Production system based global livestock sector modeling: Good news for the future

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INTRODUCTION

- LIVESTOCK occupy 30% of global surface area
- By 2030, consumption is projected to increase by 57% for MILK and by 68% for MEAT (FAO, 2006)

→ SUSTAINABLE INTENSIFICATION necessary to avoid large scale land use change and related GHG emissions and Biodiversity loss

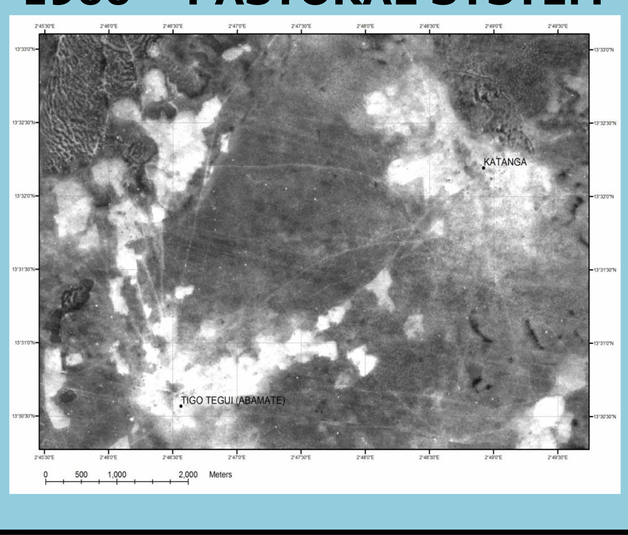
LIVESTOCK PRODUCTION SYSTEMS (LPS)
Sere and Steinfeld (1996) differentiate three main LPS

i) Grassland based (LG)
ii) Mixed crop-livestock (MX)
iii) Landless (LL)

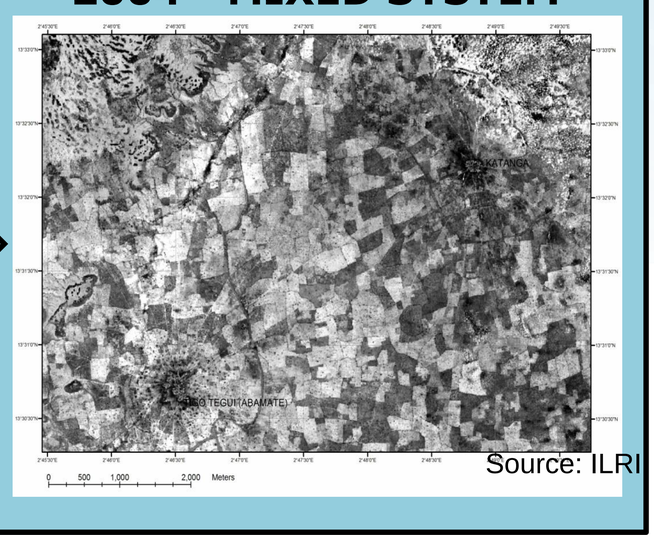
What future LPS transitions and their role in sustainable intensification?

LIVESTOCK PRODUCTION SYSTEMS TRANSITION (Western Africa)

1966 – PASTORAL SYSTEM

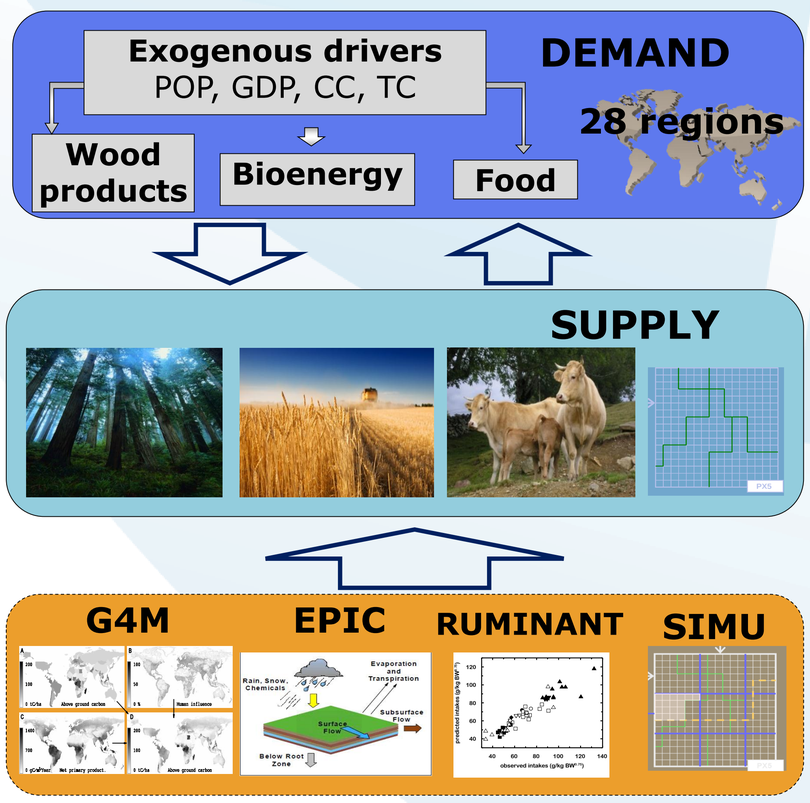


2004 - MIXED SYSTEM



Source: ILRI

GLOBIOM
(Global Biosphere Management Model)



METHODOLOGY

1. General Framework: GLOBIOM

- Partial Equilibrium: Agriculture, Forestry, Bioenergy
- Production functions with high spatial resolution and calibrated by biophysical models (e.g. RUMINANT)

2. Livestock modeling

- LPS classification including agroecology: Arid (A), Humid (H), Temperate/highlands (T)
- New datasets developed for systems parameterization
  + input coefficients (feed baskets)
  + output coefficients (meat & milk productivity, CH4 emissions, manure production…)

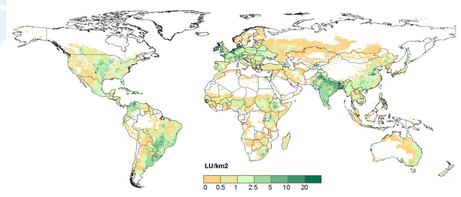
  and harmonized with FAO country level data

3. Scenario Analysis

REF0 – Livestock production systems structure fixed at 2000 values

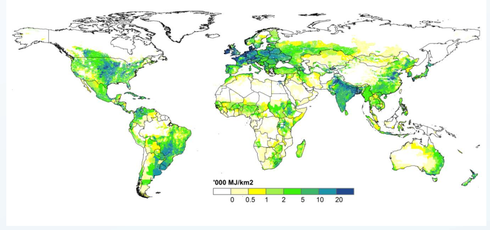
REF1 – Transition between LG and MX allowed

Bovine density

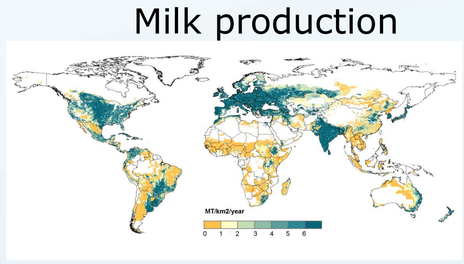


Source: GLW – FAO (2007)

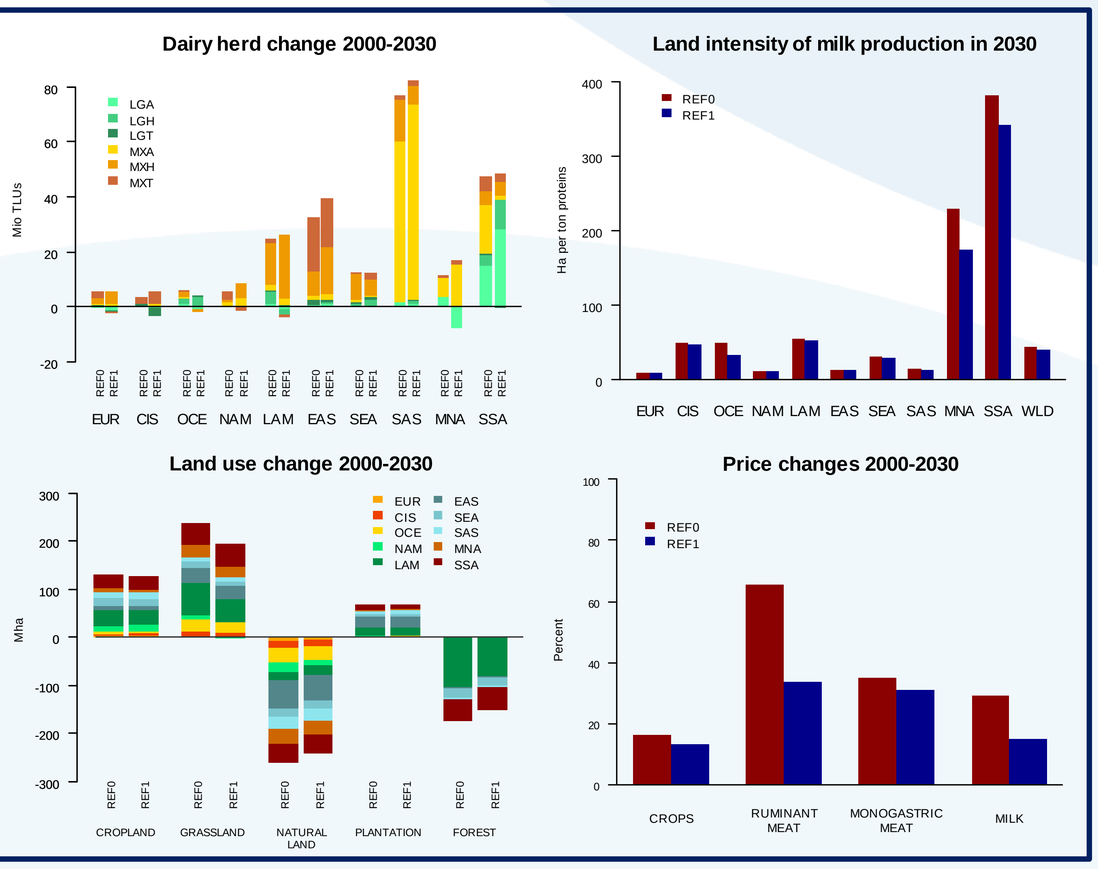
Energy intake by ruminants



Milk production



Source: Herrero, Havlík, et al. (Forthcoming)



RESULTS

1. Dairy herd expansion will mostly occur in Mixed systems.
2. In Latin America and Mid-East North Africa, slight decreases in grassland based systems (LG) likely (REF1) while in Arid zones of SubSaharan Africa LG systems preferred
3. LPS structure adjustments (REF1) lead to
   a) higher land use efficiency in the most land intensive regions
      14% less deforestation and 20% less Other Natural Land loss
   b) Lower food prices

CONCLUSION

1. Rigid LPS structure socially and environmentally unsustainable
2. Neglecting LPS adjustments in economic modeling may lead to overestimation of negative effects of increased livestock production
3. LPS structure adjustments are only ONE component of sustainable intensification, other options need to be explored

Further reading: Havlík, P., Valin, H., Mosnier, A., Obersteiner, M., Baker, J.S., Herrero, M., Rufino, M.C., Schmid, E. (Forthcoming). Crop Productivity and the Global Livestock Sector: Implications for Land Use Change and Greenhouse Gas Emissions. *American Journal of Agricultural Economics*: in press.

TAME
SEVENTH FRAMEWORK PROGRAMME

For additional information: www.globiom.org and havlikpt@iiasa.ac.at

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