Forest accounts in the SEEA-2003

Workshop on Forest Accounting

Rio de Janeiro

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Overview

- Objectives
- Physical accounts
- Links between FRA 2010 and SEEA
- Methods to value forests
- Accounts for carbon
- Issues in the revision of the SEEA

Objectives

Forests are at the centre of many environmental and economic issues including energy supply, local community subsistence base, biodiversity protection, tourism, soil erosion, stability of water cycles, climate change etc.

- Accounts for forest land and timber show how forests develop over time
- Physical accounts help determine threats from timber extraction and from other interventions
- Monetary accounts help understand the economic significance of the forest resources
- The accounts allow for the derivation of environmental indicators and data for the national accounts

SEEA assets related to forests

EA.1 Natural resources

- EA.12 Soil resources (m^3, tons)
  - **EA.122 Non-agricultural**
- EA.14 Biological resources
  - **EA.141 Timber resources (m^3)**
    - **EA.1411 Cultivated (Pof AN.1221)**
    - **EA.1412 Non-cultivated (Pof.AN213)**

EA.2 Land and surface water (ha)

- **EA.23 Wooded land (Pof.AN.2112,2113,2119)**
  - **EA.231 Forested land**
    - **EA.2311 Available for wood supply**
    - **EA.2312 Not available for w. s.**
  - **EA.232 Other wooded land**

EA.3 Ecosystems

- EA.31 Terrestrial ecosystems
  - **EA.313 Forest ecosystems**

Cultivated timber resources

- Trees ***whose natural growth and/or regeneration is*** under the direct control, responsibility and management of institutional units
- Processes must constitute production in the SNA sense and not consist of just legislative control.
  - Control of regeneration; for example, seeding, planting of saplings, controlling the fertility of livestock
  - Regular and frequent supervision of the plants to remove weeds or parasites, attend to illnesses

Why is it important to distinguish cultivate and non-cultivated forest

- Cultivated forest are inventories in the national accounts
- Net growth in cultivated forest is a process of production – have impact on GDP
- Output of the forest industry is
  - Net growth (cultivated forests) + removals (from non-cultivated forests)
- Cultivated forests are not subject to depletion

FRA 2010 format of 17 reporting tables

- T 1 **Extent of forest and other wooded land**
- T 2 Forest ownership and management rights
- T 3 **Forest designation and management**
- T 4 **Forest characteristics**
- T 5 **Forest establishment and reforestation**
- T 6 **Growing stock**
- T 7 **Biomass stock**
- T 8 **Carbon stock**
- T 9 **Forest fires**
- T 10 **Other disturbances affecting forest health and vitality**
- T 11 **Wood removals and value of removals**
- T 12 **Non-wood forest products removals and value of removals**
- T 13 Employment
- T 14 Policy and legal framework
- T 15 Institutional framework
- T 16 Education and research
- T 17 Public revenue collection and expenditure

FRA categories and the SEEA

T1 'land'	T4 'characteristics'	T3 'designation'
- Forest - Other wooded land - Other land with tree cover	- Primary Forest - Other naturally regenerated forests - Planted forest	- Production - Protection of soil and water - Conservation of biodiversity - Social services - Multiple use - Other or Unknown

Definitions in the FRA

T1 Extent of forest and other wooded land

Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as "Forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land - Other land with tree cover (sub-category)	All land that is not classified as "Forest" or "Other wooded land". Land classified as "Other land", spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

Definitions in the FRA

T 4 Forest characteristics

Primary forest	Naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Other naturally regenerated forest	Naturally regenerated forest where there are clearly visible indications of human activities.
- of introduced species (sub-category)	Other naturally regenerated forest where the trees are predominantly of introduces species.
Planted forest	Forest predominantly composed of trees established through planting and/or deliberate seeding.
- of introduced species	Planted/seeded trees are predominantly of introduced species.

Definitions in the FRA

T3 Primary designated functions

Production	Forest area designated primarily for production of wood, fibre, bio-energy and/or non-wood forest products.
Protection of soil and water	Forest area designated primarily for protection of soil and water.
Conservation of biodiversity	Forest area designated primarily for conservation of biological diversity. Includes but is not limited to areas designated for biodiversity conservation within the protected areas.
Social services	Forest area designated primarily for social services.
Multiple use	Forest area designated primarily for more than one purpose and where none of these alone is considered as the predominant designated function.
Other	Forest areas designated primarily for a function other than production, protection, conservation, social services or multiple use.
No / unknown	No or unknown designation.

Definitions in the FRA

T 6 Growing stock

Category	Definition
Growing stock	Volume over bark of all living trees more than X cm in diameter at breast height (or above buttress if these are higher). Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm.
Growing stock of commercial species	Growing stock (see def. above) of commercial species.

T 11 Wood removals and value of removals

Category	Definition
Industrial roundwood removals	The wood removed (volume of roundwood over bark) for production of goods and services other than energy production (woodfuel).
Woodfuel removals	The wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

SEEA assets and FRA

EA.141 Timber resources

EA.1411 Cultivated

- Timber in Other naturally regenerated forest
- Timber in Planted forest
- Timber in forest designated for Production
- Timber in forest designated for Multiple use

EA.1422 Non-Cultivated

- Timber in Primary forests
- Timber in forest designated for Protection…
- Timber in forest designated for Conservation…
- Timber in forest designated for Social services…

SEEA assets and the FRA

EA.23 Wooded land and associated surface water

EA.231 Forested land (FRA category Forest)

EA.2311 Available for wood supply

Forest designated for Production

Forest designated for Multiple use

Primary forest

Other naturally regenerated forest

Planted forest

EA.2312 Not Available for wood supply

Forest designated for Protection…

Forest designated for Conservation…

Forest designated for Social services…

Primary forest

Other naturally regenerated forest

Planted forest (for Prot., Cons., Social categories.)

EA.232 Other wooded land (FRA 'Owl')

FRA as a data source for the SEEA

SEEA asset account for forested land	FRA as a data source
Opening stock levels	T1 Forest area
Increases in stock	
Due to economic activity	T5 Forest establishment and reforestation; Afforestation
Due to regular natural process	T5 Forest establishment…;Natural expansion of forests
Decrease in stock	
Due to economic activity	T1 Forest area
Due to regular natural process	(T9 Forest fires, T10 Other disturbances)
Due to natural disaster (net decrease)	(T9 Forest fires, T10 Other disturbances)
Changes due to economic classifications	T1 Forest area, T3 F. designation and management
Closing stock levels	T1 Forest area
Changes in environmental quality	
Due to natural processes	
Due to economic activity	

FRA as a data source for the SEEA

SEEA asset account for timber	FRA as a data source
Opening stock levels	T6 Growing stock
Increases in stock	
Due to economic activity	T6 Growing stock, T4 F.characteristic (derived)
Due to regular natural process	T6 Growing stock, T4 F.characteristic (derived)
Decrease in stock	
Due to economic activity	T11 Removals of industrial roundwood and fuel wood
Due to regular natural process	
Due to natural disaster (net decrease)	T9 Forest fires, T10 Other disturbances
Changes due to economic classifications	T1 Forest area, T3 F. designation and management
Closing stock levels	T6 Growing stock
Changes in environmental quality	T9 Forest fires, T10 Other disturbances
Due to natural processes	
Due to economic activity	

Removals / Decrease in stock

- Decrease in Growing stock of timber due to economic activity

  = Wood removal (FRA) + **Felling residues** (left in the forest)

- Felling residues:
  - Flow inside the environment (not waste)
  - Flow from Growing stock to dead biomass and from CO_2 sink to source (GHG reporting)
  - Unused extraction (MFA)
  - Losses in extraction process?

Units of measurement

- Physical timber asset accounts should be presented in cubic meters of roundwood (as in the FRA). If needed, this can be expanded to total tree biomass stock or carbon stock.

Some considerations

- SEEA classification is being changed to match the FRA-2010
- **EA.231 Forested land** should be divided into:
  - EA.2311 Primarily for production of forest products or multiple use (‘Primarily for production and multiple use’), and
  - EA.2312 Primarily for protection, conservation and social services (‘Primarily for services’).

Carbon sequestration

- Stocks and flows? Or only stocks in the SEEA standard?
- Easy to do the changes in stock of carbon
- Building Bridge between the IPCC/ FRA and the SEEA is being developed
- Carbon content in biomass is usually derived using conversion factors. Reported figures on carbon stock are closely related to figures on biomass stock and growing stock

Land use, land use change and forestry (LULUCF) in greenhouse gas reporting

In reporting greenhouse gases according to the UN climate convention and the Kyoto protocol, the LULUCF category is sub-divided into:

- Forest land
- Cropland
- Grassland
- Wetlands
- Settlements
- Other land.

Forest land in greenhouse gas reporting

The Forest land consists of:

1. Forest land remaining forest land
   - 1.1. Managed (intensively/extensively)
   - 1.2. Natural, undisturbed
2. Land converted to forest land
   - 2.1. Managed (intensively/extensively)
   - 2.2. Natural, undisturbed

The GHG reporting covers only managed forests. Managed forests are subject to periodic or ongoing human interventions.

Forest land in greenhouse gas reporting

For the forests the key entity is **annual change in carbon stock.** It is the sum of:

Change in carbon stocks in living biomass

+ Increase due to above and below ground biomass growth

- Decrease due to fellings, fuelwood gathering, disturbances

Change in carbon stocks in dead wood and litter

Change in carbon stocks in mineral and organic soil

Equations to changes in carbon stocks of cropland, grassland, wetlands, settlements and other land are also available from the IPCC Good Practice Guidance for LULUCF, as well as instructions for calculations.

Annual change in carbon stock of forest and other wooded land

Annual change in carbon stocks =

+ Annual change in carbon stocks in living biomass (above- and belowground biomass) =
  + Increase due to biomass growth
    Above ground biomass increment (stem, stump, branches, bark, seeds, foliage)
    Belowground biomass increment (live roots)
  - Decrease due to biomass lost
    Loss due to commercial fellings (extracted volume, fraction of biomass left to decay in forest)
    Loss due to fuelwood gathering (volume, density, expansion factor to total biomass a.ground)
    Other losses (due to disturbances)
+ Annual change in carbon stocks in dead organic matter (dead wood and litter)
  Change in carbon stock in dead wood (standing, lying in the ground, in the soil)
  Change in carbon stock in litter (litterfall; leaves, twigs, small branches, fruits, flowers, bark, (-)decomposition)
+ Annual change in carbon stocks in soils
  Change in carbon stock of mineral soil (organic fraction of mineral soil)
  Change in carbon stock of organic soil

Some considerations

- The GHG reporting on changes of carbon stocks cover only managed forests corresponding to FRA categories “Other naturally regenerated forest” and “Planted forest” and SEEA “Cultivated (timber resources)”

- SEEA is broader because it can expand the calculations to non-cultivated timber

Valuation

- Several methods are available.
- The choice of valuation method depends on:
  - primary data available
  - characteristics of the forests
- Main methods are:
  - transactions in forest real estates,
  - net present value (NPV),
  - stumpage and consumption value (for timber).

Valuation 1 - transactions

Theoretically the best basis.

In practice there may be problems due to

- lack of data
- too few transactions in forests
- actual transactions are not representative
- other biases (e.g. real estate taxes)

Valuation 2 - NPV

Theoretically sound. Works best for “optimally” (T) managed forests. $V=\Sigma Q_T p_T/(1-r)^{T-t}$

In practice there may be problems due to:

- lack of data on costs (management - for cultivated - and felling costs) and intermediate receipts
- difficulties determining a good discount rate
- several assumptions are needed, including:
  - successive identical rotations
  - competitive markets
  - no changes in the very long run (!?)

Valuation 3 - Simplified methods

Stumpage value and consumption value method. (~net price methods)

- ONLY for the standing timber!
- Needs only the current stock and stumpage price (or the raw wood price less the felling costs)
- Identical to NPV if natural growth* = discount rate
- Stumpage value: an average stumpage price (the value of trees while standing) is applied to the current stock, per main species if important. $V=Qp$
- Consumption value: average stumpage prices are applied per age or diameter class. $V=SQ_tp_t$

Valuation 4 - Simplified methods cont.

Difference between stumpage and consumption value method:

- stumpage value method assumes that the age/diameter structure of removals is constant (weighting by removal structure)
- consumption value method assumes the current age/diameter structure of the stock is constant (weighting by stock structure)
- consumption value=value of the total standing volume if it was cut today (hence the name)

Valuing flows and stocks

- Opening and closing stocks: any method!!
- Removals: ONLY stumpage value!!
- Natural growth: stumpage or consumption value
- The “best” method depends on the data and time available AND on the characteristics of the forest.
- For an optimally managed steady-state forest (if that exists) all methods are broadly equivalent
- Old growth or overmature forest is best valued with consumption value; major new afforestations by the net present value, other forest by stumpage value.
- Stumpage value is least demanding.

Current and future work

- SEEA revision
  - Develop a set of standard tables for forest accounts
  - Develop an agreed link between FRA-2010 and SEEA tables for forest land and timber
  - Develop an agreed link between IPCC and SEEA table (scope of SEEA broader)
  - Develop a classification of ecosystem services
  - Develop a classification of forest-related products and activities