

Forest definitions and linkages to wood product information

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## Summary

### Introduction

1. The demands on forest information systems continue to grow with users broadening their information needs from the historical demand for timber industry statistics into the nature of forests and their array of values.
2. In this paper we note the achievements in global forest information systems in meeting changing information needs and examine how well the associated wood product information systems are linked to forest information systems to provide meaningful information for users. Questions for consideration conclude the paper.

### Ecosystem definitions

3. We start by defining words linked to key ecosystem concepts of importance for forest and associated information systems. The ecosystem definitions presented in the SEEA EEA carbon stock account (SEEA EEA Annex A4.1) are the latest refinement in this evolving area. The SEEA EEA (carbon) ecosystem definitions present a broad ecosystem classification that focusses on the key mechanism of 'management' and captures the varying degrees of human modification of the ecosystem. It presents four broad ecosystem groupings:

**Natural ecosystems:** which are largely the product of natural and ongoing evolutionary, ecological and biological processes. The key mechanism of 'management' in natural ecosystems is natural selection operating on populations of species which has the effect over time of optimizing system level properties and the traits of component species. System-level properties which are naturally optimized with respect to, among other things, environmental conditions include canopy density, energy use, nutrient cycling, resilience, and adaptive capacity. Natural processes dominate natural ecosystems within which human cultural and traditional uses also occur. Natural ecosystems include terrestrial and marine ecosystems.

**Semi natural ecosystems:** which are human modified natural ecosystems. Natural processes, including regenerative processes, are still in operation to varying degrees. However, the system is often prevented from reaching ecological maturity or is maintained in a degraded state due to human disturbance and land use. Thus, the vegetation structure may not reflect natural optima, and the taxonomic composition may be depauperate.

**Agricultural ecosystems:** which are human designed, engineered and maintained systems on agricultural lands that grow animals and crops mainly for food, wood and fibre and as feedstocks for biofuels and other materials. Plantations of trees for timber or fruit production (e.g. orchards) are included in the agricultural ecosystem.

**Other ecosystems:** including settlements and land with infrastructure.

4. In this paper, we use this ecosystem terminology and associated definitions.

**Natural forests** are forests that meet the natural ecosystem definition irrespective of their use. They may be in conservation or logged for wood production: the key point is that their ecological structure and functions have not been degraded such that natural regenerative processes can no longer operate to recover the canopy structure following disturbance.

**Plantation forests** are forests that meet the agricultural ecosystem definition. They are used primarily for wood production.

**Semi natural forests** are the grey area and an acknowledgement that determining the ecological effects of human use is complex and reporting quantified information can be demanding.

## Information needs

5. Historically, forest information systems have been shaped by the demand for wood supply statistics. A structural, rather than an ecosystem, definition of forests was developed because it captures the capacity of the vegetated area to supply wood and also for its simplicity. Calls to distinguish between native forests and plantations have firmed from both the forestry industry and environment sectors.
6. Because plantations are an agricultural crop, they deliver cost efficiencies in wood growing and processing, particularly through scale economies (Sedjo 1990) and therefore drive significant forestry industry structural change (Ajani 2008). Statistics that disaggregate forestry information into natural forests and plantations – from the forest estate through to the products made from the wood logged (e.g. sawn timber, wood panels, pulp, paper and bioenergy) – is of great interest to forestry industry researchers, policy makers and the public. This disaggregated information applies to the main economic variables including investment, production, consumption, trade and employment.
7. Researchers, policy makers and the public are also interested in disaggregated forest and forestry industry information from an ecological and climate change perspective. Most forest ecologists are more interested in the extent and condition of natural forests and have a lesser interest in plantation forests. Climate change research and policy has been a major driver for forest information disaggregated by ecosystem type. The essence of this interest is found in ecosystem science. The carbon stocks in natural forests with their biodiversity-based resilience processes are more likely to persist (relative to plantation forests) and hence accumulate relatively large carbon stocks in soils and plants, particularly large, old trees (Secretariat of the Convention on Biological Diversity 2009, Ajani 2013). This is not an argument against plantation forests: rather it is a reflection of the important attributes of plantation forests for competitiveness in many wood products markets AND the importance of natural forests for carbon storage. Forest information disaggregated into natural forests and plantations is highly relevant for those considering policy options aimed at avoiding carbon emissions caused by natural forest clearing or degradation; restoring carbon stocks in natural forests after earlier logging; and establishing forest plantations. Such disaggregated information is significantly more useful than information that reports deforestation or forest degradation irrespective of ecosystem type. For example, the carbon stock losses from

clearing or logging a hectare of native forests are likely to be larger than the losses from clearing or logging the same area of plantations.

## Forest classifications

8. Major institutions, including the IPCC and Eurostat have adopted the FAO 'forest' definition as used in the FAO *Forest Resource Assessment 2000* (FAO 2000) (since modified in FAO 2010). The FAO defined 'forest' as:

'land with a tree canopy cover of more than 10 per cent and area of more than 0.5 ha. Forests are determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 m. Young stands that have not yet but are expected to reach a crown density of 10 per cent and tree height of 5 m are included under forest, as are temporarily unstocked areas. The term includes forests used for purposes of production, protection, multiple-use or conservation (i.e. forest in national parks, nature reserves and other protected areas), as well as forest stands on agricultural lands (e.g. windbreaks and shelterbelts of trees with a width of more than 20 m), and rubberwood plantations and cork oak stands. The term specifically excludes stands of trees established primarily for agricultural production, for example fruit tree plantations. It also excludes trees planted in agroforestry systems.' (FAO 2000).

With this boundary definition, land with some tree cover but not meeting the forest criteria is termed 'other wooded land'.

9. These forest definitions have been adopted in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for estimating greenhouse gas emissions and removals due to changes in biomass, dead organic matter and soil organic carbon on Forest Land (IPCC 2006).
10. The FAO and IPCC further disaggregate forests according to different characteristics to meet their information needs. For example, greenhouse gas emissions and removals per hectare vary according to forest types and the IPCC Guidelines state that it is good practice to stratify Forest Land into various sub categories to reduce variation in forest parameters and to reduce uncertainty (FAO 2006).
11. Although 'natural forests' and 'plantations' are seen as having important differences and these are agreed at a general level, definition differences between the various institutions remain, as summarised in Table 1. Despite these variations, agreement exists that forests have different characteristics and that these should be reflected in a classification system.

**Table 1** Natural forest and plantation terminology

Institution and reference	Natural forest definition	Plantation forest definition
FAO 2000	A forest composed of indigenous trees and not classified as plantation forest.	A forest established by planting or/and seeding in the process of afforestation or reforestation. It consists of introduced species or, in some cases, indigenous species.
FAO 2010a and b	<p>The term 'natural forest' is referred to but is not defined outside of the context of primary forests.</p> <p>[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.]</p>	<p>Planted forests are composed of trees established through planting and/or through deliberate seeding of native or introduced species. Establishment is either through afforestation on land that until then was not classified as forest, or by reforestation of land classified as forest, for instance after a fire or a storm or following clearfelling.</p> <p>The concept of planted forests is broader than the concept of forest plantations used in previous global assessments. This change was made to capture all planted forests and is in line with the recommendations of the Global Planted Forests Thematic Study 2005 (FAO, 2006d) and recent efforts to develop guidelines and best practices for the establishment and management of planted forests.</p>
IPCC 2006	A forest composed of indigenous trees and not classified as a forest plantation.	Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either of introduced species (all planted stands), or intensively managed stands of indigenous species, which meet all the following criteria: one or two species at planting, even age class, and regular spacing.
SNA 2008	Forest terminology is not covered, however for the purposes of the capital account, a distinction is made between 'Cultivated biological resources' and 'Non-cultivated biological resources': the latter includes plants (e.g. trees) that yield both once-only and repeat products over which ownership rights are enforced but for which natural growth or regeneration is not under the direct control, responsibility and management of institutional units. Primary forests are classified as non-cultivated biological resources.	Forest terminology is not covered, however for the purposes of the capital account, a distinction is made between 'Cultivated biological resources' and 'Non-cultivated biological resources': the former yield repeat products whose natural growth and regeneration are under the direct control, responsibility and management of institutional units. Coppiced trees used for wood production would be included as cultivated biological resources.
SEEA Central Framework 2012	Refers to 'natural forests' and 'plantation forests' but does not define them.	Refers to 'natural forests' and 'plantation forests' but does not define them.

SEEA EEA 2013	Refers to 'natural forests' and 'plantation forests' but does not define them. Annex A4.1 (Additional detail concerning accounting for carbon) presents and ecosystem classification that could accommodate these different types of forests.	Refers to 'natural forests' and 'plantation forests' but does not define them. Annex A4.1 (Additional detail concerning accounting for carbon) presents and ecosystem classification that could accommodate these different types of forests.
Eurostat 2002	<p>Classifies forests by naturalness: 'Forest/other wooded land undisturbed by man' is defined as forest/other wooded land which shows natural forest dynamics, such as natural tree composition, occurrence of dead wood, natural age structure and natural regeneration processes, the area of which is large enough to maintain its natural characteristics and where the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.</p> <p>['Semi-natural forest/other wooded land' is defined as forest/other wooded land, which is neither 'forest/other wooded land undisturbed by man' nor 'plantation'.</p>	Classifies forests by naturalness: 'Plantations' are defined as forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either of introduced species, or intensively managed stands of indigenous species, which meet all following criteria: one or two species at plantation, even age class, regular spacing. They exclude stands which were established as plantations but which have been without intensive management for a significant period of time. These should be considered semi-natural.

### Linkages to wood product statistics

12. The wood product classifications (e.g. sawn timber, pulp, wood panels, bioenergy) do not disaggregate wood product variables (e.g. production, imports, exports) by forest type. In some cases a linkage is made through the product classification system to coniferous, broadleaved, tropical or non-tropical forests/regions, but not to forests conceptualised as ecosystems – i.e. natural forests, semi-natural forests and plantation forests. This includes the UN Central Product Classification (CPC) Ver.2 and FAO FAOSTAT information. This reflects a combination of historical realities, the evolving consensus about the need for an ecological based forest classification which is not yet settled on terminology, and the additional resources needed in statistical offices to collect/report wood product information in a newly disaggregated form.
13. The growing interest in ecosystem accounting, driven partly by economic considerations, opens the possibility for aligning wood product classifications with forest classifications. It would seem sensible to consider product classifications in conjunction with the important work on forest classifications.

## Questions

1. Are there existing examples of linking asset types and method of production to product classifications, and if so could the (these) approaches be reasonably applied to forest types and forest products?
2. What processes are available for considering the linking of forest type to wood product information?
3. How can the physical information for spatial statistical units be linked to economic information on production from economic units?

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