How can land-use change models assist monitoring?

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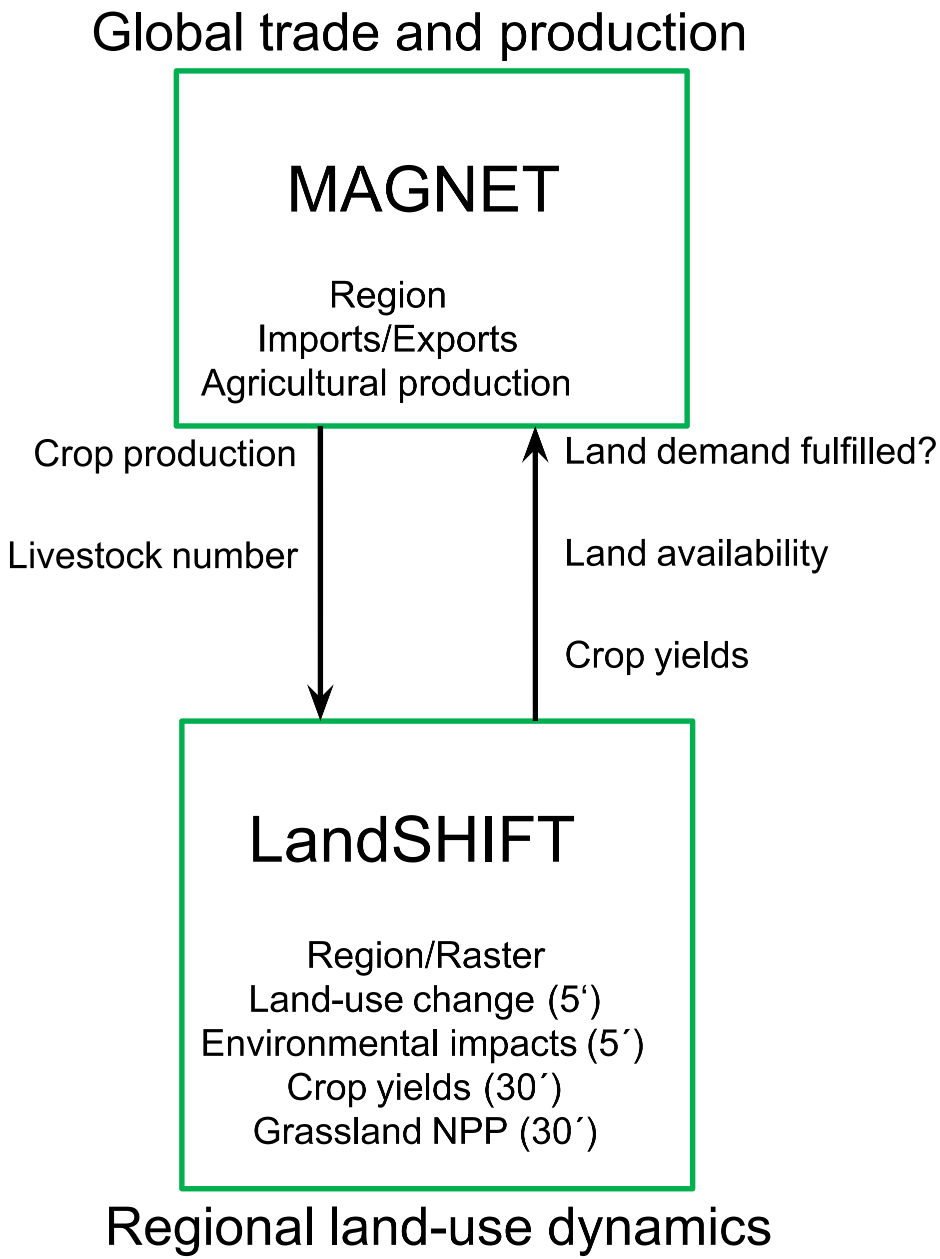
Overview

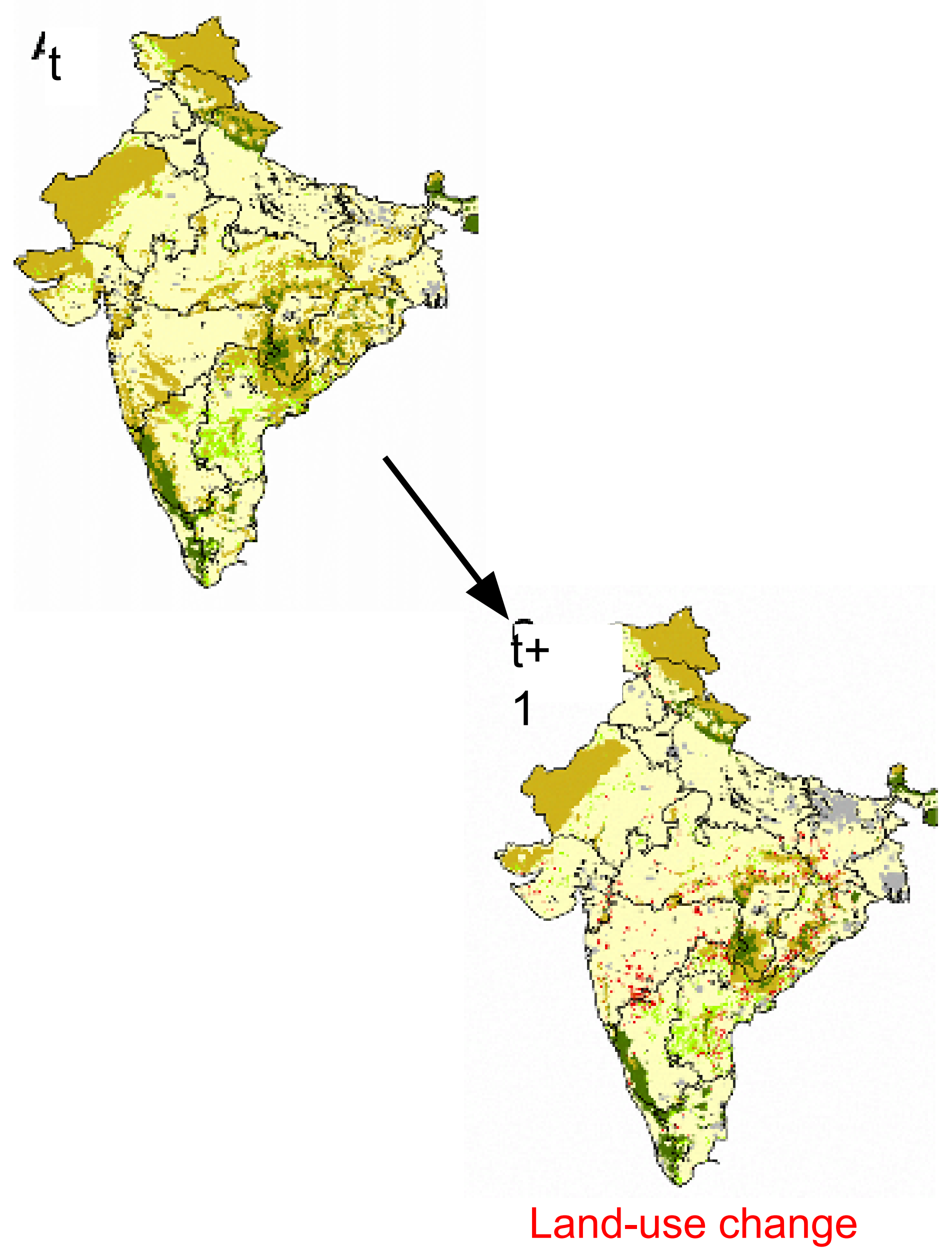
1. Background and Objectives
2. Monitoring and Land-use Change Models
3. Optimized Monitoring Systems
4. Optimized Monitoring and Land-use Change Models
5. Examples

Background and Objectives

- Monitoring has become an integral part of many environmental, economic and social programmes.
- The Sustainable Development Goals, REDD+, as well as many governments call for integrated monitoring and appropriate sets of indicators.
- Land-use change models can contribute to monitoring efforts and the establishment of indicators.

Spatial Explicit Land-use Change Modelling



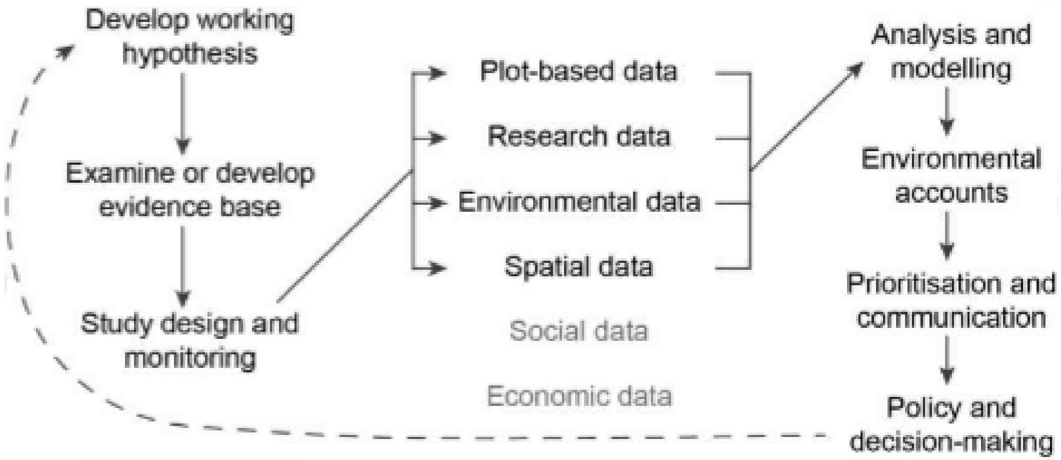


Land-use Change Models

- simulate future pathways and scenarios
- assess hotspots and competition
- identify indirect land-use change

In a monitoring framework land-use change models can help:

1. identify monitoring goals and target areas
2. define and calculate indicators
3. optimize the design of monitoring networks



Lindenmayer et al.

Optimized Monitoring Systems

Designing optimized monitoring systems needs to incorporate significant planning objectives and at the same time consider social, economic and environmental constraints.

Designing water quality monitoring networks in river basins
(Pérez et al, submitted 2017)

- number of monitoring stations – minimized
- high pollution area (modelled) – maximized
- impacted population – maximized
- areas of high structural importance – maximized
- number of stations - constraint

Design of Optimized Monitoring Networks

risk related

- pressure
- drivers
- expected impact
- sensitivity
- uncertainty

research related

- knowledge gaps
- information gaps

management related

- cost
- existing network
- existing infrastructure
- time
- accuracy needed
- impact of monitoring
- accuracy of methods

object related

- spatial variation
- detectability

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model related

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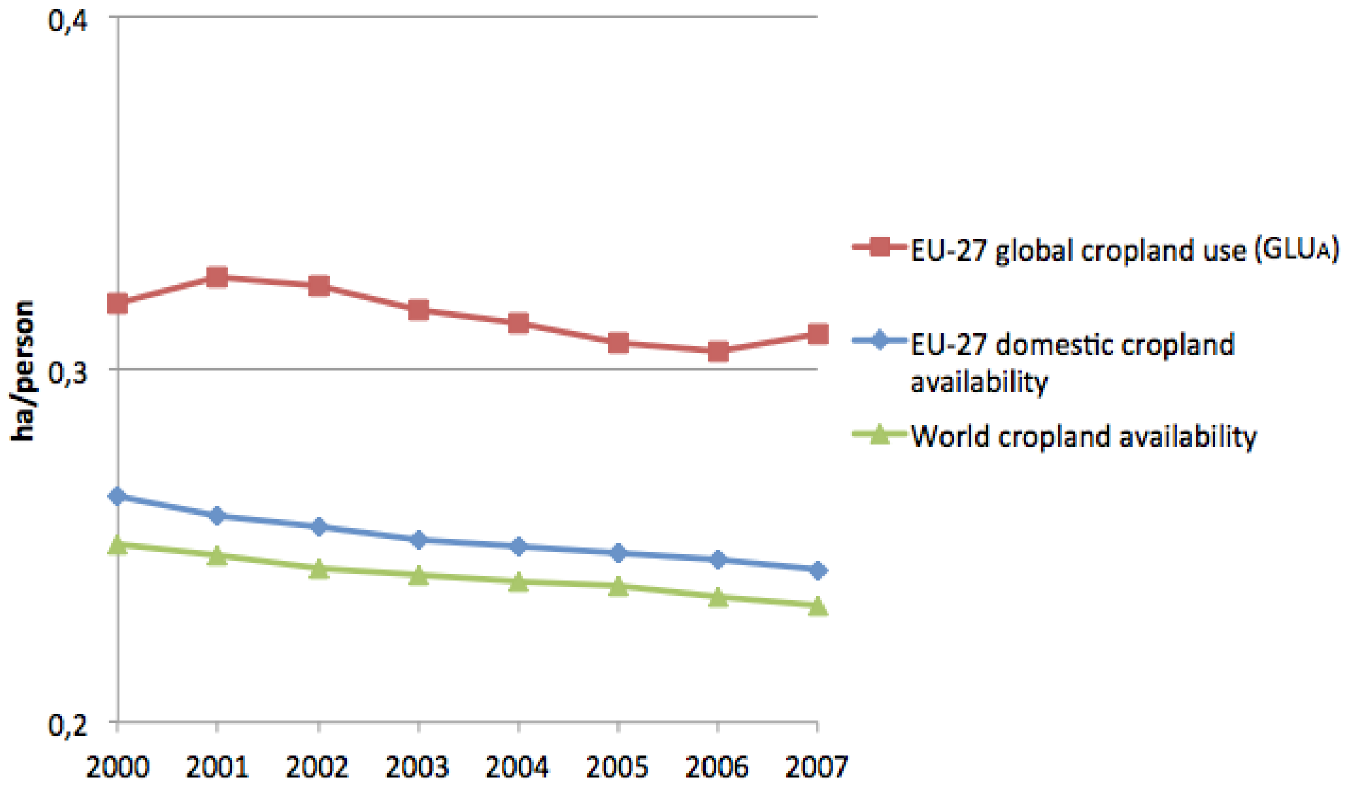
Example – exported land-use change

drivers

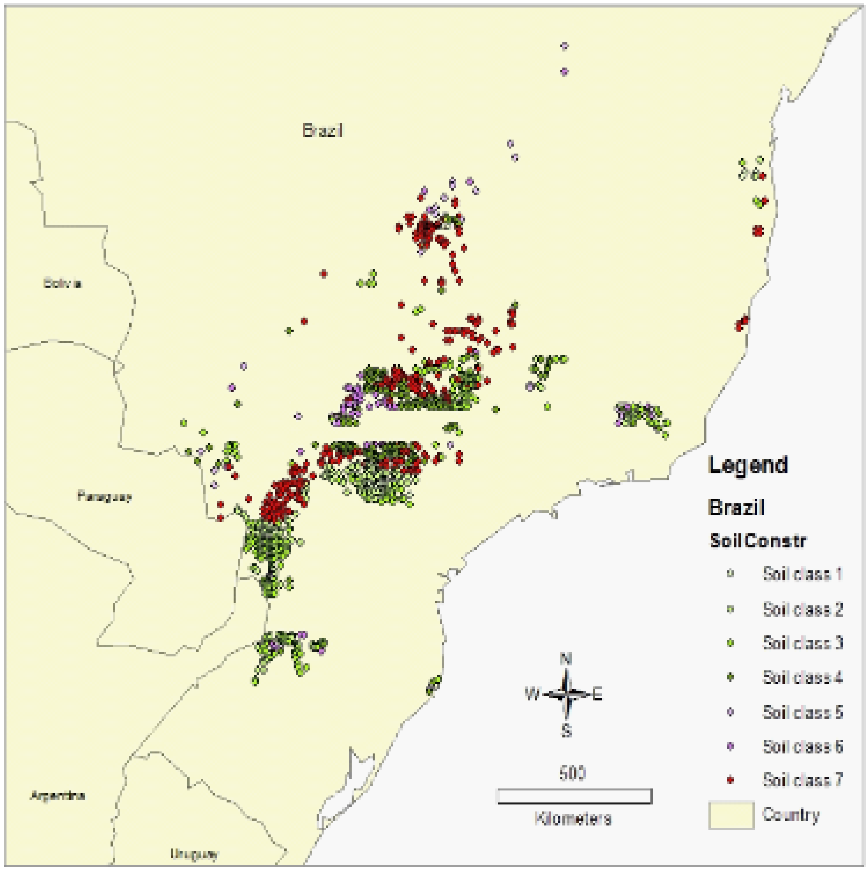


(source: Bringezu 2014)

Example – risk of reduced soil fertility

pressure

drivers



bioethanol in Germany 2012:
68,23 PJ = 2.555.348. t

imported from Brazil:
1,12PJ = 43.701 t
(source: BLE 2013)

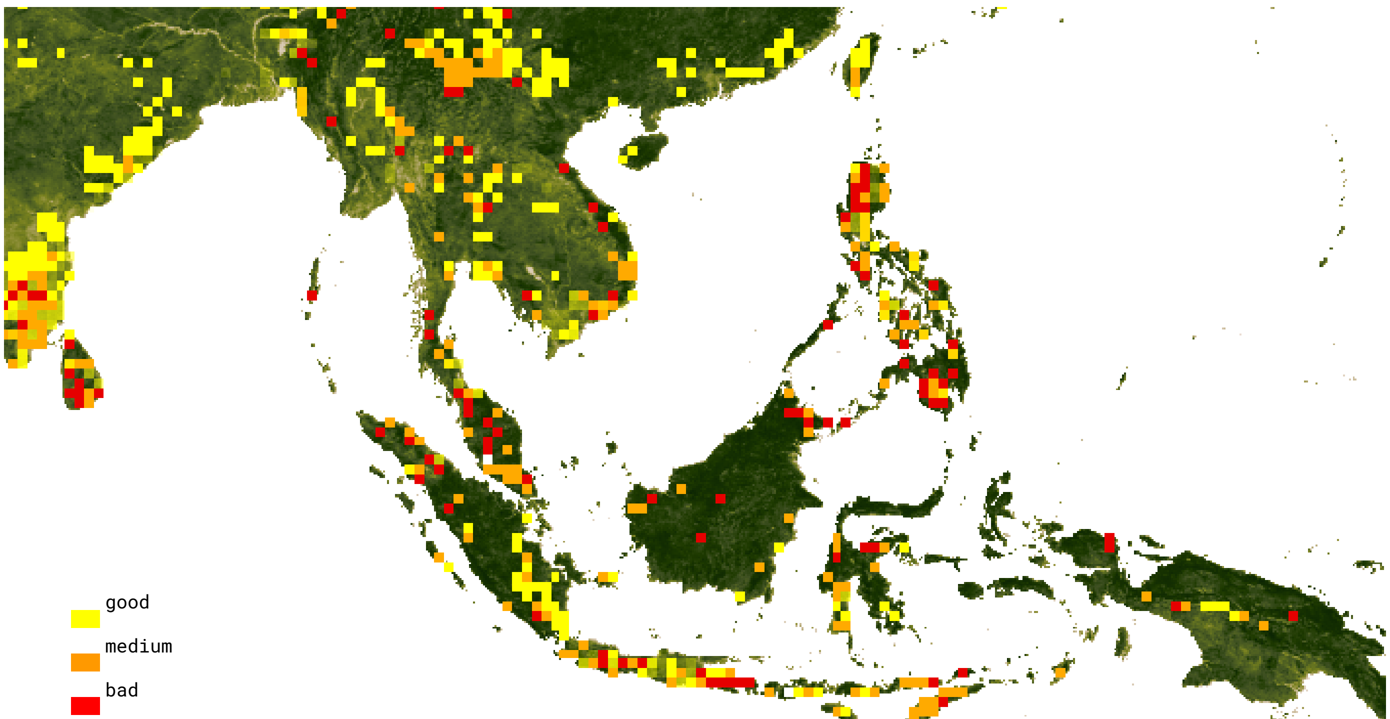
suitability	percentage of crop	ethanol xported o ermany 2012)
good	63,5%	27.736 t
medium	9,0%	2.924 t
bad	27,6%	12.041 t
		43.701 t

(source: OEKO,CESR,data from 2007)

Example – REDD+ afforestation

pressure

uncertainty

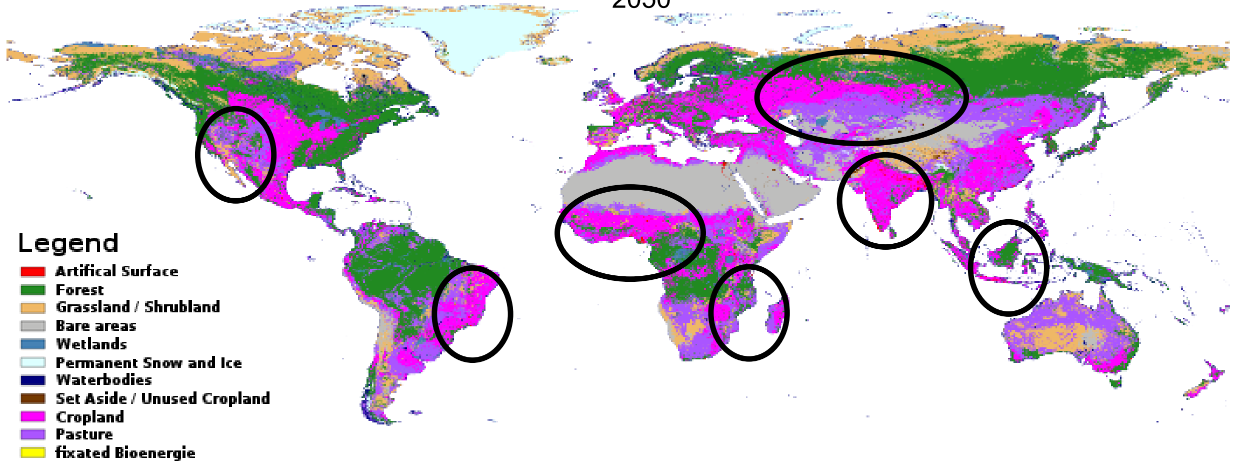


robust biophysical suitability
for afforestation

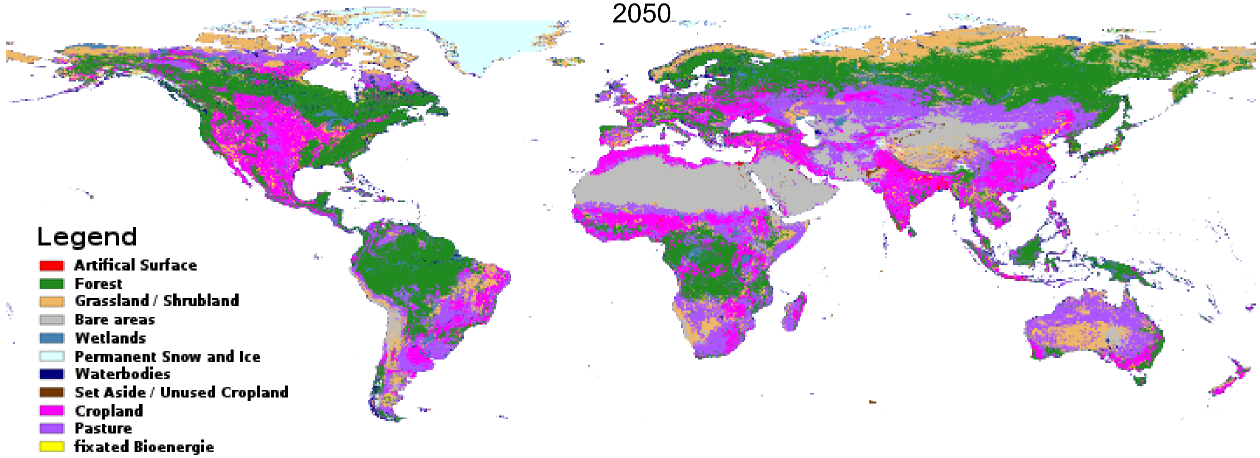
Thank you !!!

Globale Landnutzungsänderungen

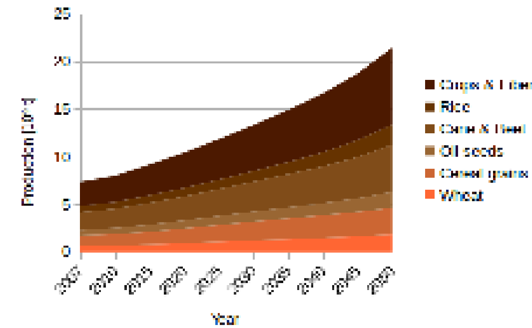
Land-use
fuel business as usual (KS BAU) - 2050



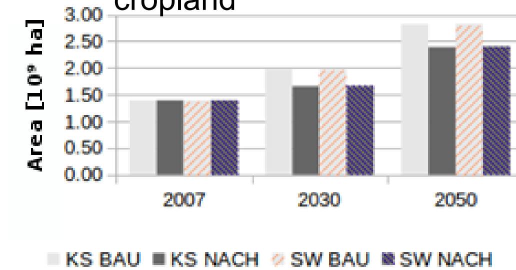
Land-use
fuel sustainable (KS NACH) - 2050



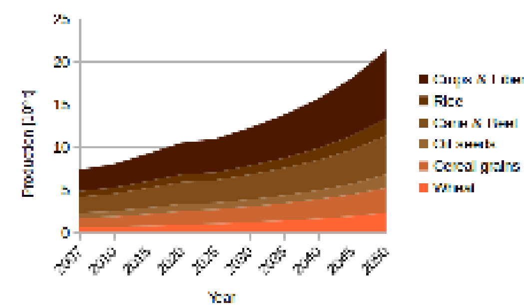
Global production BAU Scenario



Global used cropland



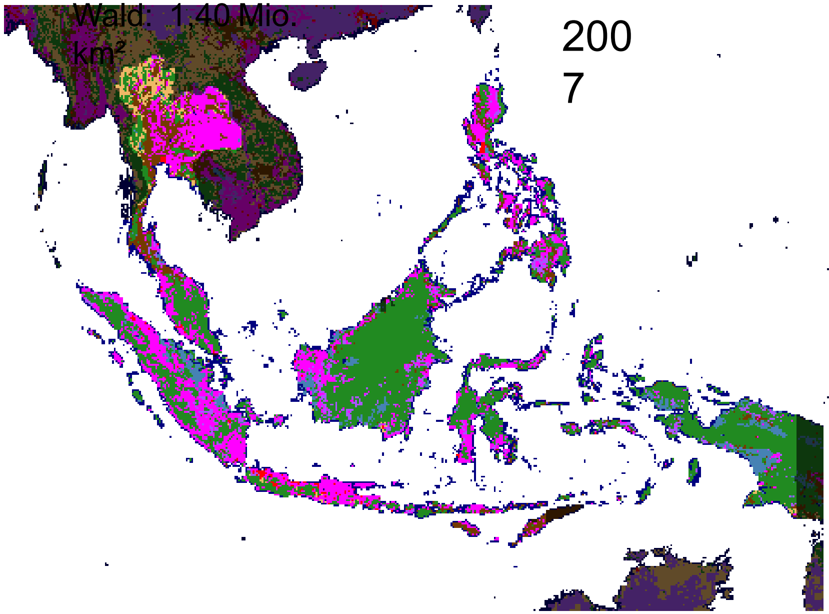
Global production NACH Scenario



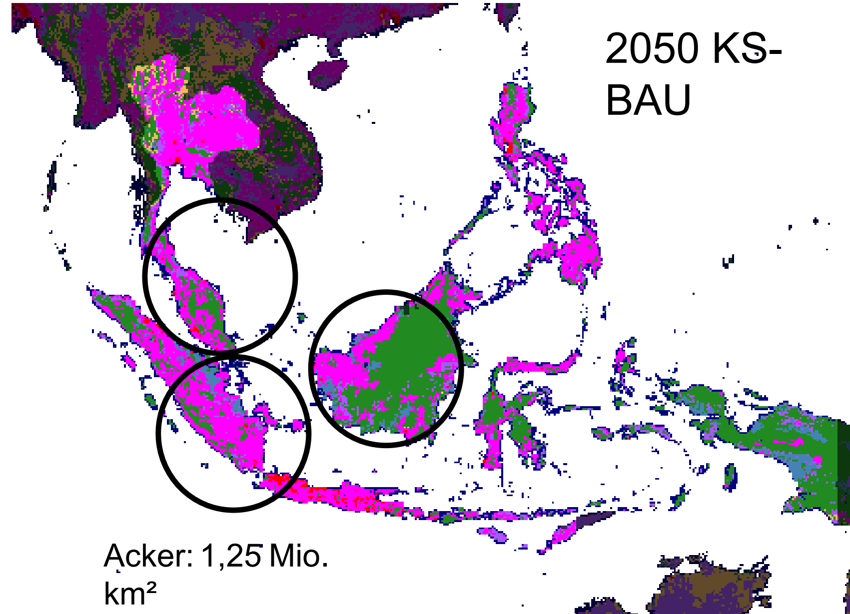
Fokus Süd Ost Asien

Acker: 0,76 Mio. km²
Wald: 1,40 Mio. km²

2007

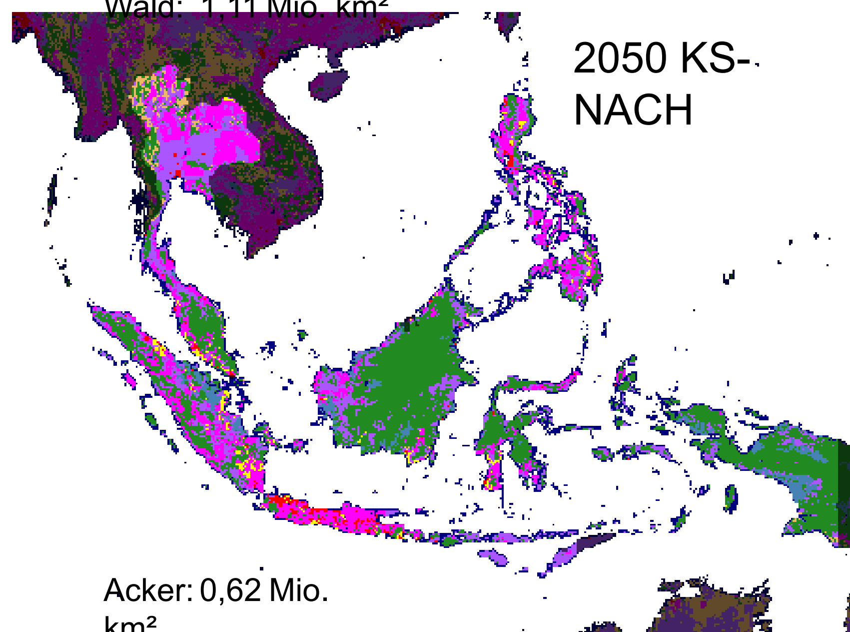


2050 KS-BAU



Acker: 1,25 Mio. km²
Wald: 1,11 Mio. km²

2050 KS-NACH



Acker: 0,62 Mio. km²
Wald: 1,35 Mio.