Forest Ecology and Management 352 (2015) 3–8

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Global Forest Resources Assessment 2015: What, why and how? ☆

Kenneth G. MacDicken

Food and Agriculture Organization of the United Nations, Rome, Italy

ARTICLE INFO

Article history:
Received 10 November 2014
Received in revised form 4 February 2015
Accepted 5 February 2015
Available online 7 September 2015

Keywords:
Global Forest Resources Assessment 2015
FRA
Global forest statistics
Forest resource change
Forest change

ABSTRACT

This paper introduces a Special Issue of Forest Ecology and Management that includes a collection of analytical results from the 2015 Global Forest Resources Assessment (FRA 2015) covering 25 years of forest change (1990–2015). FRA 2015 builds on a series of global assessments that began in 1948 and covers change in forest area and type, volume, biomass and carbon stocking, measures of sustainable forest management, biodiversity and conservation, soil and water protective functions, wood production and a number of socio-economic variables. It covers 234 countries and territories with an emphasis on forest resource change over a twenty-five year period (1990–2015) and also looks forward to anticipated forest change – both as government targets for forest area and projected change (to 2030) to global production and conservation forest area (to the year 2050). This paper describes important contributions of global forest resource estimates to forest management, the methods used in the collection and analysis of FRA 2015 data and provides links to additional information resources. It discusses some of the limitations of this global dataset, some of the steps taken to improve quality and the characteristics that make this type of global data most useful. While forest area change dominates public use of the FRA, the state of the forest resource and management is critical to understanding the ecological and social values of the forest and forestry. Country level reporting not only provides insights that are only possible through national reporting but also provides greater national-level understanding and discussion of forest resource change. The papers that follow in this Special Issue provide analyses of FRA 2015 data covering a wide range of topics related to sustainable forest management and forest change.

1. Introduction

1.1. A short history of global forest resource data

We often take for granted our global knowledge of forest resources. Yet it is only since the 1920s that humankind has had any real understanding of the global forest resource. That knowledge has changed the shape of how forests are viewed by the public – and it has influenced the investment of public and private money in forestry.

Global information on the extent and quality of the forest resource did not exist until Rafael Zon and Sparhawk (1923) produced the first comprehensive Global Forest Resources Assessment in 1923. This ground-breaking work set the stage for all future global forest assessments and was a remarkable accomplishment in the aftermath of World War I. The assessment did not include all countries and as a result reported world forest area as just over 3 billion ha.

The first global assessment conducted by the Food and Agriculture Organization of the United Nations (FAO) was published in 1948 when the main interest was well expressed in the first sentence of the report: "The whole world is suffering from shortages of forest products" (FAO, 1948).

Global Forest Resources Assessments, coordinated by FAO, have been made at approximately five to ten year intervals since then. The mandate for these assessments is found in the FAO Constitution, which states that "The Organization shall collect, analyze, interpret and disseminate information relating to nutrition, food and agriculture. In this Constitution, the term 'agriculture' and its derivatives include fisheries, marine products, forestry and primary forestry products." (Article I, Functions of the Organization, paragraph 1).

The scope and content of global forest assessments have evolved over time to respond to changing information needs. Studies of timber supply trends dominated the assessments through the 1960s, but from the 1980s onward they have included a wider range of forest benefits and functions. The challenges faced in global forest assessment begin with a persistent lack of reliable source data to meet increasing demand for information. For example, the 1992 Earth Summit in Rio de Janeiro initiated three

☆ This article is part of a special issue entitled "Changes in Global Forest Resources from 1990 to 2015".

E-mail address: kenneth.macdicken@fao.org

http://dx.doi.org/10.1016/j.foreco.2015.02.006
0378-1127/

conventions (UN Framework Convention on Climate Change, Convention on Biological Diversity and the UN Convention to Combat Desertification) that each have expanded requirements for countries to report on forest resources. Organizations and technical professionals seek new global information through the FRA and this interest often translates into new areas of inquiry, despite efforts to keep the assessment focused on the forest resource. This demand for information has been difficult for countries to meet in large part because the data often do not exist and resources for additional data collection are scarce.

Criticisms of FRA data have been primarily focused on data-poor country reports, the lack of comparable long-term trend data (Mather, 2005; Grainger, 2008; Harris et al., 2012) and assumptions that suggest remotely-sensed data are inherently superior to forest statistics reported by sovereign nations (Grainger, 2008; Harris et al., 2012; Hansen et al., 2013). While the idea of long-term, high quality forest data collected using the same methods across time, forest type and countries with highly divergent access to technical and financial resources is attractive, it is also most impractical. At the same time, the assumption that remote sensing provides clear, accurate and precise results for forest change at the global scale is also tenuous. Recent attempts to report global forest change have made the mistake of characterizing tree cover change from satellite imagery as forest change (Harris et al., 2012; Hansen et al., 2013) without regard to the processes of natural regeneration and reforestation. Both of these studies have confused the distinction between forest and woody horticultural crops and as a result reflect tree canopy change, but not necessarily forest change. Neither remote sensing nor country-based reporting provides perfect answers to forest resource change questions. An analysis of how results from FRA 2015 and remote sensing studies compare is found in Keenan et al. (2015).

Global Forest Resources Assessment (FRA) 2015 statistics and analyses reported in this volume inherit many of the same strengths and weaknesses as the 1948 assessment, yet it is also a very different assessment in scope, transparency and quality. More national forest inventories were available for FRA 2015 than for any other global assessment – 70% of them utilized remote sensing for at least a portion of the inventory. In 1948, one hundred and one countries and territories reported – in 2015, this increased to 234 countries and territories.

While public interest in forest change presently seems focused on deforestation, many of the world's forests have changed in other important ways that are less visible to the public – for example characteristics such as stocking density, species composition and diameter distribution (Plumptre, 1996; Dallmeier and Comiskey, 1998; Coomes and Allen, 2007). Climate change is predicted to create substantial shifts in tree species distribution and forest structure (Scheller and Mladenoff, 2005; Gustafson et al., 2010). These shifts may require even greater monitoring efforts to assess more rapid forest change in the future. At the same time, human populations have nearly tripled from 1948 to 2015 and are predicted to continue increasing, putting greater pressure on remaining, accessible forests to provide goods and services for a growing population.

Understanding how global forest resources are changing is far more complicated, and generally far more important than understanding forest area change alone.

1.2. How have FRA global datasets been used?

Information on the global state of forests drives policy and resource flows at global, regional and national levels. Forests today – including extent, composition and structure, are in part a result of the many years spent acting on reported characteristics and forest change. MacDicken (2014) highlights how, for example, past FRA reports noted the rapid conversion of broadleaf tropical forest into agricultural land. This helped prompt some 60 years of increased investment by governments, companies, individuals, donor agencies and civil society groups in improving forest management in the tropics. This investment has in turn contributed to the reductions in tropical forest loss rates reported in Keenan et al. (2015) and FAO (2015).

Forest stock losses due to long-term land use change, especially in the tropics, are an important part of greenhouse gas emissions (Settele et al., 2014). Forest area and growing stock changes detected through monitoring have provided improved understanding of forests in the global carbon balance – and much of the early work on this topic came from the FRA (Detwiler and Hall, 1988; Houghton, 2008). FRA data continues to be used in global estimates of emissions from land use and land use change for the Intergovernmental Panel on Climate Change (IPCC) and climate change modelling (Smith et al., 2014; Petrescu et al., 2012).

Global reporting over time can help identify knowledge gaps and highlight where improved information on forest resources is needed. The importance of field-based National Forest Inventories (NFI) has long been demonstrated through FRA reporting – both through the value of reported inventory results and the identification of serious data gaps in countries where these inventories do not yet exist. The FRA 2015 dataset adds value to NFI results by providing a Tier system that integrates data age and source classes. The need for updated field-based forest inventory has become increasingly important for climate change mitigation efforts such as the Reducing Emissions from Deforestation and Degradation (REDD+) mechanism.

The inclusion in FRA global reports of earth observing satellite data such as those obtained and derived from the Landsat sensor have become a useful adjunct to country reporting on forest extent over time. The integration of Landsat in tracking forest cover change in the tropics (FRA 1980, 1990, 2000) has helped highlight the global value of this unique dataset. At the same time the use of remote sensing in national forest inventories on which many FRA country reports are based has grown substantially (MacDicken et al., 2015).

2. Methods

2.1. Characteristics of FRA 2015

FRA 2015 was organized around 21 key questions grouped into eight topical categories: forest area and forest characteristics, production, protective functions and ecosystems services, biodiversity/conservation, disturbance, measuring progress toward sustainable forest management, economics/livelihoods and looking forward (www.fao.org/forestry/FRA2015/Methods). A total of 117 variables are included, most of which covered the period 1990–2015 (Table 1). FRA 2015 included 37 variables that were not included in previous assessments. Countries submitted reports between October 2013 and July 2014, including projected values for the 2015 reporting year.

The majority of variables were reported for the years 1990, 2000, 2005, 2010 and 2015. Future forest area targets were requested for the years 2020, 2030, and some variables were requested for the latest available year when a specific date was likely to be unavailable or irrelevant (e.g., monitoring of forest management plans stakeholder involvement). In addition to the quinquennial reports, annual values were reported for wood removals, total burned area and burned forest area. Annual forest area under international forest management certification were provided by the Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC). Projections of future forest area were requested of countries for 2020 and 2030 and a