The impacts of carbon values on optimal rotation ages and end-uses of forest products

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Overview

• Background: carbon neutrality, carbon debt
• Carbon and sustainable forest management
• Carbon substitution or storage in end-uses
• Permanent carbon storage in forests
• Policy implications
Background

- Forests, carbon and bioenergy
- What do we mean by carbon neutrality?
- Carbon debt, emissions and stock changes
- Carbon costs and benefits occur throughout the rotation and the life-time of forest products
- Harvesting and carbon release is a “decommissioning cost” of forest production
Optimal rotation age

Pine, Northern Europe, Yield Class 6 (m³/ha/yr maximum MAI)
(Carbon value: USD 10/tCO₂eq)
Marginal changes to optimal rotation ages

<table>
<thead>
<tr>
<th>Discount rate</th>
<th>Years to add per USD 5 increment in CO₂ value (range 0-20)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Under yield class 8</td>
</tr>
<tr>
<td>5%</td>
<td>3.0</td>
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<tr>
<td>3%</td>
<td>4.0</td>
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</tbody>
</table>

- Little impact on high-value crop (e.g. *T. grandis* in India)
- Big impact on low-value crops, for example:
  - YC 13, USD 10/m³: +1 year for every USD 1/tCO₂eq value
  - YC 6, USD 10/m³: +2 years for every USD 1/tCO₂eq value
- No harvesting is only justified where crop value is much lower than carbon value
Policy implications

1. Rotation ages should be extended in forests managed for commercial production.
2. Focus should be on forests producing low value wood (yield is a less important factor).
3. Carbon debt is a valid concept, but no harvesting is only optimal under very restrictive assumptions.
4. Bioenergy will lead to climate benefits in many cases, but the policy is lopsided (and contradicts 1 above).
5. There would be implementation challenges, but extending rotations could be quite cost-effective.
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