Deforestation & Land Use Change

Jen Burney

Professor, Marshall Saunders Chancellor’s Endowed Chair in Global Climate Policy & Research

Photo: Axel Fassio (CIFOR)
~600 million farms
500 million are family farms

Many are food insecure
Lots of land pressure
Fig. 1. Carbon sinks and sources (Pg C year$^{-1}$) in the world’s forests. Colored bars in the down-facing direction represent C sinks, whereas bars in the upward-facing direction represent C sources. Light and dark purple, global established forests (boreal, temperate, and intact tropical forests); light and dark green, tropical regrowth forests after anthropogenic disturbances; and light and dark brown, tropical gross deforestation emissions.
Not all CO$_2$ is equal from the climate’s perspective

- CO$_2$ emitted from land use change behaves the same in the atmosphere.
- But the deforestation or land conversion itself changes future carbon uptake potential.
- Also albedo changes, and downstream hydrological changes.
Fraction of main growing season water originating from land
Not all CO$_2$ is equal from the climate’s perspective

- CO$_2$ emitted from land use change behaves the same in the atmosphere.

- But the deforestation or land conversion itself changes future carbon uptake potential.

- Also albedo changes, and downstream hydrological changes.

Proposition: Social cost of carbon from land use change is fundamentally different than social cost of fossil carbon.
Not all land conversion is equal from a food security perspective

- Smallholder land degradation and encroachment often directly or indirectly driven by food insecurity and economic hardship.

- Large scale encroachment often driven by non-food demand (of different food security value).

- What is expansion contribution to improved food security? Hypothesis - weak!

Proposition: Need new institutional frameworks to directly address this vicious cycle.
Policy environment for freezing food’s footprint

Global crops production in any year:

\[ P = \sum_{c} \sum_{s} Y_{cs} \cdot A_{cs}^{planted} \cdot HAR_{cs} \]

- c: crop type
- s: season
- Y: yield (t/ha)
- A: area planted to crop c (ha)
- HAR: fraction of A harvested ∈ (0,1)

This needs to be kept constant.

Need to understand the dynamics of each of these, with local specifics.
What are the unique features of this problem?

- **Biophysical dimension**: changes in carbon and water cycles under warming and other environmental changes.

- **Time dimension**: the need to preserve carbon sinks never goes away; it’s never fully solved.

- **Dynamics dimension**: Considerations have to include both smallholders and multinationals, global food security depends on both.

- **Normative dimension**: Humanitarian imperative will always allow for deforestation/degradation if it’s a plausible response to a crisis. Need for new institutions to address this concern specifically (i.e., when and where is it ok to deforest to save lives?)

- **Economic/Policy dimension**: Markets don’t take care of this (even with externalities) if food prices are high. Need policy. But lots of noise and less signal over past couple decades.
Timely opportunity

- Going to hear about international environment and voluntary initiatives.

- **COP 26**: Glasgow Declaration to End deforestation by 2030. Not thinking about food as a driver!

- **COP28**: The COP28 Presidency is prepping and seeking country signatories for a Leaders’ Declaration on Food Systems, Agriculture, and Climate Action. There may be a brief window to influence the declaration contents, specifically on targets on the date by which food systems GHGs should peak and the residual emissions budget for the sector. What does this group recommend and why? What do we forecast?
Thank you!

jburney@ucsd.edu