Reconciling Conservation of Tropical Forests and Food Production: Challenges and Opportunities

Third Annual International Food Security Symposium
Tuesday, April 4th, 2017
University of Illinois at Urbana-Champaign

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The world’s largest agriculture frontier
Agriculture and forests

• Can the expansion of cropping systems influence deforestation rates?

• What’s the role of agriculture expansion in altering forest disturbance regimes?
Cattle ranching

60-70% of deforested areas
Mechanized agriculture

12% direct deforestation
Why deforestation decreased?

Nepstad et al. 2014
Agriculture will lower deforestation if it...

- Decreases demand for new deforestation.
- Increases risks to those engaged in deforestation.
- Reduces the supply of undesignated claimed forestland – target of land speculators.
Production x Deforestation

Mato Grosso

Macedo et al. (2012)
Sparing land or buying out time?
Displacing deforestation?

Cumulative loss (thousand km²) vs. Year

- **Biome**: Amazon (red solid line) and Cerrado (orange dashed line)

<table>
<thead>
<tr>
<th>Year</th>
<th>Amazon Loss (thousand km²)</th>
<th>Cerrado Loss (thousand km²)</th>
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<tbody>
<tr>
<td>2004</td>
<td>650</td>
<td>700</td>
</tr>
<tr>
<td>2008</td>
<td>750</td>
<td>800</td>
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<tr>
<td>2012</td>
<td>800</td>
<td>850</td>
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<tr>
<td>2016</td>
<td>850</td>
<td>900</td>
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</tbody>
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Agriculture x disturbance regimes

- Climate (precipitation and warming)
- Fragmentation (edges)
- Fire (ignition)
Costa et al. 2007
Amazon edges

Between 2004 and 2008, IPAM-WHRC provided science-based guidance to Amazon in this process. 12-16% of Amazon forests near an edge.

Brando et al. 2014
Testing the limits of Amazon forests

Tanguro

Brando et al. 2013
Fire-induced tree mortality

- Burned 3yrs
- Burned Annually
- Control

3°C Warmer
20% Drier

Cumulative Tree Mortality vs. Years

Brando et al. 2014 PNAS
Since 2004 IPAM/WHRC have studied the impacts of drought-fires on forest dynamics stability.
Cropping and fire ignition
Cropping and fire ignition
Discussion points

• Can agriculture intensification lead to land sparing in tropical regions?

• Are the climatic changes caused by agriculture intensification/expansion large enough to accentuate a large-scale forest dieback?

• Multiple disturbances can lead to rapid forest degradation, but it is still unclear how much of the region is exposed to such disturbances.