DOE-OBP Land-Use Change and Bioenergy Workshop: Alternate Paradigms for Land-Use Change Analysis

‘3 x 5’ Presentation

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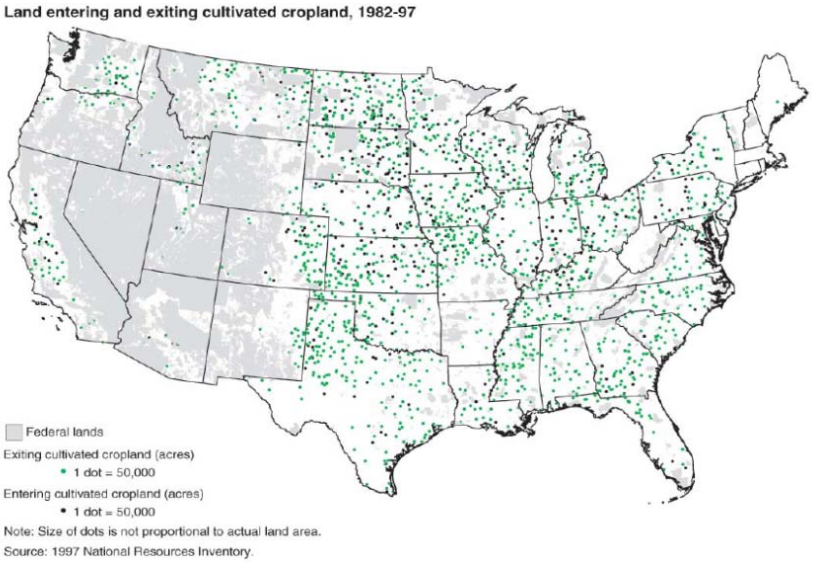
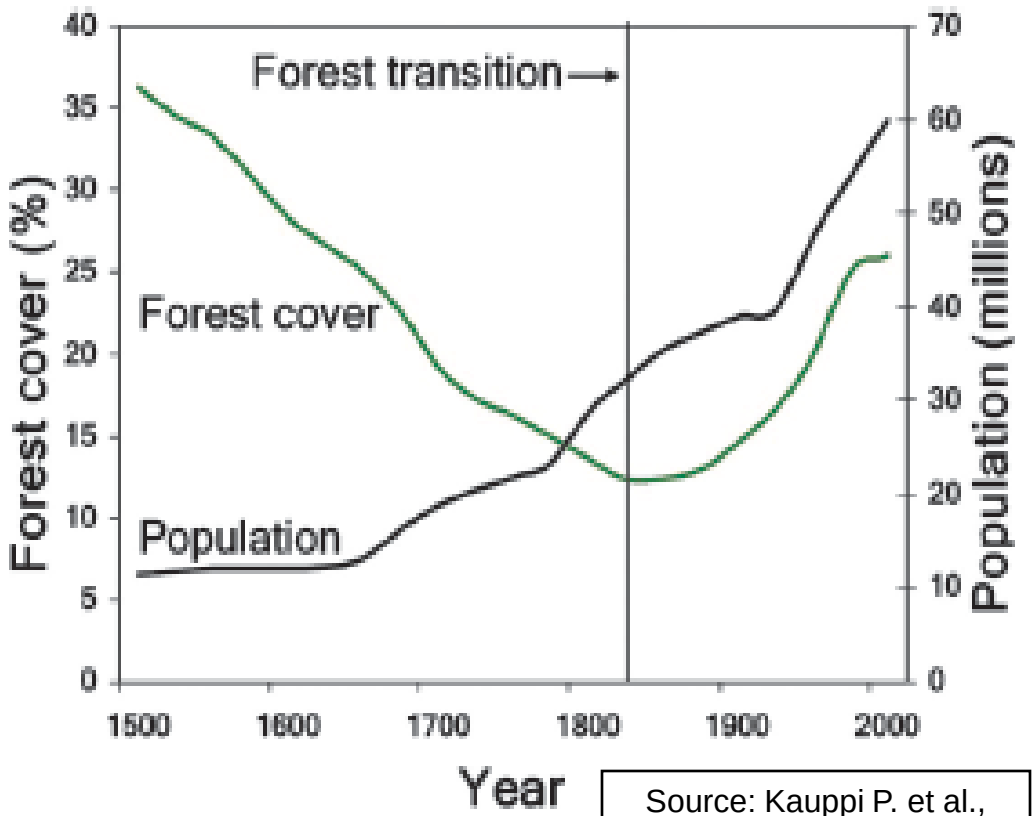
Alternative Paradigms for LUC

- LUC analysis always relative ("change" compared to what?) and scale-dependent
  - Spatial/Temporal, Past and future
  - One year/5 yrs/30 yrs/ 100 yrs…
- Models assume static state but land is in constant transition (before and after measurements)
  - Land cover is not land use
  - Current use does not explain causes
  - Cover analysis may have no relationship to causes for initial conversion
  - Long term, multi-disciplinary analysis required to determine causation
- What indirect effects are within "reasonable manageable interest"?
- Continue debate indefinitely? Or take action?
- New paradigms:
  - Identify win-win for emissions, energy security, food security, development (sustainable system scenarios)
  - Learn from experience; keep it simple
  - ***What "works" to reduce deforestation = better indicator of drivers of LUC***



Alternate paradigms - Mather Curve

- **Not all LUC equal**
  - **Expanding "ag frontier" (first time conversion) = key concern**
  - **Mather curve (net total forest cover)**
- **What is *evidence* for market-mediated impacts on curve?**
  - **On change rate?**
  - **On bottom? On upturn?**
- **Improve land *USE***
  - **Things we *can* measure**



Source: Kauppi P. et al., PNAS 2006

Good governance, economic development (improved markets/prices) are key to making the turn, reducing deforestation. Different nations, different stages on curve… potential equity issues.

Alternate paradigms – ongoing research

Economic Models (theoretical systems)	Empirical Evidence (from planet earth)	Alternative Paradigm
Baseline = equilibrium state: all land assigned to use class (crop, pasture) with fixed area; assumed to be optimal allocation. No excess production or losses. Previously cleared but underutilized land is omitted as asset class. World treated equally. Any demand increase (shock) requires land area expansion to increase production. Land assets are privately owned. Asset management governed by (crop) market signals; higher prices = expanded area for that crop.	Baseline = land cover and use in constant flux. Actual uses and allocations are not optimal. Excess production and losses are normal (especially if price is low). Majority of available lands (previously cleared) are under-utilized or fallow in any given growing season. Distinct land conversion stages: Initial settlement (extraction, claims) = clearing until "transition" reached. Subsequent cropland change: net reductions in cultivated area in face of rising demand and output. Frontiers: land assets not owned. Increase prices stimulates more efficient use of land and reduced losses.	*Drivers of initial conversion are distinct from later management.* Governance, extractive enterprises, and land claims - strong *initial* change drivers. Demand shocks accelerate change toward more efficient production, higher yields, lower losses (opposite of CW model assumptions). Models based on better data for land classes, transitional stages and drivers will verify historic trends, alternate paradigm. Develop improved "reference case" for trends, patterns. Calibrate locally; scale-up incrementally.