

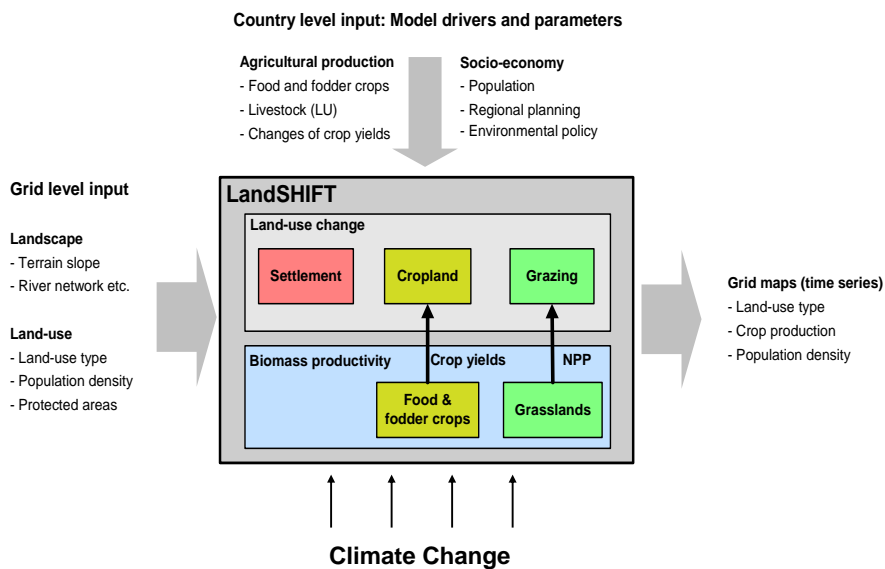
Scenarios of agricultural land-use change in Africa under changing climate conditions

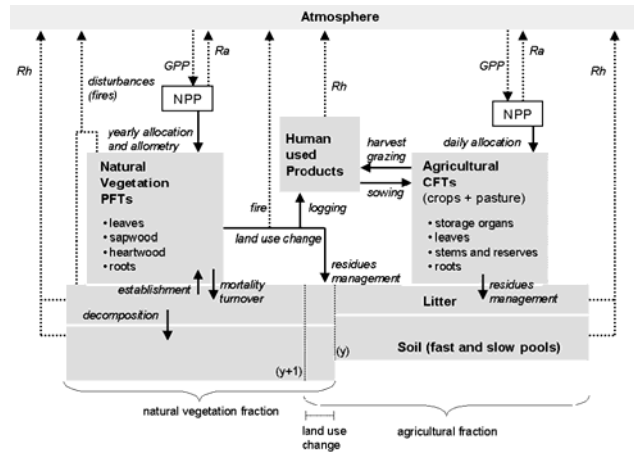
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- Increasing food demand by growing human population and improved food availability and security
- Crop cultivation and livestock management important drivers
- Crop growth and NPP of grassland affected by CC
- Scenario analysis for Africa:
 - GEO-4 scenarios as a framework for analysis of next 50 years
 - Application of a simulation-based method for land-use changes
 - Assessment of expansion of agricultural area
 - Assessment of environmental consequences

- Simulation to *harmonize and integrate* freshwater availability and the *terrestrial* environment
- Consistent framework to model land-use changes on continental and global scale
- Integration of socio-economic and environmental aspects
- Competition of different land-use activities
- Multiple spatial scales: country level (macro level) and 5 arc-minutes grid (micro-level)
- Temporal resolution: currently 5 years





The LPJmL Model (Sitch et al., 2003; Bodeau et al., 2007)
Lund-Potsdam-Jena dynamic global vegetation model with managed lands

Plausible descriptions of how the future may unfold... scenarios until 2050 from the UNEP Global Environmental Outlook 4

Markets First

Faith in markets and their advances for economy but also for social and environmental improvements.

Population: 800 Mio - 1900 Mio

GDP/cap: 702 \$ - 3300 \$

Food availability: 2460 kcal/day - 3476 kcal/day

Climate: $dT = 2.2 \text{ K}$; $\text{CO}_2 = 563 \text{ ppmv}$



Sustainability First

Emphasis on environmental and social concerns.

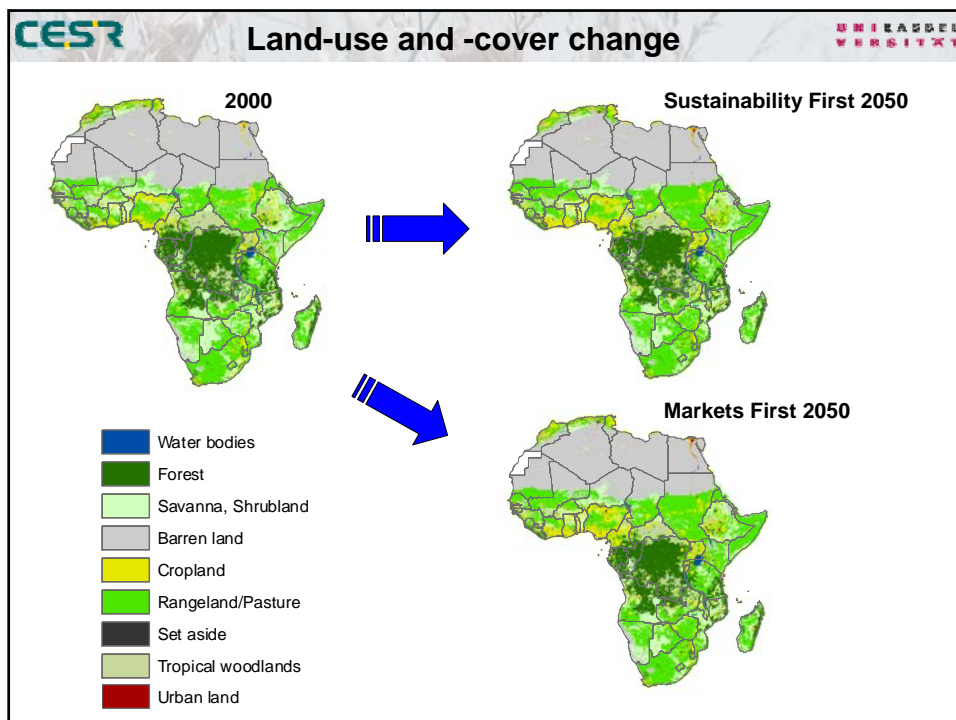
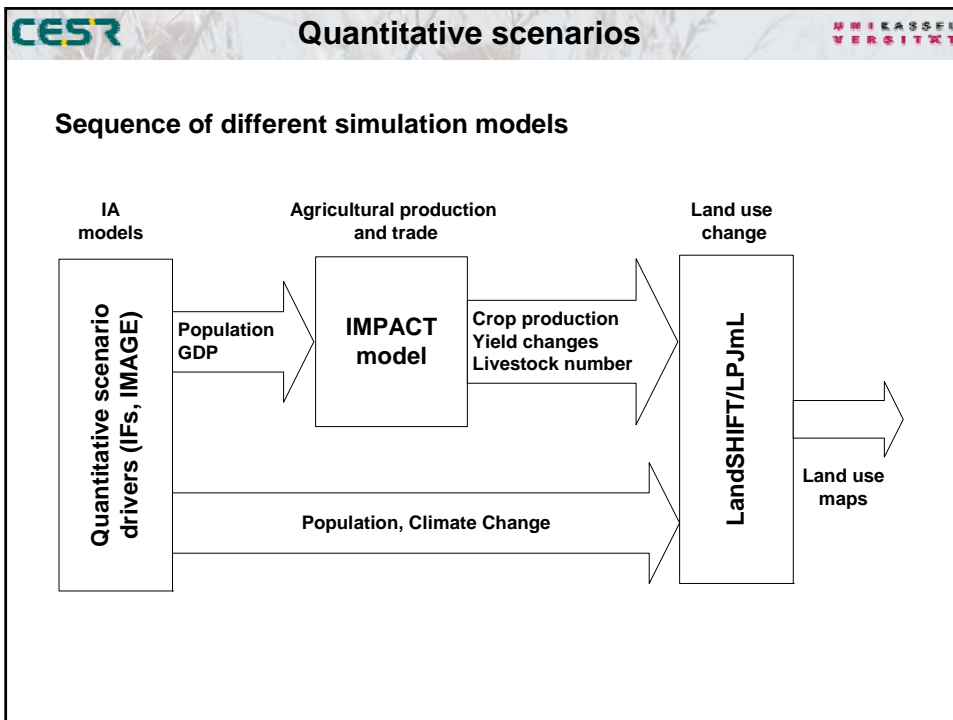
Population: 800 Mio - 1400 Mio

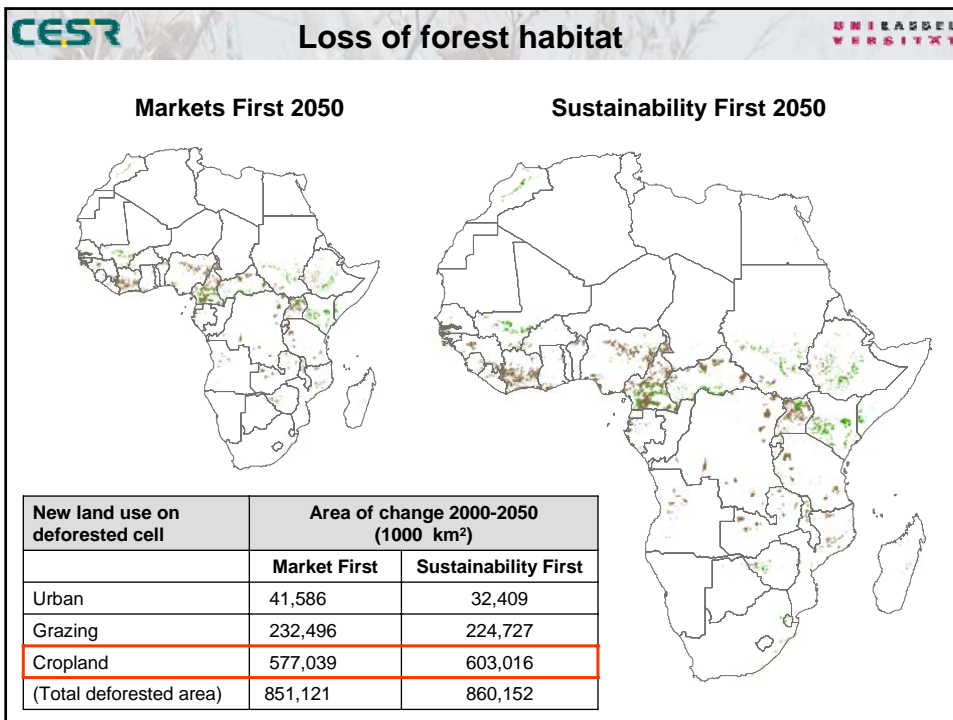
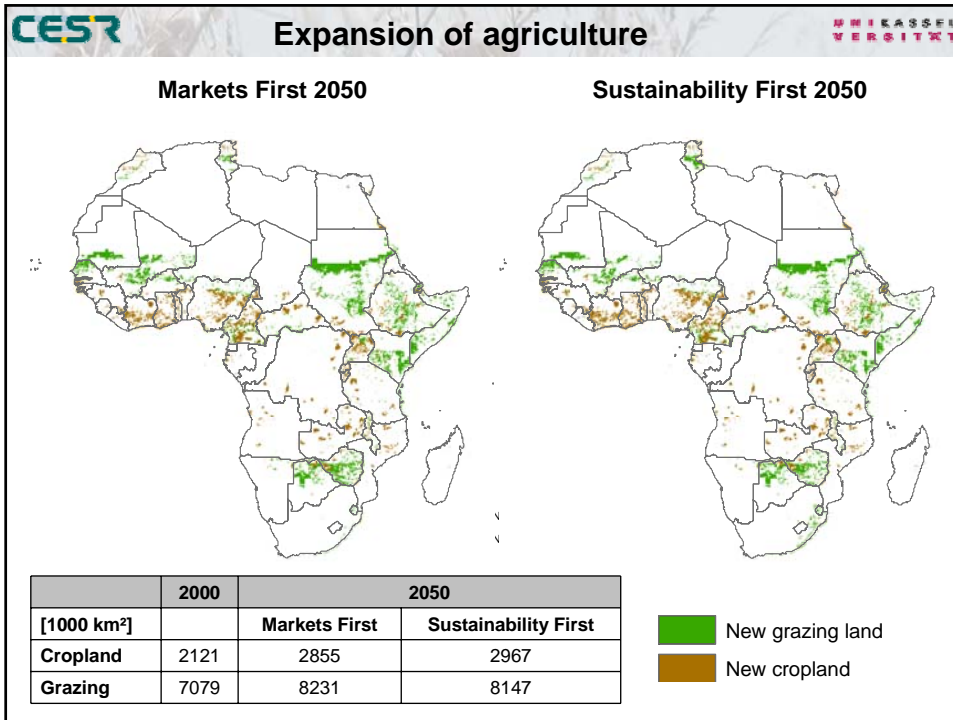
GDP/cap: 702 \$ - 4300 \$

Food availability: 2460 kcal/day - 4108 kcal/day

Climate: $dT = 1.7 \text{ K}$; $\text{CO}_2 = 478 \text{ ppmv}$







- LandSHIFT is a model framework which integrates anthropogenic and biogeochemical components of land-use systems
- Scenario analysis shows that agriculture is likely to be the main driver for land-cover change in Africa until 2050
- Expansion of grazing land has largest overall impact on land-cover
- Cropland expansion identified as main factor for deforestation
- Strong impact of CO₂ concentration on modeled biomass productivity
- Model results reflect the complex interplay of socio-economic factors and environmental change
- Future improvements will address the role of irrigated cropland as well as inter-annual climate variability and consequences for security of food production