Forestry and Forest Products Carbon Cycle and its contribution to mitigate Climate Change.

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ENRIQUE VALERO
Targets, strategies and one Question:

TARGETS of WG F & CC:
- Improve contribution of forests to CC mitigation
- Adaptation of forest ecosystems to CC
- The role of forests in helping society adapt to CC

MITIGATION STRATEGIES:
1. Carbon reserve management
2. Carbon substitution management

QUESTION:
What should be the role of Forestry, Forests and Forest Products in the Europe of the future?
## Repositories for carbon storage in terrestrial ecosystems

<table>
<thead>
<tr>
<th>“Carbon Sink”</th>
<th>Classes</th>
<th>Example</th>
<th>Average Permanence Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biomass</strong></td>
<td>Woody B.</td>
<td>Stems, branches,…</td>
<td>Decades to Centuries</td>
</tr>
<tr>
<td></td>
<td>Non-Woody B.</td>
<td>Leaves, Herbs,…</td>
<td>Months to Years</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>Litter</td>
<td>Litter, harvest residues…</td>
<td>Months to Years</td>
</tr>
<tr>
<td></td>
<td>O. M. Active</td>
<td>Partially decomposed litter,…</td>
<td>Years to Decades</td>
</tr>
<tr>
<td></td>
<td>Stable Organic matter</td>
<td>Organic Matter stabilized by clay, peat…</td>
<td>Centuries to Milennia</td>
</tr>
<tr>
<td><strong>Products</strong></td>
<td>Wood Based Products</td>
<td>Building Materials, Furniture,…</td>
<td>Decades to Centuries</td>
</tr>
<tr>
<td></td>
<td>Paper, Textiles</td>
<td>Paper, paperboard, textile fibres,…</td>
<td>Months to Decades</td>
</tr>
<tr>
<td></td>
<td>Waste</td>
<td>Wood and Paper in Landfills</td>
<td>Months to Decades</td>
</tr>
<tr>
<td></td>
<td>BioFuel</td>
<td>Firewood, harvest residues, forest biomass,…</td>
<td>Weeks to Months</td>
</tr>
</tbody>
</table>

Fuente: Valero et al 2003
Forestry Contribution in C Sequestration:

- Increase of Forest Areas
- Timber Crop and Products
- Substitution of Fossil Fuels
Increase of Forest Areas
Abandoned pasture

8-year-old *Eucalyptus nitens* stand

4-year-old *Pinus radiata* stand

Abandoned pasture
Increase forest areas (Reforestation, afforestation)

Estimation of CO2 balance in a Forest Management Unit through existing simulation models.

(simulating by CO2Fix)

Collecting C is faster in biomass but sequestration in soil is more stable.

It’s necessary to take into account:

• Preexisting Vegetation
• Previous work in soil

Example: Avoid

• Deep or intense preparation of soil (loss of fixed carbon)
• Bury vegetable debris (methane)

Source: Valero (2002)
CO2Fix Model developed by CASFOR project
(ALTERRA, UNAM, CATIE and EFI)
C-Stocking in a Eucalyptus Stand
Case of a single rotation of 16 years and no reforestation after harvesting

Sink potential is about $112.58 \text{TmC/ha}$
Annual sequestration of $7.04 \text{TmC/ha/year}$.
Comparación de la Estimación del Carbono en la Biomasa entre los datos de campo y la simulación de CO₂Fix
THE GREAT PARADOX

IMPORTANCE OF PLANTED FOREST:

- UN, AGENDA 21, UNCCD, UNFCCC, CBD, FAO, ITTO, IUCN, CIFOR, MCPFE, EU, FAP, EESC, etc.

FOREST ROLE AS:

- Capacity of C sequestration (in 2005, 315 Mt CO2, 8 % GHG EU)
- Welfare of adjacent communities
- Provision of environmental services
- Soil erosion protection and well structured watersheds
- Organic Matter and Nutrient balances
- Restore degraded landscapes
- Take the pressure for raw materials away from native forests

THE DATA, PF ARE LESS 2% OF GLOBAL LAND USE (FAO, 2008):

- 271 MHAs of PF sequestered 1.5 Gtons of C per year
- Additionaly 0.5 GTons of C are stored long-term in products / year.
Aumento del Área Arbolada

Aprovechamientos y Productos de madera

Sustitución de Combustibles Fósiles

Forestry
Forestry and Sustainable Forest Management

1. Increment of productivity
   [ Thinning, Fertilisation, mixing species … ]

2. Consciencious soil management

3. Prevention of Forest Fires

4. Sustainable Forest Management (MCPFE)

5. Careful rotation selection

6. Adaptation measures to CC
C-Stocking in a Eucalyptus Stand
Case of a 3 rotations of 16 years
Belowground Biomass: a key factor (especially in coppice silviculture)

Disasters

Figure 2: Cumulated wind storm damage (million m³) from 1865 to 2000 (after Doll, 1991 and updated [3])
Forest Adaptation Problems to CC

– BIOTIC PATHOLOGY AGENTS

• Mountain Pine Beetle:
  8 million hectares (400 millions m³) affected in Canada
From EFFIS (JRC) data and applying 2006 IPCC Guidelines for National Greenhouse Gas Inventories methodology
Comparing CO₂ forest fires emissions with certified industrial sectors in Galicia.

1.747,272,65 Mg CO₂

Millones Toneladas de CO₂
Aumento del Área Arbolada

Selvicultura

Timber Crop and Products

Sustitución de Combustibles Fósiles
From a carbon sink…
... to a source?
Must wood harvesting and manufacturing be outside of a C Strategy?

No

1.- Important Volume in long life wood products
2.- Powerful Substitution Effect
3.- Rural Development and other social and economic implications
4.- Enhancement possibilities

The substitution effect is a permanent effect substituting fossil-based energy and fossil-based raw materials by forest based products.

Fruehwald et al. (1994) made a statistical approach to estimate the mass of carbon in wood products. In Germany the volume of wood products in use equals to 335 Mill. tons carbon (33 % of carbon stored in above ground biomass in German forests).
Example of the substitutive effect in products

**Floor manufacture**

![Bar chart showing CO2 emissions for different floor manufacturing processes.](chart.png)

Fuente: Werner et al 2003
Net emissions of CO₂ including carbon sink effect

Rigid PVC
Steel
Recycled steel
Aluminium
Red brick
Light concrete block
Sawn timber

Window frames: the environmental impact

GWP: Global Warming Potential (CO₂ eq.)
AP: Acidification Potential (SO₂ eq.)
EP: Eutrophication Potential (PO₄ eq.)
POCP: Photochemical Ozone Creation Potential (C₇H₄ eq.)
Flooring: the environmental impact

- **GWP**
  - Wood
  - Vinyl
  - Linoleum

- **AP**
  - Wood
  - Vinyl
  - Linoleum

- **EP**
  - Wood
  - Vinyl
  - Linoleum

- **POCP**
  - Wood
  - Vinyl
  - Linoleum

**kg/m² of emissions**
- By substituting wood for PVC up to 0.5 t CO₂ can be saved

Each 10 Windows

- By substituting wood for Aluminium to 4.0 t CO₂ can be saved
Aumento del Área Arbolada

Selvicultura

Aprovechamientos y Productos de madera

Substitution Of Fossil Fuels
Substitutive effect fossil fuels (permanent)

Fuentes de Energía en la industria forestal gallega

Fuente: Valero et al 2002
Substitution of Carbon Intensive Fuels
Substitution of Carbon Intensive Products
Landfill
Short Life Products
Long Life Products
Living Biomass
Litter
Soil

Adapted from Marland and Schlamadinger 1999
Ejemplo: de una especie generica con rotación de 40 años
2008

Referencia: 1 Enero de 1990

*Generic species with 20 year rotation*

- Sustitución de Combustibles Fósiles
- Sustitución de Productos
- Vertedero
- Productos de Vida corta
- Productos de Vida Larga
- Arbolado
- Litter
- Suelo

*First Kyoto period*
Kyoto Protocol  Article 3

“removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article….”

Also arts. #3.3, #3.4, #6 & #1 must be considered
REGISTERED CDMs (26.03.2009)

- (01) Energy industries (renewable / non-renewable sources)
- (10) Fugitive emissions from fuels (solid, oil and gas)
- (13) Waste handling and disposal
- (15) Agriculture

- (04) Manufacturing industries
- (05) Chemical industries
- (08) Mining/mineral production
- (11) Halocarbons and sulphur hexafluoride
- (14) Afforestation and reforestation

3 FORESTRY CDMs out of 1,880 total registered CDMs
0,16%
Energy industries (renewable - / non-renewable sources) (1)
Afforestation and reforestation (14)
Manufacturing industries (4)
Chemical industries (5)
Waste handling and disposal (13)
Transport (7)
Metal production (9)
Fugitive emissions from fuels (solid, oil and gas) (10)
Energy demand (3)
(11) halocarbons and sulphur hexafluoride

17 REGISTERED METHODOLOGIES FOR FORESTRY CDMs out of 160 total registered methodologies for CDMs 10,16%
From 277,2 Mill T CO2 eq CER in Registered Projects

216,633 CERs (T eq CO2) Annual account of all forestry CDL approved in the world Equivalent to 8,5 days

83% Moldavia

37,391 CER (0.013%) of real forestry CDM (1.5 days)
TALE ESTE MISMO.
CREO QUE TIENE EL TAMANHO
IDEAL PARA SACAR LOS TABLONES
CON LOS QUE HACER LA MESA EN
LA QUE SE FIRMARA EL ACUERDO
PARA CONTROLAR EL CAMBIO
CLIMÁTICO.
CONCLUSIONS: Is Forest Carbon Sequestration a Viable C Strategy?

• Recognition and enforcement of European forest, forestry and silvicultors is necessary

• Policy Instruments and measures for conscious carbon forest management are urgent (SFM)

• Forest sector needs to mobilise sustainable products in form of raw materials and biomass

• Strengthen use of forest measures in context of R&D Policy and other funding mechanisms

• Review LULUCF measures into CDM

• EU could lead the real role of forest in CC in the forthcoming commitments and to DC
Thank you very much for your attention!