Next frontiers in global land cover/land use monitoring

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Outline

• What global land cover/land use datasets are available?
• How has the quality of these data changed over time, including the level and types of uncertainty in the data?
• To what extent have crops expanded globally and replaced natural ecosystems?
• How have crop yields and utilizations for biofuel feedstocks changed over time?
• Key takeaways
2,500x more information
<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Resolution</th>
<th>Years</th>
<th>Data Producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODIS/Terra+Aqua (NASA)</td>
<td>Global land cover MOD12Q1</td>
<td>500m</td>
<td>2001-2019</td>
<td>Boston University (Friedl)</td>
</tr>
<tr>
<td>Sentinel-1 and Sentinel-2 (EU Copernicus)</td>
<td>Various</td>
<td>10 m</td>
<td>2020</td>
<td>ESA WorldCover*, ESRI / Microsoft / Impact Observatory Google*, TerraPulse*^</td>
</tr>
<tr>
<td>Landsat 9 + precursors (NASA/USGS)</td>
<td>Global Land Cover Change</td>
<td>30 m</td>
<td>2000-2020</td>
<td>Boston University (Friedl)*, UMD GLAD (Hansen/WRI)</td>
</tr>
</tbody>
</table>

*unpublished  ^ proprietary
HILDA+: a global land change allocation model

Winkler et al. 2021 Nature Climate Change
Evaluation of map quality and uncertainty

Sample-based analysis has two main objectives:
1. To estimate areas and their associated uncertainties
2. To assess map accuracy

Potapov et al. 2022 Nature Food
Global cropland extent and change (2003-2019)
Half of new cropland replaced natural ecosystems

Land Cover change to and from Cropland

<table>
<thead>
<tr>
<th>Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture &amp; abandoned agricultural land</td>
<td>51</td>
</tr>
<tr>
<td>Restored forests and natural vegetation</td>
<td>16</td>
</tr>
<tr>
<td>Built-up Area</td>
<td>16</td>
</tr>
<tr>
<td>Other intensive agriculture</td>
<td>13</td>
</tr>
<tr>
<td>Water (natural and water reservoirs)</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Authors.
Deforestation linked to key commodities, 2001-2015

Goldman et al. 2020, WRI Technical Note
Deforestation linked to key commodities, 2001-2015

Goldman et al. 2020, WRI Technical Note
6 Key Takeaways

1. Satellite-based land cover and land use information is increasingly available, and will continue to be improved and refined over time.

2. Precision of land cover maps has increased, and good practice methods are available to estimate uncertainty and map accuracy.

3. Cropland area has expanded by 9% worldwide over the past 20 years, with the fastest rate of expansion in Africa.

4. Globally, half of all crop expansion replaced natural ecosystems. Crops have also replaced pasture land, and pasture continues to expand into tropical forests.

5. Crop area harvested for export and industrial use has increased faster than for food and feed, and yields for industrial and feed uses are rising faster than for food.

6. The world faces intense competition for land to meet global food, energy, climate and biodiversity goals.
Land and Carbon Lab presents: What Does Cropland Expansion Mean for People and the Planet?

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March 03, 2022 · 8 - 9:15am EST · Online

Registration Link