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Review and synthesis

Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015 ☆

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ABSTRACT

The area of land covered by forest and trees is an important indicator of environmental condition. This study presents and analyses results from the Global Forest Resources Assessment 2015 (FRA 2015) of the Food and Agriculture Organization of the United Nations. FRA 2015 was based on responses to surveys by individual countries using a common reporting framework, agreed definitions and reporting standards. Results indicated that total forest area declined by 3%, from 4128 M ha in 1990 to 3999 M ha in 2015. The annual rate of net forest loss halved from 7.3 M ha y^{-1} in the 1990s to 3.3 M ha y^{-1} between 2010 and 2015. Natural forest area declined from 3961 M ha to 3721 M ha between 1990 and 2015, while planted forest (including rubber plantations) increased from 168 M ha to 278 M ha. From 2010 to 2015, tropical forest area declined at a rate of 5.5 M ha y^{-1} – only 58% of the rate in the 1990s – while temperate forest area expanded at a rate of 2.2 M ha y^{-1}. Boreal and sub-tropical forest areas showed little net change. Forest area expanded in Europe, North America, the Caribbean, East Asia, and Western-Central Asia, but declined in Central America, South America, South and Southeast Asia and all three regions in Africa. Analysis indicates that, between 1990 and 2015, 13 tropical countries may have either passed through their forest transitions from net forest loss to net forest expansion, or continued along the path of forest expansion that follows these transitions. Comparing FRA 2015 statistics with the findings of global and pan-tropical remote-sensing forest area surveys was challenging, due to differences in assessment periods, the definitions of forest and remote sensing methods. More investment in national and global forest monitoring is needed to provide better support for international initiatives to increase sustainable forest management and reduce forest loss, particularly in tropical countries.

Contents

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1. Introduction

Reliable information on global trends in forest area is of great help to international agencies, governments, non-governmental organizations and the commercial sector when they make decisions on policies and investment, and to scientists whose research also informs these decisions. The first global forest assessment was undertaken by the US Government early in the 20th Century (Zon, 1910; Zon and Sparhawk, 1923). However, regular global assessments had to wait until the Food and Agriculture Organization of the United Nations (FAO) was established in 1945. FAO published statistics on global forest resources every five years from 1948 to 1963 in its World Forest Inventory series. It launched a new series of Forest Resources Assessments (FRAs) in 1980 that were initially limited to the tropics (Lanly, 1981; FAO, 1982, 1993). Subsequent assessments for 1990, 2000, 2005 and 2010 have had global coverage (FAO, 1995, 2001, 2006, 2010).

Statistics contained in FRAs have supported decision making by various international bodies. These include FAO itself, the UN Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity, the UN Convention to Combat Desertification, and the UN Forum on Forests. Concerns in the UNFCCC about the role of forests in global climate change have led to negotiations on a mechanism for Reducing Emissions from Deforestation and Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+) (UNFCCC, 2014), and to the recent New York Declaration on Forests (UN, 2014). FRA statistics have also been of value in many scientific studies, most recently on forest and agricultural land dynamics (Ausubel et al., 2012), drivers of deforestation (Hosonuma et al., 2012), environmental sustainability (Arrow et al., 2012) and the carbon cycle (Le Quere et al., 2009; Smith et al., 2014).

Deforestation, particularly in the tropics, was a major concern of FRAs 1980 and 1990 (Holmgren and Persson, 2002). As the benefits expected from forests have increased over time, the focus of FRAs has diversified to assess the status and supply of a wider range of forest ecosystem services. However, debate continues about the breadth of variables that should be assessed in FRAs, given the limited resources made available to undertake the assessments (Matthews and Grainger, 2002). FRAs rely heavily on information supplied by governments in response to FAO questionnaires, and the lack of up to date and comprehensive national forest inventories in developing countries on which these responses are based has raised concerns about the accuracy of the resulting statistics on forest area change (Grainger, 2008). It has also led to proposals for improving global forest monitoring for REDD+ by making better use of satellite images (Baker et al., 2010; Grainger and Obersteiner, 2011).

This paper presents and analyses the findings on global trends in forest area between 1990 and 2015 reported in the Global Forest Resources Assessment 2015 (FRA 2015) (FAO, 2015; MacDicken, 2015). The remainder of the paper is in three main sections: Section 2 summarizes the methods used to estimate values of FRA statistics; Section 3 provides an overview of FRA 2015 results; and Section 4 analyses these findings to assess their significance for our understanding of recent trends in global forest area and what has caused them.

2. Methods

FAO's Global Forest Resources Assessments (FRAs) continue to rely on the submission of national data by governments, but the methods used for this have changed over time. Sending questionnaires to countries, the same method used for the World Forest Inventories, was found to have limitations. Since FRA 2005, FAO has devolved most statistical estimation to the National Correspondents (NCs) who supply information on behalf of governments, giving them instructions in detailed guidance documents on how to submit information using a common reporting framework (e.g. FAO, 2013a,b).

The two main categories of tree cover for which statistics are reported in this paper are 'forest' and 'other wooded land'. Since FRA 2000, all countries in the world have been asked to use a common definition of 'forest', as land of at least 0.5 ha covered by trees higher than 5 m and with a canopy cover of more than 10%, or by trees able to reach these thresholds, and predominantly under forest land use. This excludes land that is mainly under agricultural or urban land uses. The FAO definition of 'forest' is essentially a land-use based definition, and it differs from other definitions of forest which rely solely on the presence or absence of tree cover, and from legal definitions based on topographic or other factors (Lund, 1999, 2002). It includes areas of land that may be temporarily unstocked with trees but are still intended for forestry or conservation use. It also combines natural forest and planted forest, the latter including intensively managed forest plantations. 'Other wooded land' describes land of at least 0.5 ha that is covered by trees higher than 5 m, and either the tree canopy cover is 5–10%, or the total cover of trees, shrubs and bushes exceeds 10% (FAO, 2010).

Three key questions asked in FRA 2015 that are relevant to forest area concern:

1. The areas of forest and other wooded land. Forest area was also reported in the categories of primary forest, other naturally regenerated forest, and planted forest.
2. The rate of forest expansion, which was subdivided, where possible, into the natural expansion of forest, and human-induced afforestation.
3. The rate of forest loss.

NCs were asked to submit responses to these and other questions for the reporting years 1990, 2000, 2005, 2010 and 2015, through tables in the online Forest Resources Information Management System (FAO, 2013a) for which standard templates