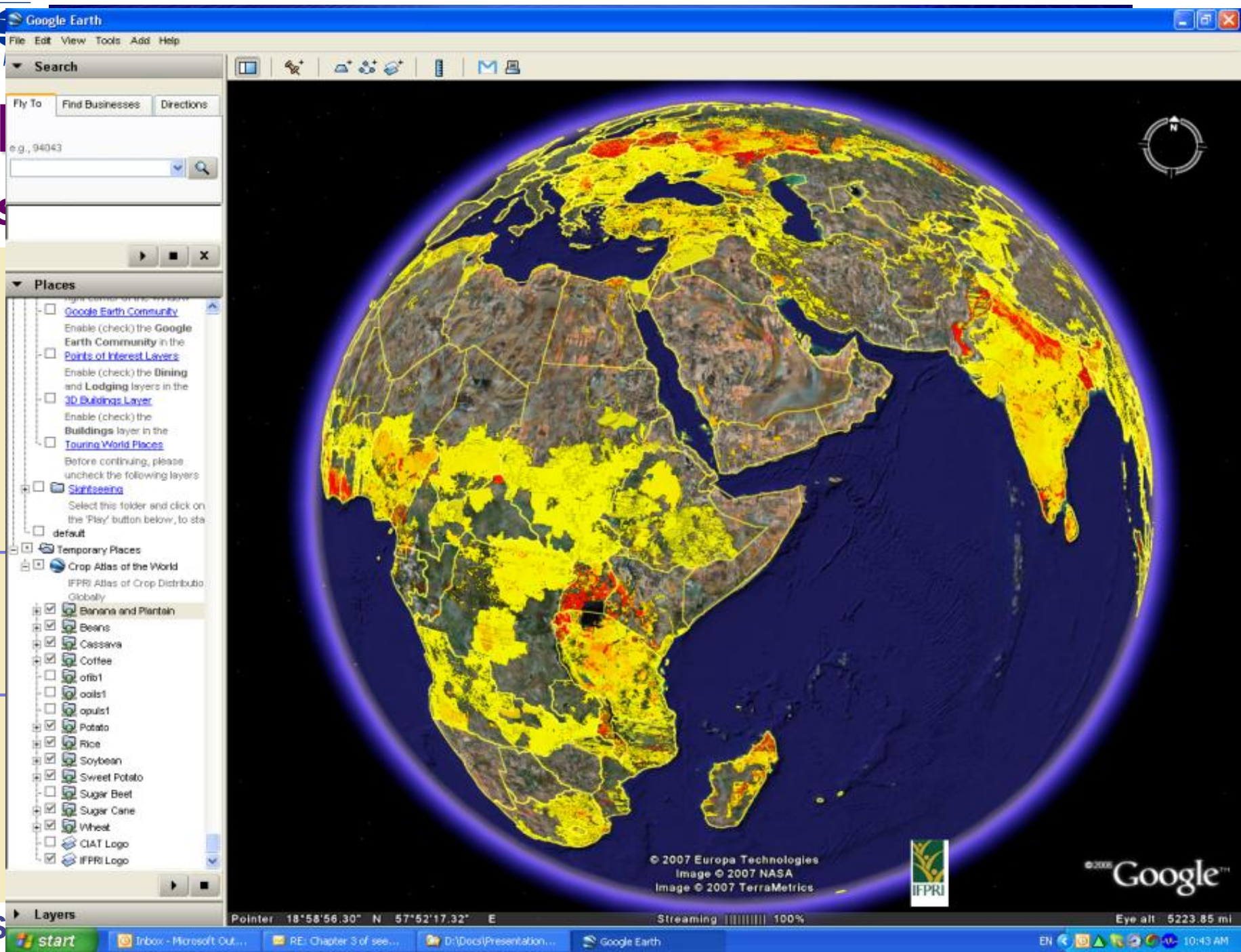
and environmental effects

- complete in sector and Earth coverage

to capture "linkage and leakage"

I. Model presentation: Supply chains

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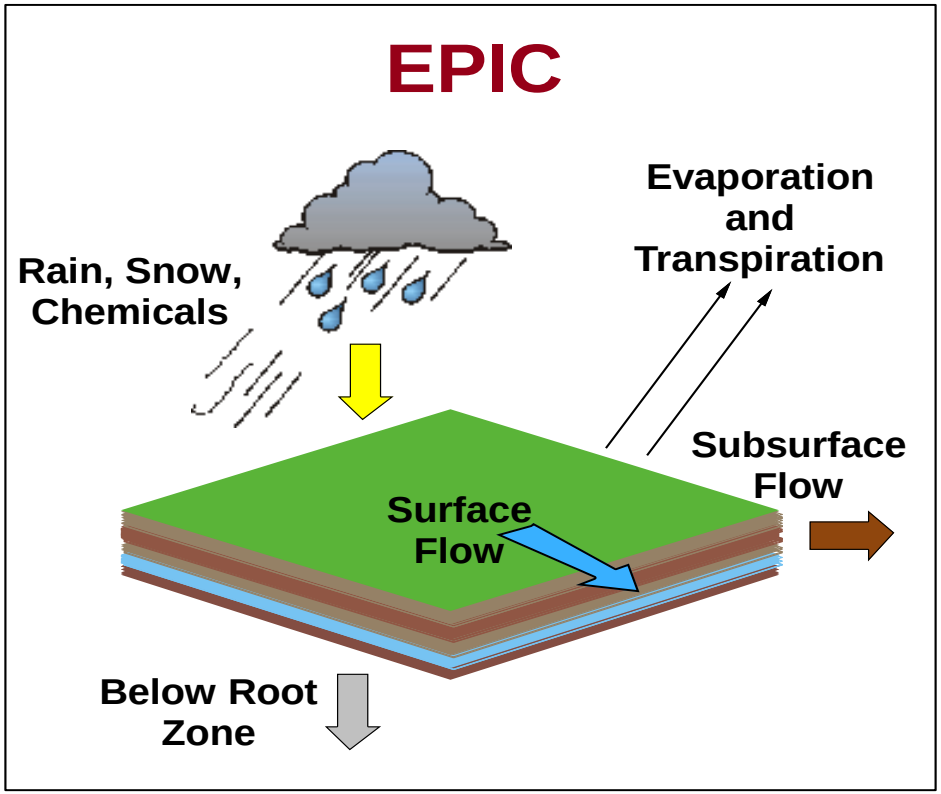
I. Model presentation: AG-Land

Processes

- Weather
- Hydrology
- Erosion
- Carbon sequestration
- Crop growth
- Crop rotations
- Fertilization
- Tillage
- Irrigation
- Drainage
- Pesticide
- Grazing
- Manure

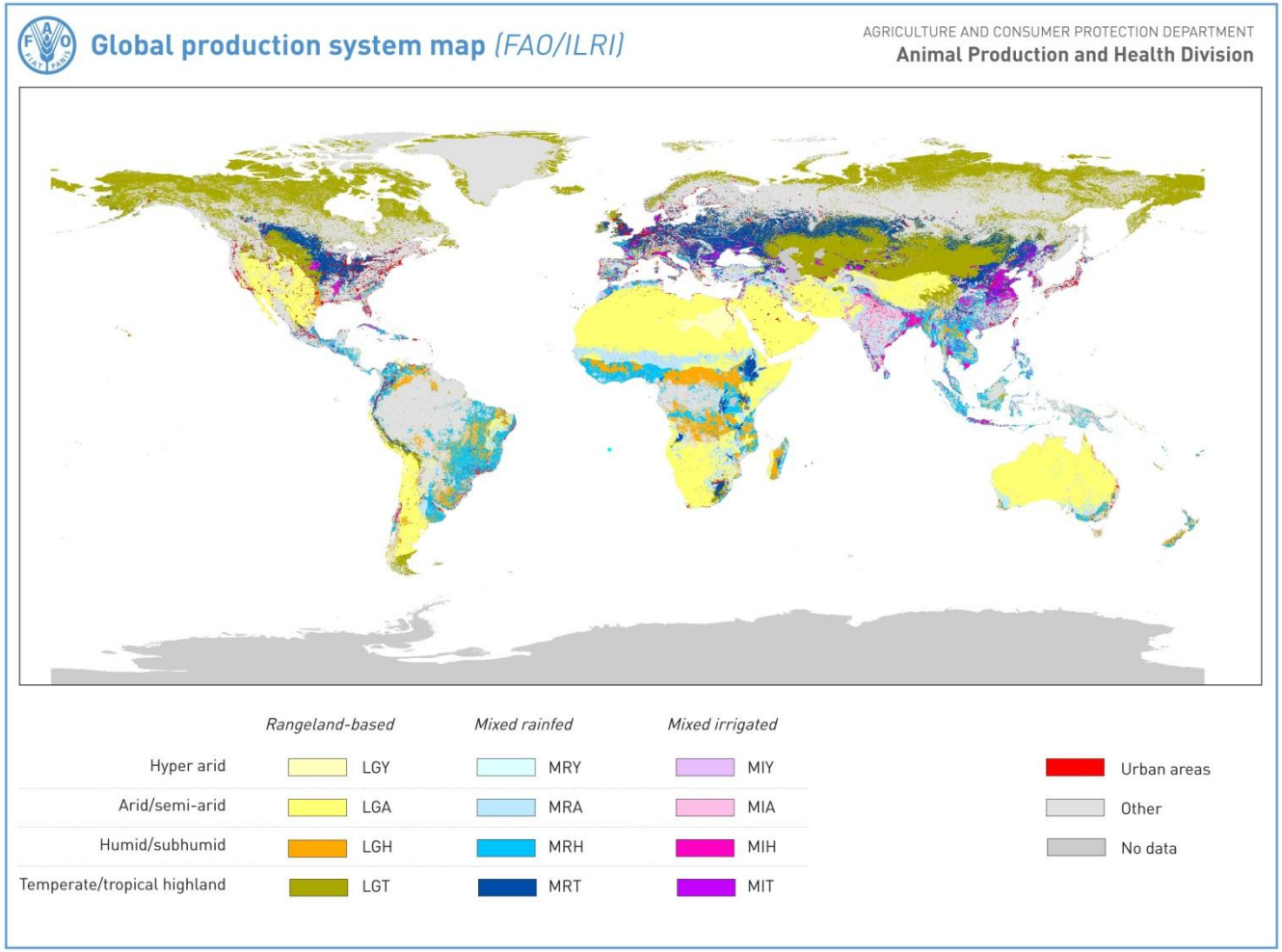


Major outputs:

Yields,
Environmental effects (e.g. soil carbon, N2O, erosion, N-leakage)
Costs by System

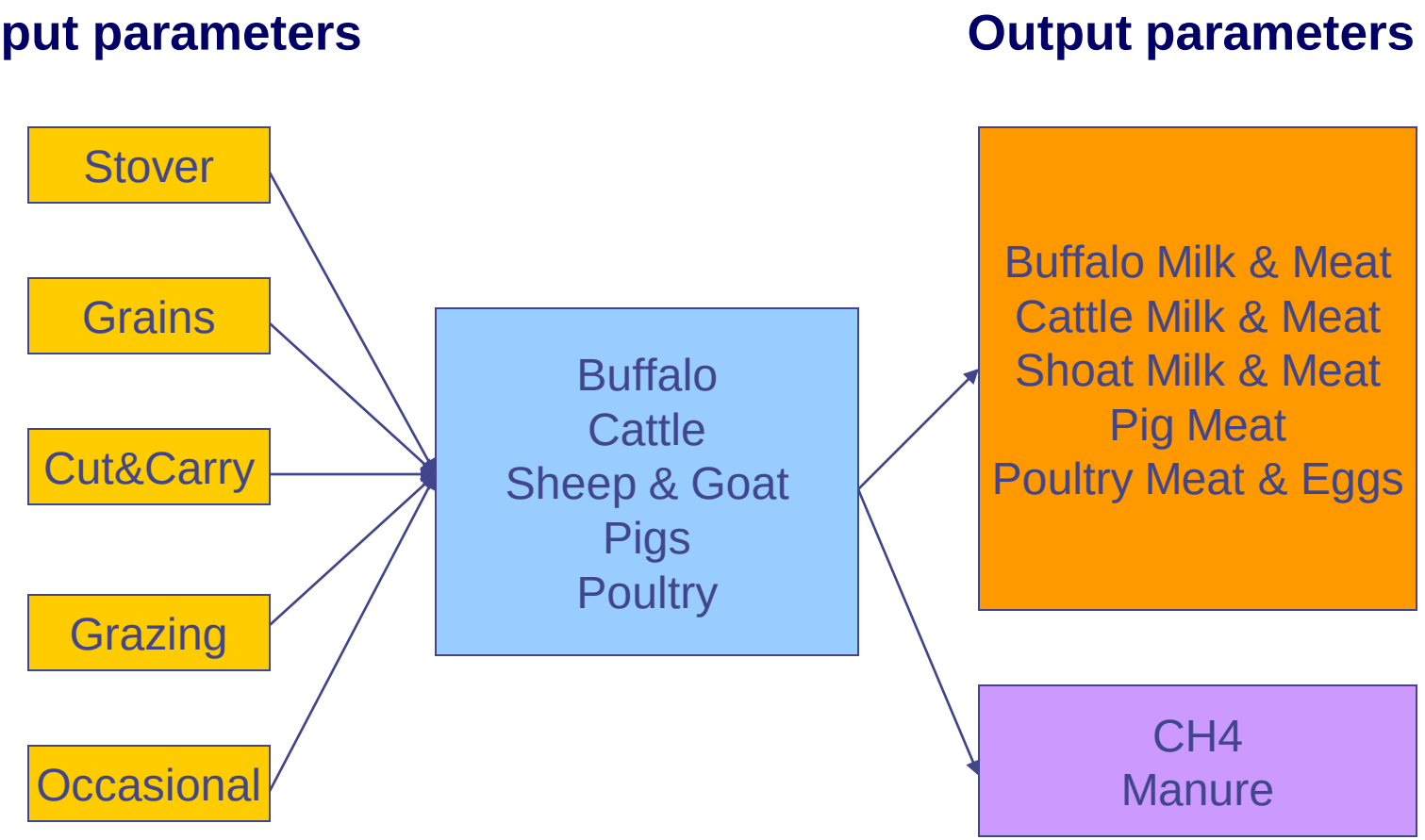
I. Model presentation: Livestock

Livestock Production System Approach (14 systems)



I. Model presentation: Livestock

Livestock Production System Parameters

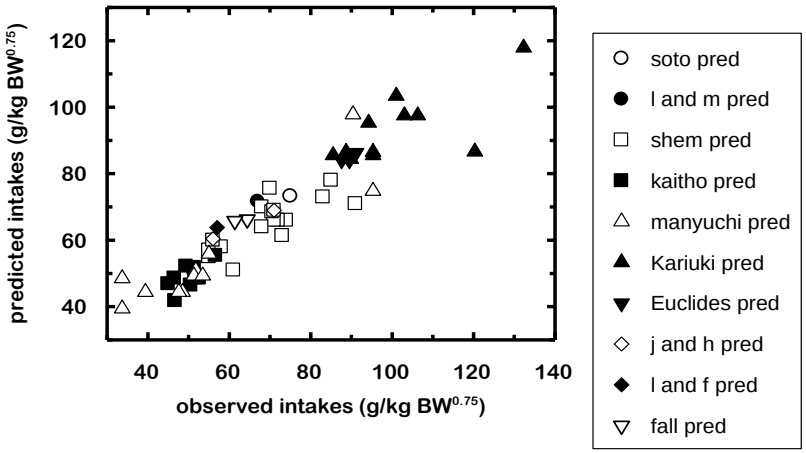


I. Model presentation: Livestock

The RUMINANT Simulation model

- **Dynamic simulation model of digestion in ruminants**
- **Predicts intake, production (milk, meat), and excretion**
- **Predicts metabolism end products** (**METHANE**, Volatile fatty acids, etc)

Prediction of intake



- CH4 coefficients have recently been approved by the IPCC GHG emissions taskforce (Herrero et al 2008, 2009)

II. Model presentation

Optimization Model (FASOM structure)

Partial equilibrium model

Main exogenous drivers:

Population (IIASA SRES projections)

Diets (FAO, 2006)

Bio-energy demand (POLES team, JRC Seville, and WEO, 2008)

(GDP, technological change,…)

Output:

production Q → land use, water use, GHG, environment

consumption Q

trade flows

prices

III. Unpublished results – LS investment

Simulation horizon: 2020

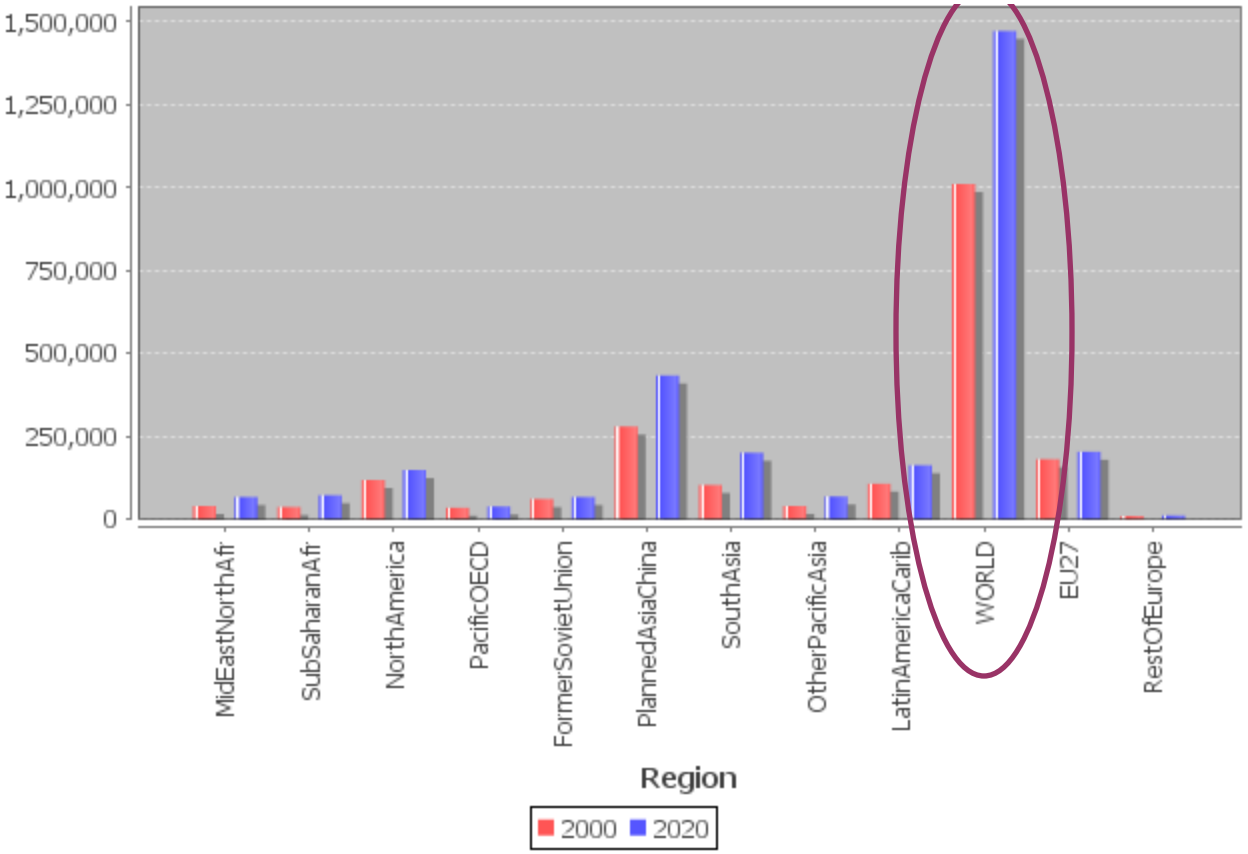
STICKY livestock production systems

- **continued historical low investment until 2020**

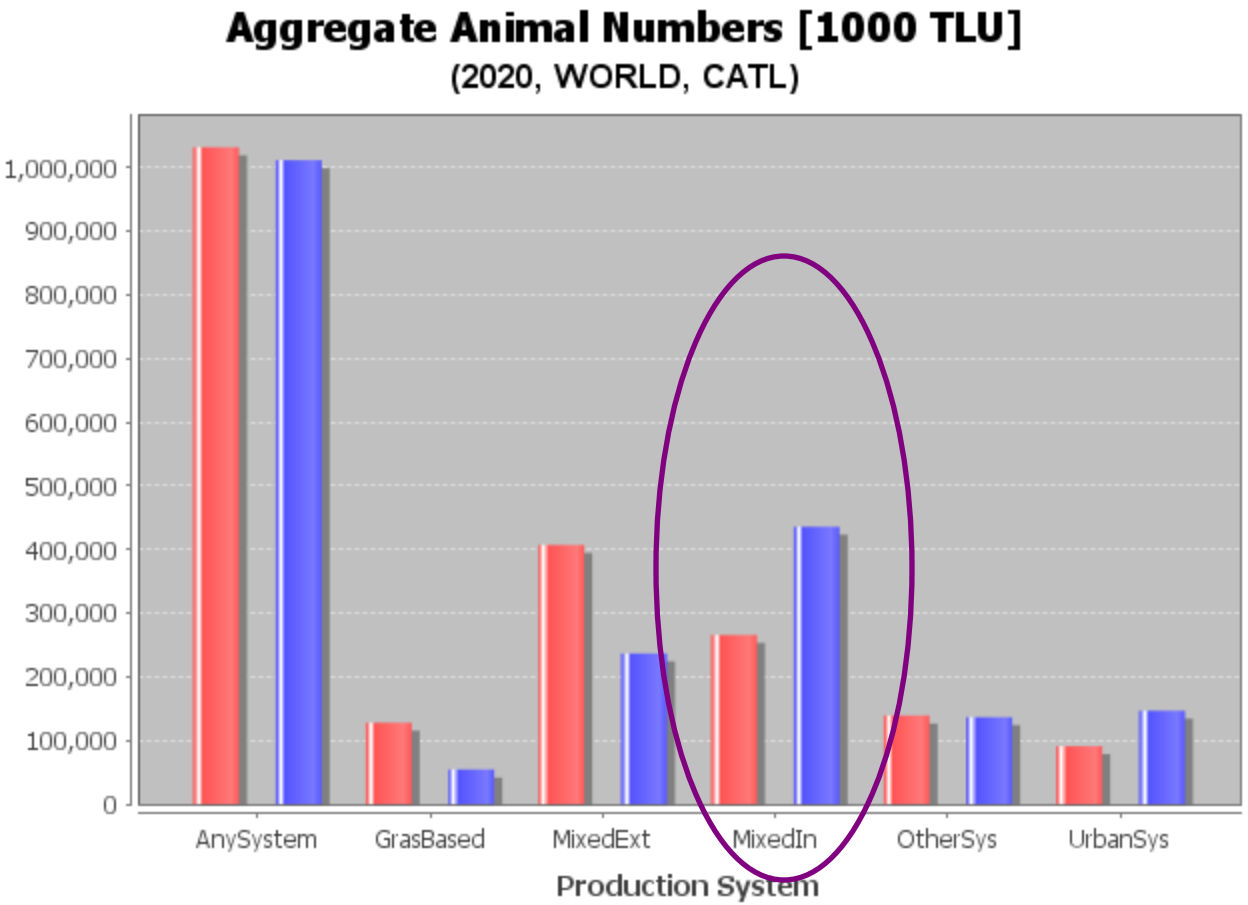
FLEXIBLE livestock production systems

- **strategic increased investment in LS until 2020**

Animal Calories Consumption (Billion kcal)

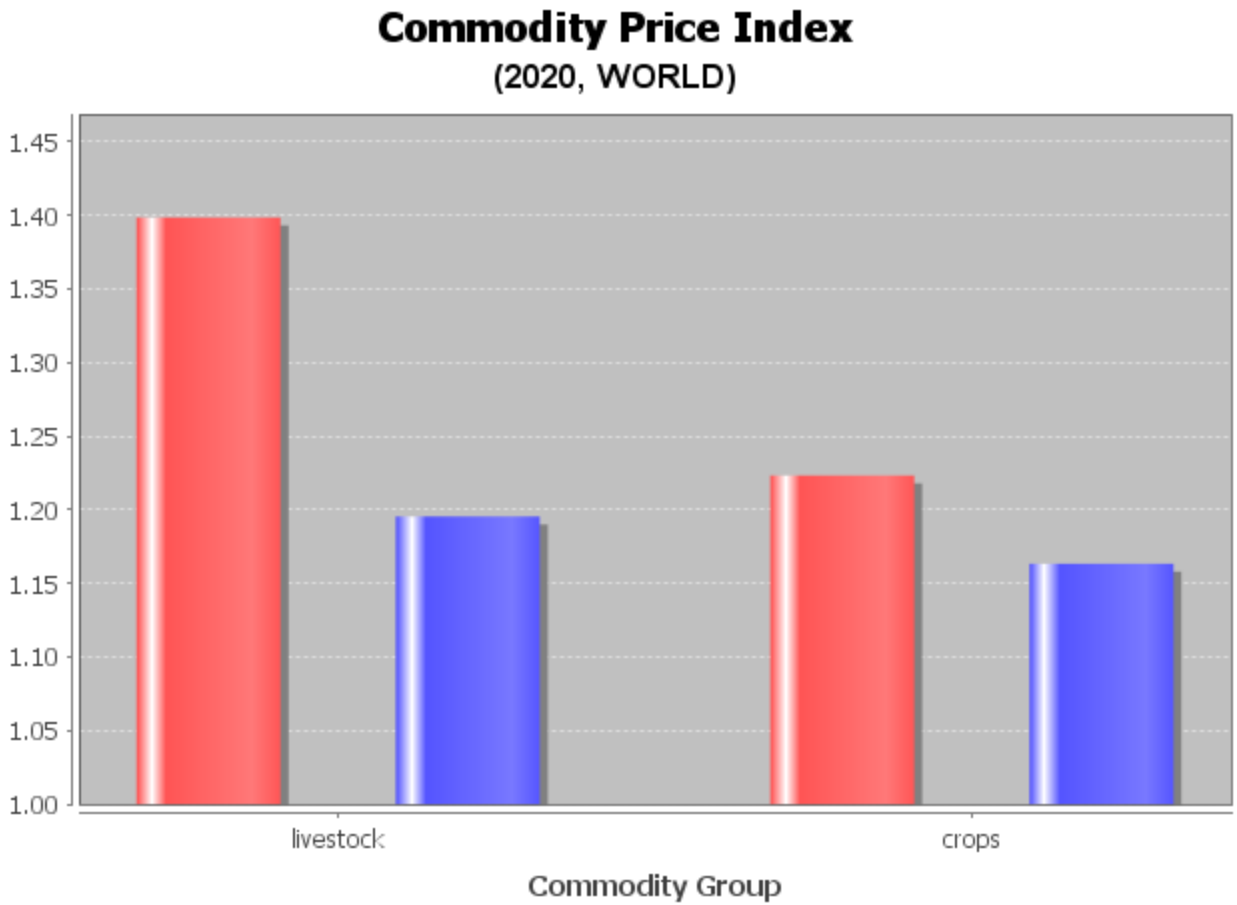


Important increase in absolute animal calorie consumption.



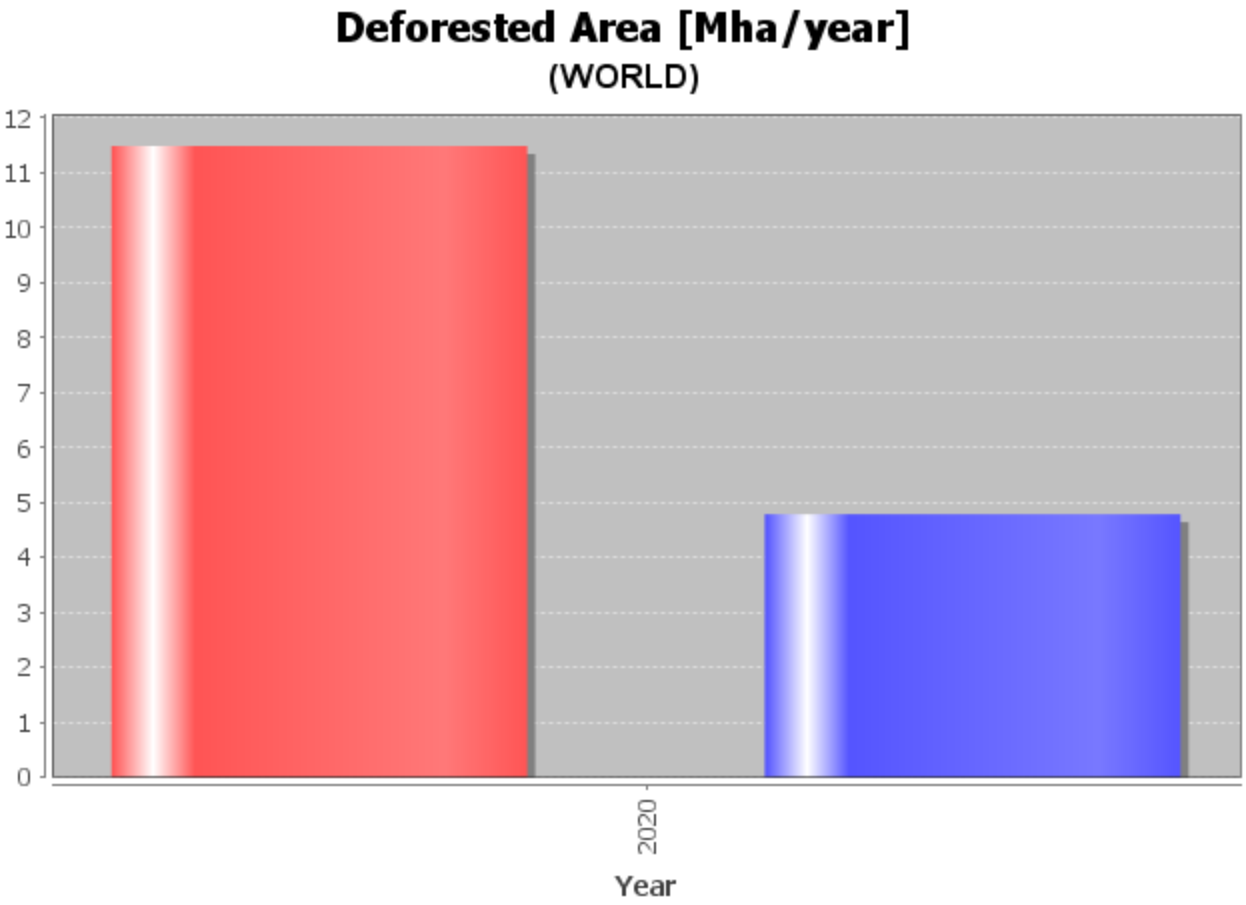
STICKY x FLEXIBLE

IF system change possible → shift to intensive production systems



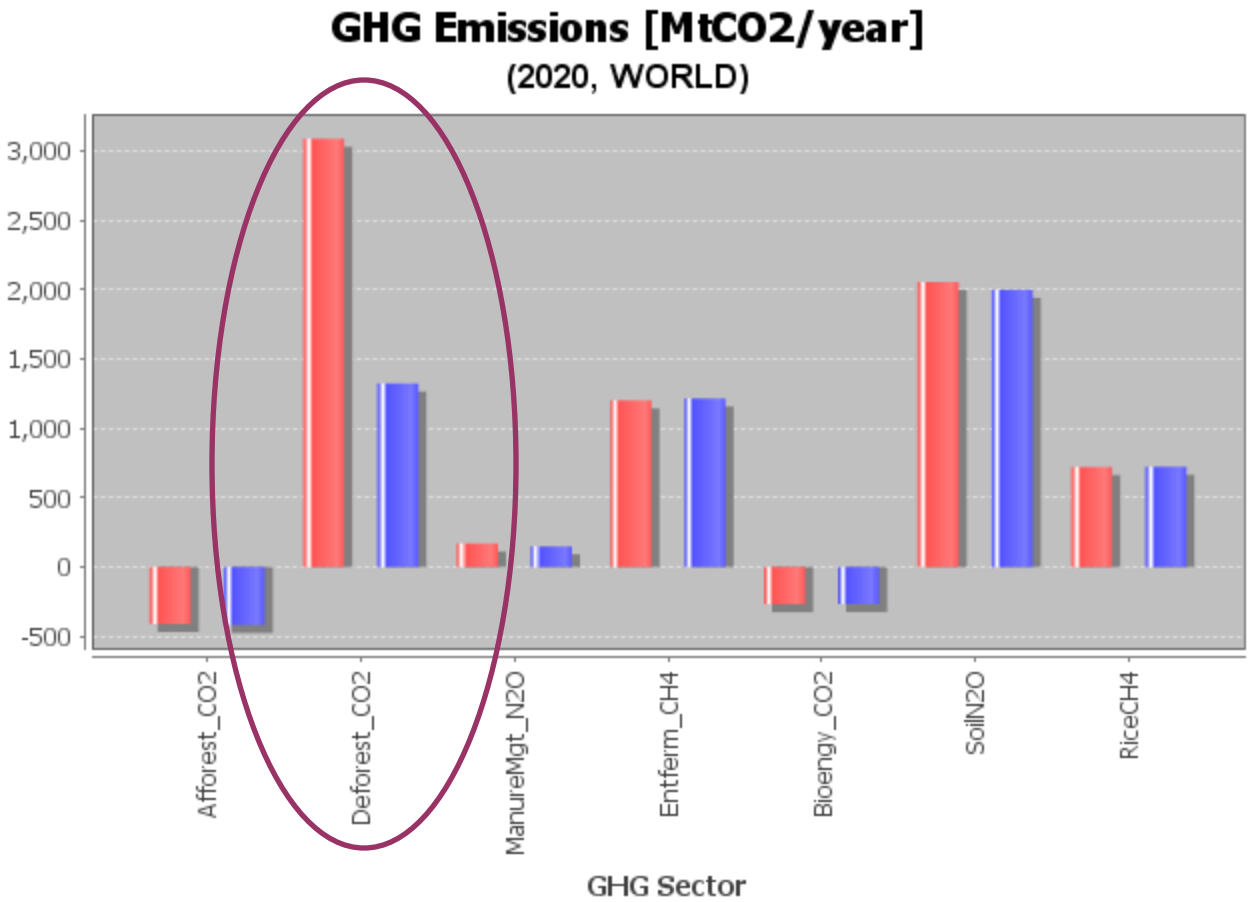
STICKY x FLEXIBLE

Adjustments in production systems help to keep commodity prices low



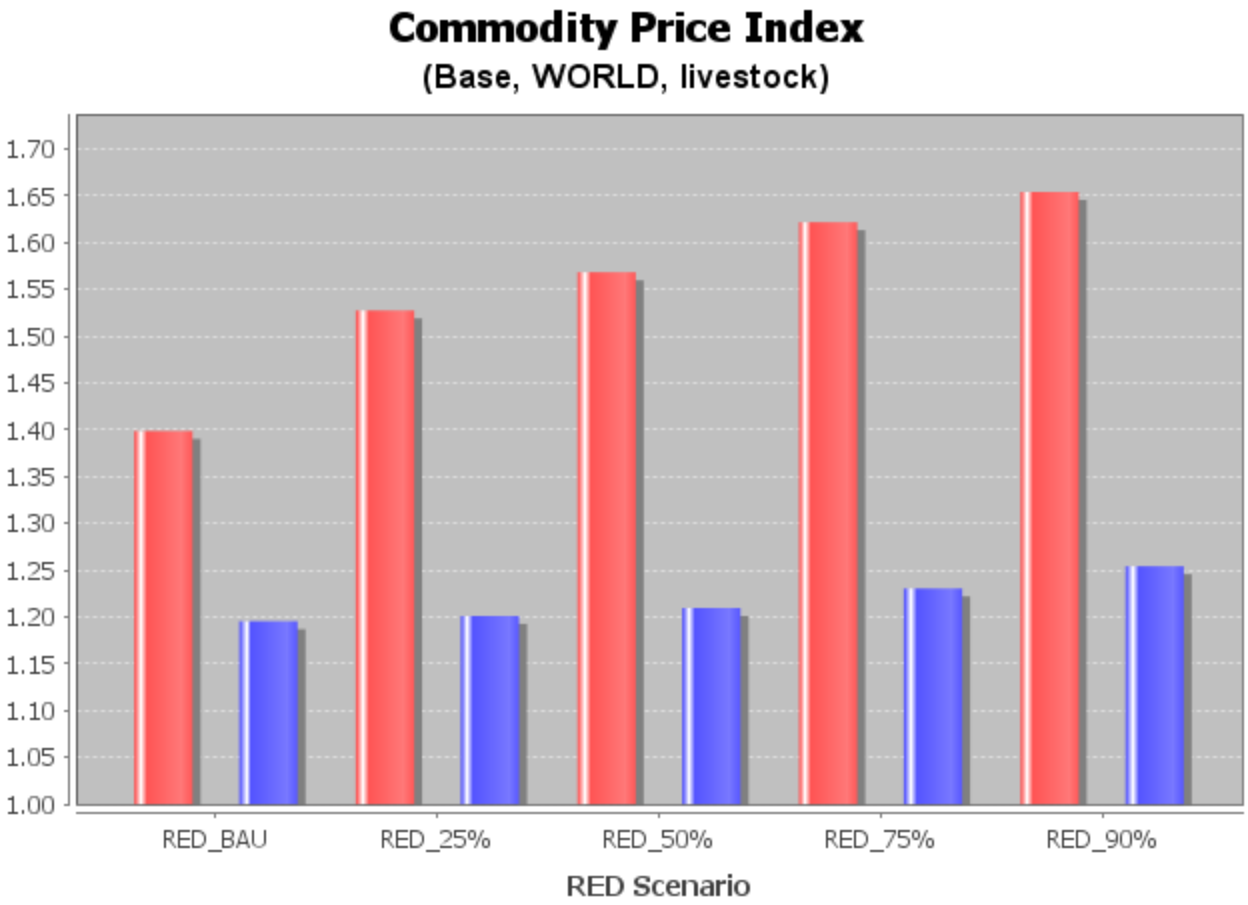
STICKY x FLEXIBLE

AND to reduce deforestation!



STICKY x FLEXIBLE

RED through livestock does not have negative effect on non-CO2 emissions.



STICKY x FLEXIBLE

RED will have important effects on commodity markets if systems don't adapt

IV. Conclusions

I. GLOBIOM - operational model with uniquely detailed livestock sector while regionally and across sectors comprehensive (biofuels - iLUC, water,…)

II. Livestock sector adjustments unavoidable → livestock production systems based approach enables in-depth analysis

III. IF adjustments in LPS happen, reduction of CO2 emissions from deforestation can be achieved without substantial effects on non-CO2 emission sectors

If you think REDD+ think land use systems

oberstei@iiasa.ac.at