

Protective function of forest resources

Background paper to the Kotka V Expert Consultation

1. Introduction

The world's forests have many protective functions, some local and some global. Early assessments of forest resources were focused on the productive functions of forests, particularly wood supply, as this was the main issue identified by policy-makers. In view of the many protective functions of forest and their growing importance it is becoming increasingly necessary for countries to gather, analyse and present information on the extent and condition of protective forests.

With each succeeding FRA, the environmental services provided by forests have gained increasing recognition.

FRA 2005 is a first attempt to evaluate the importance of protective functions of forests at the global level. In response to the increased awareness of the important role of forests in providing environmental services through their protective functions and consistent with the overall concept of sustainable forest management, FRA 2005 also evaluates trends in those forest resources with a protective function.

As part of the FRA 2005, a qualitative thematic study on forests and water and a second one on planted forest were carried out and they will be released during 2006.

2. Evaluation of the variables used in FRA 2005

FRA 2005 variables

The protective functions theme is depicted by two variables indicating the total area of forest used primarily for protective functions and the area of forest plantations managed for protective functions.

1. Area designated for protective purposes (as the primary function or as one of several functions).

This variable indicates to what extent forest area have been set aside for protective purposes, by legal prescription or by decision of the landowner or manager.

In FRA 2005 forest designation is reported in two ways: primary function (where the protective function is significantly more important than the others) and total area with function (either primary or secondary).

2. Area of protective forest plantations.

This variable focuses on forest plantations having a primary objective of protection, including all those planted trees to stabilize sand dunes and combat desertification, windbreaks and individual trees planted to provide shade. Protective forest plantations are defined as those of introduced species and in some cases of native species, established through planting or seedlings, with few species, even spacing and/or even aged stands.

Definitions

Forest Area designated for protective purposes: Forest and other wooded land designated for protection of soil and water.

Protective plantations: Forest / Other wooded land of native or introduced species, established through planting or seeding mainly for provision of services. Includes all stands of introduced species established for provision of services, such as soil and water protection, pest control and conservation of (habitat) biological diversity and areas of native species characterized by few species, straight tree lines and even-aged stands.

Data availability

Information on forest area designated for protective functions was available for 172 countries up to 229, together accounting for 95 percent of the world's forest area. Of these only 134 reported that they had areas specifically designated for protective purposes, while the others reported insufficient information or they included such areas as part of the category multiple purposes.

Information on total area designated for protection was available for 85 countries or 46 percent of the total forest area.

Information on protective forest plantations was available for 174 countries, accounting for 93 percent of the world's forest area.

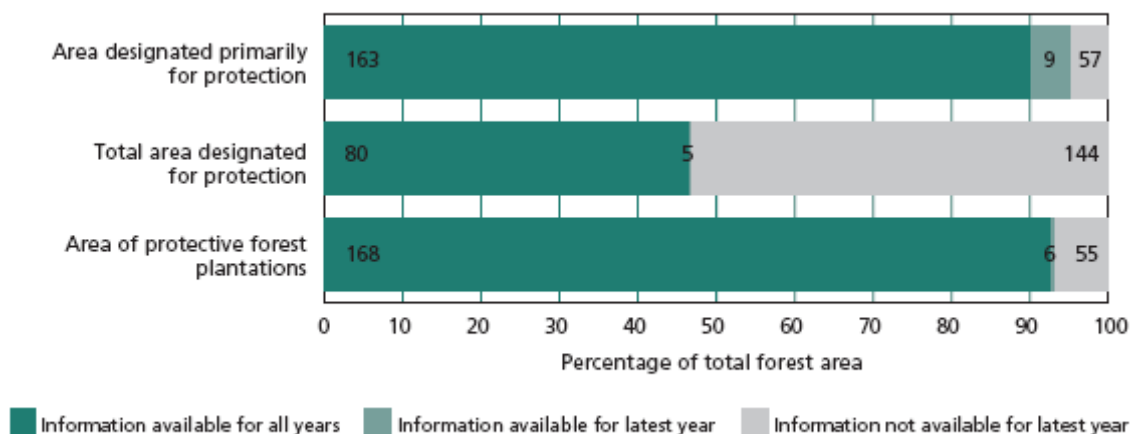
Data availability is generally good with all subregions except Western and Central Africa and the Caribbean region providing information for more than 85 percent of the total forest area in the respective subregions.

Concerning other wooded land, 89 countries provided information on area designated primarily for protection, equal to 55 percent of the world's forest area or 48 percent of the world's other wooded land area.

Forty-seven countries provided information on total area designated for protection, accounting for 20 percent of the world's forest area or 19 percent of the world's other wooded land area.

Twelve countries provided information on area of protective forest plantations for the three reference years, accounting to 23 percent of the world's forest area or 7 percent of the world's other wooded land.

Information availability – protective functions of forest resources



Note: Figures present number of countries in each category.

Data quality

The quality of the information is highly variable. Many countries have identified forest area that serve a protective function and have given them special status such as avalanche protection, watershed reserve, natural catchment area or multiple use management area. Other countries simply referred to the area of protected forest which is not necessarily a good measure of the protective functions of forests, because forest and other wooded land can have a protective function although outside protected areas.

Concerning protective forest plantations data availability is generally quite good but some countries were unable to distinguish between productive and protective forest plantations.

Methodologies for data collection

Information on forest area designated for protective functions came mainly from management plans and often assumptions and estimates were necessary to extrapolate the figure to the three reference years. From an evaluation questionnaire sent out to all the FRA 2005 contributors, countries expressed the difficulties in adjusting national definitions to FRA 2005 definitions, which were also of difficult interpretation. The problem of overlapping functions of a forest was also reported together with the difficulty to separate one function from another. Information was sometimes scarce or old and the need to have new and updated information from national forest inventories was also reported.

Information on forest plantation came mainly from statistics on forest plantations even if some countries experienced difficulties in dividing the productive plantations from the protective.

In general information for other wooded land was very low for the area designated for protective functions (primarily or not) and for protective forest plantations.

3. Proposals for variables for FRA 2010

The proposals presented below are based on the responses to the FRA 2005 evaluation questionnaire sent to all national correspondents, FAO staff, the FRA Advisory Group and representatives of forest related organisations and reporting processes (Members of the Collaborative Partnership on Forests, criteria and indicator processes and environmental NGOs). Feedback received on the release of the Key Findings of FRA 2005 and the Main Report has also been included where relevant. The proposals have not been prioritised and are presented for discussion by working group participants.

Deletions

The lack of information for what concern the other wooded land category brought to the proposal of deletion of this variable (or of aggregation of forest and other wooded land for what concern the area designated for protective functions.

Total area with function was also often difficult to understand, and it was proposed to delete this variable for the next assessment.

Additions

For the next assessment it should be considered the correspondence between FRA 2005 definitions of protective forest and the definitions of other international processes that have included the protective function theme among their indicator of sustainable forest management. It would be useful to revise the indicators (Annex 1) to see how it is possible to improve or integrate the FRA 2005 variables. A proposal could be that of extending the **protective function to infrastructure and managed natural resources against natural hazards** (as proposed by the MCPFE, Annex 1).

Furthermore it was suggested to extend the analysis of degree of protection, using some GIS analysis, in order to verify how well the protection status is working.

Changes and proposals for how the information should be obtained

In order to improve the compatibility between FRA categories and those of others international processes it was also suggested to change this variable adopting the **breakdown by forest characteristics** used in table 4 and based on these, specify how much of the primary, modified, seminatural forest have in percentage a major function. Following the proposed change, forest that have several major functions would be listed under several categories, so a country might report that of its primary forest area 20% is for production, 70% is for soil and water conservation, 80% is for biodiversity and 100% provides social services.

Interesting recommendations came also from the author of the thematic study on forest and water. One of these was concerning the importance that countries officially recognize “**cloud or fog forest ecosystem**” in their classification, and designate these for protective purposes.

Similar techniques to that employed by UNEP-WCMC in its global mapping could be used as an approximation of potential area, in the absence of ground or aerial surveys.

Furthermore, it was recommended that planning authorities should identify **slip-prone areas**, “red flag” or zone them for forest retention, or agroforestry/sylvopastoral use with fairly dense tree cover. Such areas may then be part of the Protective Forest estate. They should be reported as such in the next Forest Resources Assessment.

It was also recommended that each country undertake an assessment of its **key riparian zones**, and classify them for conservation management, protection or restoration. The author of the thematic study also recommended that countries report for on the existence of national regulations or guidelines for forest riparian buffer zone maintenance.

Taking into account the level of details proposed in the thematic study, for the next assessment it could be suggested **to expand the explanatory notes** of protective functions in order to better explain what should be included within the forested areas designated for the protection of soil and water.

Comments have also been received to change the class protective forest plantations to cover **all planted forests established/ managed for protective purposes**.

Summary of proposals for discussion

- Delete (or aggregate) forest and other wooded land for protective functions for area designated for protective functions and for protective forest plantations?
- Delete the total area with function?
- Add other variables like:
 - the forest area having protective function to infrastructure and managed natural resources against natural hazards
 - the extent of watershed areas of watershed under a management plan?
 - the extent of forest presenting particular soil and water conditions (degradations, erosion, flooding etc)
- Extend the explanatory note of the variable to explain the importance of including riparian zones, slip prone areas and cloud or fog ecosystems, within the protective forests?
- Extend the class protective plantations to cover all planted forest established or managed for protective purposes?

Annex 1

| International process | Indicator |
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| <p>Dry Zone Africa Process</p> | <p>Criterion 5: Maintenance and improvement of protective functions in forest management</p> <p>Indicators:</p> <p>5.2: Areas and percentages of forests and other wooded areas managed mainly for the production of water, protection of watersheds, riverine zones and for flood control</p> <p>5.3: Change in water yield and quality</p> |
| <p>Regional Initiative for the Development and Implementation of National Level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia</p> | <p>Criterion 4: Conservation and enhancement of soil and water resources and other environmental functions</p> <p>Indicators:</p> <p>4.1: Extent of watershed areas under management</p> <p>4.2: Area under shelter and green belts</p> <p>4.3: Duration of stream-flow and water yield</p> <p>4.4: Extent / degree of soil erosion</p> <p>4.5: Change in level of water table</p> <p>4.6: Change in sediment load</p> |
| <p>International Tropical Timber Organization (ITTO)</p> | <p>Criterion 6: Soil and water</p> <p>This criterion deals with the protection of soil and water in the forest. The importance of this is two-fold. First, it has a bearing on maintaining the productivity and quality of forest and related aquatic ecosystems (and therefore on the health and condition of the forest, Criterion 3); secondly, it also plays a crucial role outside the forest in maintaining downstream water quality and flow and in reducing flooding and sedimentation. The environmental and social effects of mismanagement (landslides, flooding, water pollution) can be enormous and restoration very costly. National-level data for indicators will normally be derived from the aggregation of data collected periodically at the forest management unit level.</p> <p>Indicators of extent of protection:</p> <p>6.1: Extent and percentage of total forest area managed primarily for the protection of soil and water.</p> <p>6.2: Extent and percentage of area to be harvested for which off-site catchment values have been defined, documented and protected before harvesting.</p> <p>6.3: Extent and percentage of area to be harvested which has been defined as environmentally sensitive (e.g. very steep or erodible) and protected before harvesting.</p> <p>6.4: Extent and percentage of area to be harvested for which drainage systems have been demarcated or clearly defined and protected before harvesting.</p> <p>6.5: Percentage of length of edges of watercourses, waterbodies, mangroves and other wetlands protected by adequate buffer strips.</p> <p>Indicators of conservation and protection procedures:</p> <p>6.6: Existence and implementation of procedures to identify and demarcate sensitive areas for the protection of soil and water</p> <p>6.7: Availability and implementation of guidelines for forest road lay-out, including drainage requirements and conservation of buffer strips along streams and rivers.</p> <p>6.8: Availability and implementation of harvesting procedures: to protect the soil from compaction by harvesting machinery, to protect the soil from erosion during harvesting operations.</p> <p>Indicators of monitoring and evaluation:</p> <p>6.9: Existence and implementation of procedures for assessing changes in the water quality of streams emerging from production forests as compared with streams emerging from the same forest type kept free from human intervention.</p> |

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| <p>Lepaterique Process of Central America on Criteria and Indicators for Sustainable Forest Management</p> | <p>(National level) Criterion 4: Contribution of forest ecosystems to environmental services 4.3.:Number, area and percentage of watersheds with a management plan. 4.4.:Area and percentage of forest managed for soil and water conservation. 4.5.:Relation between forest cover by watershed and frequency of flooding.</p> |
| <p>Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests</p> | <p>Criterion 4: Conservation and maintenance of soil and water resources. This criterion encompasses the conservation of soil and water resources and the protective and productive functions of forests. <u>Indicators:</u> 4.1:Area and percent of forest land with significant soil erosion-(b); 4.2: Area and percent of forest land managed primarily for protective functions, e.g. watersheds, flood protection, avalanche protection, riparian zones-(a); 4.3:Percent of stream kilometres in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation-(b); 4.4: Area and percent of forest land with significantly diminished soil organic matter and/or changes in other soil chemical properties-(b); 4.5:Area and percent of forest land with significant compaction or change in soil physical properties resulting from human activities-(b); 4.6: Percent of water bodies in forest areas (e.g. stream kilometres, lake hectares) with significant variance of biological diversity from the historic range of variability-(b); 4.7: Percent of water bodies in forest areas (e.g. stream kilometres, lake hectares) with significant variation from the historic range of variability in pH, dissolved oxygen, levels of chemicals (electrical conductivity), sedimentation or temperature change-(b); 4.8: Area and percent of forest land experiencing an accumulation of persistent toxic substances-(b).</p> |
| <p>The Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest</p> | <p>National level: Criterion 5: Conservation and integrated management of water and soil resources <u>Indicators:</u> 5.1: Measures for soil conservation. 5.2: Area and percentage of forest lands managed for environmental protection. 5.3: Percentage of forest flooded in relation to the historic range of variation, and maintenance of the relationship between the forest and hydrobiological resources. 5.4: Effects of forest conservation on the integrated management of water resources. FMU level: Criterion 10: Conservation of forest ecosystems <u>Indicators:</u> 10.6: Measures for protection of water courses from forest activities. Global level: Criterion 12: Economic, social and environmental services performed by Amazonian forests <u>Indicators:</u> 12.3 Contribution to the global water cycle-</p> |
| <p>Near East Process</p> | <p>Criterion 5 : Protective and environmental functions <u>Indicators of protective functions:</u> 5.2: Size and percentage of wooded areas managed mainly for the protection of watersheds</p> |
| <p>CIFOR</p> | <p>Criterion.2.1 The processes that maintain biodiversity in managed forests (FMUs) are conserved. <u>Indicator:</u> 2.1.7: There is no significant change in the quality and quantity of water from the catchment Verifiers:</p> |

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| | <p>2.1.7.1 :Abundance and diversity of <i>aquatic organisms</i> is maintained within critical limits.</p> <p>2.1.7.2 :<i>Chemical composition</i> of stream water does not show significant variation as compared to unlogged forest</p> <p>2.1.7.3 : <i>Decomposition</i> rate of the stream water does not show significant change as compared to unlogged forest</p> <p>2.1.7.4: <i>Stream flow</i> does not show significant change as compared to the flow in the unlogged site.</p> <p>Criterion.2.2 Ecosystem function is maintained</p> <p>Indicators:</p> <p>2.2.1 :No chemical contamination to <i>food chains</i> and <i>ecosystem</i></p> <p>2.2.2: Ecologically sensitive areas, especially buffer zones along watercourses, are protected</p> <p>Criterion.6.4 Implementation of the management plan is effective</p> <p>Indicator:</p> <p>6.4.8 Absence of significant <i>off-site impacts</i> such as on down stream water quality/quantity, infrastructure etc.</p> <p>Verifier:</p> <p>6.4.8.1 Number of official complaints, court cases etc.</p> |
| MCPFE | <p>Criterion 5: Maintenance and appropriate enhancement of protective Functions in Forest Management,</p> <p>Indicator 5.1 Protective forest, soil water and other ecosystem function: Area of forest and other wooded land designated to prevent soil erosion, to preserve soil erosion, to preserve water resources, or to maintain other forest ecosystem functions.</p> <p>Indicator 5.2 Protective forest: Infrastructure and managed natural resources: area of forest and other wood land designated to protect infrastructure and managed natural resources against natural hazards</p> |

Indicators distribution:

| | Dry Zone Africa | Dry Forest Asia | ITTO | Lepaterique | Mont | Tara | NE | CIFOR | MCPFE |
|--|-----------------|-----------------|------|-------------|------|------|----|-------|-------|
| Extent, percentage of forest managed for soil and water protection | X | | X | X | X | | | | X |
| Extent, number of managed watersheds | X | X | | X | X | | X | | |
| Extent of forest presenting particular soil and water conditions (degradations, erosion, flooding etc) | X | X | | | X | | | | |

The indicators related to the extent and percentage of forest managed mainly for the protection of soil and water is common to all the international processes. Another recurrent indicator is concerning the forest management of watershed and the area and percent of forest land presenting soil erosion or significant change