



Food and Agriculture  
Organization of the  
United Nations

# Global Forum on Food Security and Nutrition

FSN Forum

Report  
of activity  
No. 163

from 11.02.2020  
to 25.02.2020



© Flickr/Utet Fransasti/CIFOR

## Towards improved reporting on primary forests

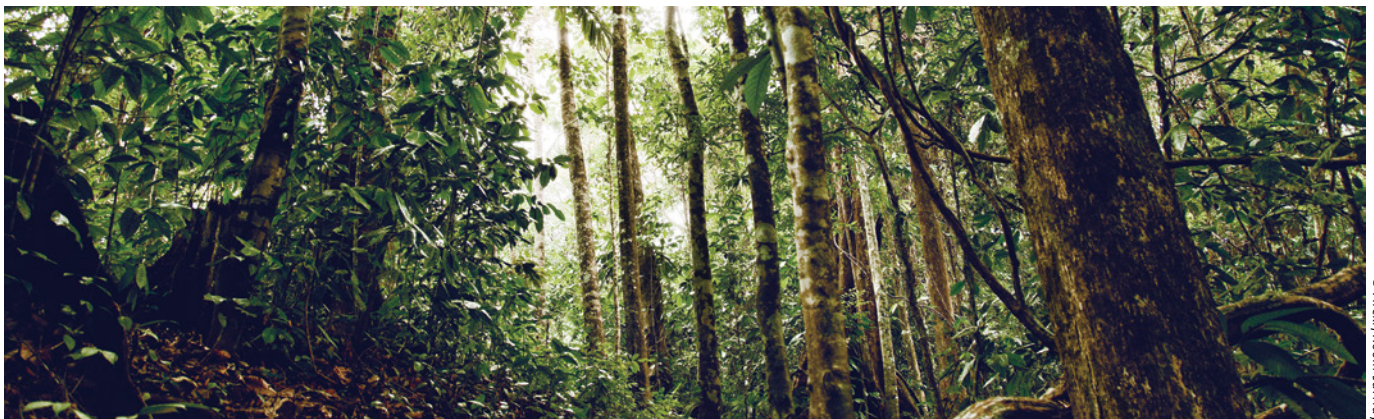
### About this online consultation

This document summarizes the online consultation *Towards improved reporting on primary forests*, held on the FAO Global Forum on Food Security and Nutrition (FSN Forum) from 11 to 25 February 2020. The consultation was facilitated by Brendan Mackey and Patrick Norman from Griffith University, Australia.

The goal of this online consultation was to solicit comments on a draft background paper on past, current and emerging methods for assessment of primary forest areas, which is currently being prepared by FAO in collaboration with countries and other stakeholders. This background document serves to facilitate discussion during the workshops that will bring FAO's Global Forest Resources Assessment (FRA) national correspondents and other experts together to discuss how reporting on primary forests can be improved. The workshops are to take place in different regions in the course of 2020 and 2021.

During this online consultation, participants discussed definitions related to primary forests and their adequacy for assessment and reporting purposes, identifying what they perceived as gaps in the draft background document. In addition, participants shared information on the methodologies and data they use in assessing primary forest areas and discussed which methodological changes would be needed to improve reporting, paying specific attention to promoting consistency among countries. Last, ideas were shared on how FAO could help countries improve reporting.

Over the two weeks of discussion, participants from 18 countries shared 26 contributions. The topic introduction and the consultation questions proposed, as well as the contributions received, are available on the consultation page: [www.fao.org/fsnforum/activities/discussions/primary-forest](http://www.fao.org/fsnforum/activities/discussions/primary-forest)



© Flickr/Robin Jaffray

## Discussion question 1: Is the FAO definition of primary forest (FAO, 2018) adequate for your national/regional/global assessment and reporting purposes? If not, what criteria would you like to add/remove from the FAO definition?

Participants commented on the adequacy of FAO's definitions of "forest" and "primary forest", and shared suggestions on how they could be improved.

### Definition of forest

Some participants pointed out that the FAO definition of forest is already being used in their countries. In Congo, for instance, it has been applied in the context of the national forest inventory carried out there with support from FAO (Brice Dzatini). In Equatorial Guinea the definition has been used as well; there, it is also perceived to be adequate in the context of assessing primary forests (Ruslan Lamberto Ndje Nzo Angue).

Other participants argued that the definition is fine (Aklilu Nigussie, AMM Zowadul Karim Khan) and adequate for them as experts (Terfa Olani), but that different definitions are used in their country. In Bangladesh, for instance, a forest is a forestland, declared as such and protected by the government (AMM Zowadul Karim Khan), while in Ethiopia, a different definition is applied (Terfa Olani).

Comments also addressed the question of which criteria and thresholds the definition should comprise. For instance, one participant wondered which tree species are included in the definition. Specifically, he referred to Ethiopia's Afar region, where plots of land with weed-type trees like the *Prosopis juliflora* meet the numerical thresholds as laid

down in the FAO definition of forest – Could these lands be called forests as well (Aklilu Nigussie)? Other participants suggested reviewing the thresholds regarding surface, canopy cover and tree height. Comments included the consideration that a surface area of one hectare would be more realistic (AMM Zowadul Karim Khan). Reference was also made to the definition that is often used in the context of the REDD+ process, which considers a forest to be land spanning more than 0.5 hectares, with trees higher than three metres and a canopy cover of more than 30 percent (Brice Dzatini).

### Definition of primary forest

#### General adequacy

One of the contributions stressed that from the standpoint of global primary forest assessment and reporting under the Convention on Biological Diversity (CBD), the definition's criteria are a good enough fit for the concept of "forests as natural habitat" under Aichi Biodiversity Target 5. At the same time, however, the need to clarify ambiguous terms and set thresholds was also recognized (Secretariat of the CBD) – an opinion shared by multiple participants. Specifically, some stressed that as the definition lacks measurable discreet parameters for various biomes and specific inventory variables, countries will interpret it differently. Consequently, reporting practices will be inconsistent, and data will not be useful at the global scale (Jing Yang, Sonja Oswald).



Related to the common agreement that the current definition is merely descriptive, and therefore not operative, is the question of what the definition actually tries to measure (Sonja Oswalt, Mila Alvarez Ibanez). One participant pointed out that as it refers to "no clearly visible indications of human activities", the definition is confined to human visibility or perception; the question was then raised whether the definition focuses on forest appearance to the human eye or ecological health. Comments stressed that in any case, the definition attempts to envision how forests look and evolve in the absence of humans, neglecting the fact that people always have an impact – even when they are native or when their presence is remote (Mila Alvarez Ibanez). In fact, if the aim is to measure human footprint, the impact of native people should also be considered (Sonja Oswalt). A related issue arises in reaction to the definition's assumption that human impact is always negative, when, in fact, human action can sometimes be ecologically beneficial (Mila Alvarez Ibanez). Indeed, some "primary" forests are likely less biodiverse or less beneficial to humans or wildlife than well-managed secondary forests. This should be considered if the aim is to measure ecological function (Sonja Oswalt). One of the participants specifically suggested to base the definition on ecological characteristics (Mostafa Jafari).

Multiple participants stressed that reporting on measurable characteristics attributed to primary forests rather than on a broad definition left to interpretation would improve the comparability of data and its usefulness for decision-making. In this regard, the concept of intact forest landscapes (IFLs) – used in international negotiation processes on forests (Andrei Iugov) – was mentioned as a practical example for consideration (Andrei Iugov, Mila Alvarez Ibanez). Specifically, IFLs provide an estimation of where large areas of unfragmented core habitat free of visual human impact exist, a key characteristic of primary forests as defined by FAO. If this approach were to be used, criteria to measure some characteristics of primary forests would need to be adjusted to specific biomes or appropriate scales (Mila Alvarez Ibanez).



## Criteria and thresholds

Various participants provided suggestions on how the definition could be made more operative by commenting on specific criteria. They often stressed the need to establish clear thresholds, raising questions that arise in this regard but also providing concrete suggestions for improvement:

### ► Human disturbance.

- **Distinction between indigenous and non-indigenous people** (Jing Yang). The primary concern seems to be operations for commercial purposes, which raise various questions: How far back does one go to determine who is "native" or "indigenous" to an area, and how large can their disturbance for "traditional use" be before it becomes large enough to be considered human intervention (Sonja Oswalt)?
- **Scarcity of cases in which forests are not affected by human intervention.** This situation exists, for instance, in Uruguay, where nearly 90 percent of the forests host mixed farming. Here the concept of "time-bound unaltered areas" can be applied, which requires defining the time span under consideration. This time span, in turn, depends on the type of forest, its location and resilience, and the extent of the interventions. In any case, it should not be shorter than 50 years (Leonardo Daniel Boragno Rodriguez).

► **Managed forests.** Inclusion of this concept alongside that of "pristine forests" leads to a certain contradiction: managed forests involve "traditional forest stewardship" and consequently, harvesting of wood/forest products, but in an invisible way and with "no known significant human intervention" (Claudiu Zaharescu).

► **Natural.** Using this word allows for a wide range of "degrees of naturalness" to be included in the primary forest category. For example, are forests that have grown over Aztec ruins considered natural? Are they primary or secondary? Also, young forests can exhibit natural forest dynamics, natural tree species composition, and natural age structures (Sonja Oswalt).

► **Visible indications of human activities.** This aspect is important when considering the use of earth observation data. Very old or small-scale disturbances may not be visible due to limitations in available satellite data. Therefore, the definition of primary forests should be consistent with available historical observation data. Hence, it should be as follows: "Naturally regenerated forest of native tree species, where there are no clearly visible indications of human disturbances in the last 20 years or during the period of existing observation data" (Christelle Vancutsem and Frederic Achard).



- **Significant species loss.** What threshold should be used? Or, in other words, when is species loss significant enough for a forest not to be classified as “primary”? This may need to be defined separately for different biomes ([Secretariat of the CBD](#)).

Canopy cover and tree height were other variables that were discussed in relation to threshold setting. One contribution mentioned that separate thresholds may need to be established for different biomes ([Secretariat of the CBD](#)). Other comments stressed that it would be difficult for countries to undertake forest assessments on an ecoregional basis, specifying the canopy cover and height thresholds for each forest type, and then to establish baseline values for primary, secondary and degraded forests. This becomes even

more complicated when considering that one also needs to take into account anthropogenic influence, ecological characteristics and vegetation structure ([Jing Yang](#)).

### Adding or removing criteria

Some participants specifically addressed the question of whether any criteria should be added to or removed from the definition. On the one hand, some comments stressed that rather than focusing on changing any criteria, the focus should be on ensuring that the criteria mentioned are used consistently by countries that provide figures on primary forests. On the other hand, some of the participants perceived the need to include additional aspects, such as the age and nativity of trees, as well as different climate zones ([Saud Al Farsi](#)).

## Discussion question 2: Is the background paper overlooking any major issues?

Some participants shared general suggestions for the background paper, such as improving its readability ([AMM Zowadul Karim Khan](#)) and adding literature on areas that are rich in primary forests ([Terfa Olani](#)), while other comments stressed the need to include very specific topics such as mapping of geoxylic diversity ([Philmena Tuite](#)). Furthermore, a number of participants pointed to issues that should be explained in more detail:

- **The purpose of primary forest reporting.** Participants stressed that there is no discussion on the question of “why we want this” ([Sonja Oswald](#), [Jing Yang](#)) – i.e. the motivation for improving reporting on primary forests. The Secretariat of the CBD addressed this question, placing it in the context of achieving global forest-related targets. The Secretariat stressed that if the proposed targets for the new global biodiversity framework are adopted, a

global indicator of primary forests would be extremely relevant as an indicator of the integrity of ecosystems. In fact, it would be crucial to ensure that the achievement of these targets is not based upon large-scale replacement of primary forests with younger or more modified forests that do not have the same value for biodiversity. Furthermore, the monitoring framework that is currently being developed suggests monitoring the "change, and rate of change, in extent of natural ecosystems and biomes (overall, for each biome/ecosystem type, and for intact areas, e.g. primary forests)", with "trends in primary forest extent" as a potential indicator for that element.

- ▶ **The exclusion of native populations when measuring human impact.** Why should one distinguish between disturbance for commercial purposes and disturbance by local people if the impact is the same? What about commercial exploitation by indigenous people? This could be reworded to exclude particular uses by any people, such as low-impact uses like gathering fuelwood for local use (Sonja Oswalt).
- ▶ **The meaning of "native species composition"** (Kari T. Korhonen). This term is mentioned in the section on ecological characteristics (line 207); however, it is not clear what "level of naturalization" is necessary for something to be considered "native". Nor is it clear at what point something is considered to be "naturalized" and included in the "nativity" of the forest environment.

- ▶ **The meaning of "natural level of biodiversity".** This term is mentioned in the section on ecological characteristics (line 207), but it is not clear whether there is some scale or percentage of "naturalness" that a forest needs to meet and what the baseline is by which this is measured. Often, disturbed forests are more biodiverse than undisturbed forests – hence, not all biodiversity is necessarily desirable biodiversity. To what time period do we refer to determine what level of biodiversity is optimal (Sonja Oswalt)?

Multiple participants provided feedback on the topics of data collection and use, and suggested to strengthen relevant sections in the background document by including the following aspects:

- ▶ **Recommendations on data that can be used to address the definition's criteria.** The paper recommends that a "minimum attribute dataset" be defined to assess primary forest extent but does not list concrete recommendations for data that could be used for that purpose. A summary table could present specific datasets/methodologies against each criterion, possibly differentiating between regions. This could provide a basis for discussion.
- ▶ **A discussion on the discrepancies in current methodologies.** The document could draw on the 2018 review of national FRA reports carried out by the Secretariat of the CBD; this could complement the information on forest extent and loss (Table 5).



© Flickr/Uiety | Hansast/CFOR



Discussing discrepancies is also important with regard to possible reluctance to adopt new methodologies that could contradict data and trends previously reported by countries ([Secretariat of the CBD](#)).

- ▶ **Methods of data collection and evaluation used in the Carpathian region.** Specifically, chapters 1 and 2 should mention the approach of the signatories to the Framework Convention on the Protection and Sustainable Development of the Carpathians, which created the framework for the adoption and harmonization of

sustainable forest management and for the protection of the pristine forests of the Carpathians. In this context, States Parties have adopted criteria and indicators for the identification of virgin forests, as well as a common format for data collection and mapping ([Claudiu Zaharescu](#)).

- ▶ **Retroactivity of the application of harmonized/improved methodologies.** Will new time series data for primary forest extent be created or will data previously submitted be revised? How can consistency in the reporting of data be ensured over time ([Secretariat of the CBD](#))?

### Discussion question 3: Which methodology and data, if any, do you use to assess primary forest areas and their changes?

Some participants mentioned which approaches, methodology and data have been used by their countries to assess primary forest areas:

- ▶ In **China**, the primary forest data of the FAO country report came from the national forest inventory. Experts carried out an assessment based on the variable "degree of naturalness", an index that comprises five different grades: from primary forest (grade I) to plantations (grade V). This index considers anthropogenic influence, ecological characteristics and vegetation structure. However, abstract criteria and the lack of clear quantitative indicators led to inconsistent fieldwork and unsatisfactory results, with additional expert analysis needed to achieve a more accurate classification ([Jing Yang](#)).
- ▶ In **Poland**, the Polish Academy of Sciences, together with universities and research institutes, are discussing how primary forest areas should be assessed. The following terminology has been introduced to classify plant communities: a) autogenic: primary and natural; b) anthropogenic: semi-natural and synanthropic, and c) xenospontaneous ([Ryszard Kozłowski](#)).
- ▶ In **Romania**, the methodology used to assess pristine forest areas is based on indicators grouped under the criteria of naturalness, and surface size and borders ([Claudiu Zaharescu](#)).

- ▶ In the **United States of America**, the protected area database International Union for Conservation of Nature (IUCN) categories 1–5 are used, as well as interior Alaska and other roadless forests ([Sonja Oswalt](#)).
- ▶ In **Uruguay**, data collected for the national forest inventory, historical forest maps, data from the National Forest Registry, and knowledge and expertise of leading national experts (including from universities) have been used ([Leonardo Daniel Boragno Rodriguez](#)).

In addition, information and considerations were shared on the methodologies and data that are used by some institutions:

- ▶ The **Secretariat of the CBD** pointed out that the fifth edition of the Global Biodiversity Outlook applies the primary forest category of the FRA to assess progress under Aichi Biodiversity Target 5, using FRA data. Specifically, the Outlook refers to an analysis by [Morales-Hidalgo et al. \(2015\)](#) that extracts figures at the regional level from the FRA category on primary forests but also points to inconsistencies in the methodology's application and to potential data issues. However, an alternative indicator does not seem to be readily available, and for intergovernmental processes the FRA's value resides not only in its global coverage but also

in its acceptability to governments, as all data points have been formally approved.

- ▶ The **European Commission's Joint Research Centre** uses Landsat for the detection of tree cover disturbances in mapping "undisturbed tropical moist forests" (TMF). The Centre considers forests "undisturbed" when no disturbances are detected over the full period of available imagery. An expert-based system processes the full Landsat archive data from 1982 onwards, detecting tree cover disturbances that are visible in 0.09 ha pixels – which include disturbances from selective logging and fires that can be visible only during a short period. The system maps remaining moist forests without any visible sign of disturbance during the available observation period, and provides an annual change dataset depicting the spatial extent of TMF and disturbances ([Christelle Vancutsem](#) and [Frederic Achard](#)).

Individual participants also mentioned using Landsat ([Terfa Olani](#)) or, more generally, satellite data ([KBN Rayana](#), [Saud Al Farsi](#)). Aerial photography ([Saud Al Farsi](#)) and national forestry inventory field observations were other sources of data ([Kari T. Korhonen](#)). Last, Geographic Information System (GIS) and remote-sensing programmes have been used in the process of classifying tree density and species ([Saud Al Farsi](#)).

## Discussion question 4: Which methodological changes would be needed to improve reporting on primary forest areas and their changes at national, regional and global levels, with particular emphasis on improving consistency among countries?

In order to improve reporting on primary forest areas, participants believed there is a general need to:

- ▶ address the concept of primary forest at the biome level rather than the global level in order for it to be meaningful ([Sonja Oswalt](#));
- ▶ ensure that a) the definition of primary forest is based on a small number of measurable variables, and b) reporting is carried out by means of mapping based on remote sensing in order to achieve consistency between statistical data and the map area ([Jing Yang](#));
- ▶ harmonize reporting rules and formats of datasets to facilitate analysis of data at the regional and global level ([Saud Al Farsi](#));
- ▶ consider spatial issues by combining remote-sensing data and field data ([Kari T. Korhonen](#));

### Improving reporting in humid tropical regions

Specific ideas were shared on how reporting on primary forest areas in humid tropical regions could be improved. First, more information on the spatial distribution of historical disturbances would be needed. Large geographical and temporal unevenness of the Landsat archive hamper adequate monitoring of disturbances. However, consistent monitoring has been possible during the last 20 years over the full tropical belt. Expert knowledge could complement remote sensing-derived maps when historical data are missing to exclude the forests that have been falsely identified as undisturbed. Second, finer spatial resolution data is needed to capture smaller disturbances. Sentinel-2 data could significantly improve detection, but its availability is limited ([Christelle Vancutsem](#) and [Frederic Achard](#)).

## A tiered approach to reporting on primary forests

Some comments stressed that reporting mechanisms must acknowledge countries' different financial capacities; to this end, a "tiered" approach with different levels of data accuracy could be adopted for reporting on agreed primary forest characteristics (Mila Alvarez Ibanez, Jing Yang). The following approach could be used for estimating unfragmented forest area (i.e. size):

**Tier 1:** gross estimations as defined by IFLs or other mapping criteria identified for remote-sensing analysis, using imagery that is readily available and free;

**Tier 2:** estimations of unfragmented forest area based on remote-sensing analysis (Tier 1) and ground inventory data;

**Tier 3:** precise estimations that combine inventory information with high-resolution remote-sensing data and/or airborne data that might not be freely available, and that require more advanced processing and computing technology (Mila Alvarez Ibanez).

However, other comments argued that instead of relying on broad tiers of accuracy, the reporting format could include information on which of the criteria of the definition of primary forest were applied in the methodology used for the area's estimation (Secretariat of the CBD).

- ▶ establish indicators (such as the minimum surface of a primary forest) or common methodologies for ecological or biogeographical regions (Claudiu Zaharescu);
- ▶ disaggregate data in order to produce more accurate information – this implies self-validating the information concerned, which leads, in turn, to better control of the data collected (Leonardo Daniel Boragno Rodriguez);
- ▶ obtain data from local governments rather than using only satellite data in order to obtain access to additional information on field activities and involved stakeholders (KBN Rayana);
- ▶ make use of GPS-based methodologies (Murungi Jonan);
- ▶ assign the mission of national reporting to a single institute (Saud Al Farsi).

One participant shared specific suggestions on how to improve reporting in Europe. He suggested using the Buchwald hierarchical terminology, which would make the discussion about primary forests more relevant to this particular continent. Furthermore, he pointed out that EU member states could report through the Forest Information System for Europe, and that data from monitoring efforts by European countries should be integrated into the regular State of Europe's Forest reports (Zoltan Kun).

## Discussion question 5: How can FAO help countries improve their reporting on primary forests?

Participants mentioned that FAO can support countries in improving their reporting by:

- ▶ encouraging closer coordination between FRA national correspondents and CBD focal points to make the most of potential synergies between the two reporting processes (Secretariat of the CBD);
- ▶ collecting and providing them with access to the most relevant information, and by: a) helping them to use this information technically, and b) providing some guidelines to ensure consistency among countries (Christelle Vancutsem and Frederic Achard);
- ▶ providing discreet, measurable characteristics related to primary forests (Sonja Oswald);
- ▶ defining a small set of indicators derived from the definition of primary forests and a minimum number of indicators to be met, ensuring a certain flexibility and adjustment to country specificities (Claudiu Zaharescu);
- ▶ providing more concrete criteria and thresholds at the regional level (Kari T. Korhonen);
- ▶ facilitating capacity building (Aklilu Nigussie) and teaching staff how to differentiate between primary forest and non-forest areas, using GIS and remote sensing (Saud Al Farsi);
- ▶ organizing workshops and conferences (Ryszard Kozlowski, Saud Al Farsi), focusing on the regional level to exchange technical information and assist in data validation and compilation;
- ▶ continuing its efforts towards improving data quality by increasing the presence of technicians in the field, which will allow for a better understanding of forest dynamics beyond theoretical perceptions or information provided exclusively by correspondents (Leonardo Daniel Boragno Rodriguez).



## REFERENCES

FAO. 2018. *FRA 2020 terms and definitions*. Rome. 32 pp. (also available at [www.fao.org/3/i8661EN/i8661en.pdf](http://www.fao.org/3/i8661EN/i8661en.pdf)).

Mackey, B., Skinner, E. & Norman, P. *A review of current reporting & available data on primary forest & potential methods for country-level assessment. A discussion paper for the Food and Agriculture Organisation of the United Nations*. Draft for on-line consultation. Queensland, Griffith University [online]. [Cited 17 March 2020].  
[http://assets.fsnforum.fao.org.s3-eu-west-1.amazonaws.com/public/DRAFT\\_Primary\\_Forest\\_Report\\_12Feb20.pdf](http://assets.fsnforum.fao.org.s3-eu-west-1.amazonaws.com/public/DRAFT_Primary_Forest_Report_12Feb20.pdf)

## RESOURCES SHARED BY PARTICIPANTS

Buchwald, E. 2005. A hierarchical terminology for more or less natural forests in relation to sustainable management and biodiversity conservation. In *Proceedings. Third Expert Meeting on Harmonizing Forest-related Definitions, Rome, 11–19 January 2005*, pp. 111–127. Rome, FAO (also available at [www.researchgate.net/profile/Erik\\_Buchwald2/publication/309428561\\_Buchwald\\_2005\\_A\\_hierarchical\\_terminology\\_for\\_more\\_or\\_less\\_natural\\_forests/links/58107fab08aee15d49145d7d/Buchwald-2005-A-hierarchical-terminology-for-more-or-less-natural-forests.pdf](http://www.researchgate.net/profile/Erik_Buchwald2/publication/309428561_Buchwald_2005_A_hierarchical_terminology_for_more_or_less_natural_forests/links/58107fab08aee15d49145d7d/Buchwald-2005-A-hierarchical-terminology-for-more-or-less-natural-forests.pdf)).

FAO. 2015. *Global Forest Resources Assessment. Desk reference*. Rome. 253 pp. (also available at [www.fao.org/3/a-i4808e.pdf](http://www.fao.org/3/a-i4808e.pdf)).

FAO. 2016. *Global Forest Resources Assessment 2015. How are the world's forests changing?* Second edition. Rome. 54 pp. (also available at [www.fao.org/3/i4793e/i4793e.pdf](http://www.fao.org/3/i4793e/i4793e.pdf)).

FAO. 2018. *FRA 2020 guidelines and specifications. Version 1.0*. Rome. 58 pp. (also available at [www.fao.org/3/i8699EN/i8699en.pdf](http://www.fao.org/3/i8699EN/i8699en.pdf)).

FAO. 2018. *Seventy years of FAO's Global Forest Resources Assessment (1948–2018). Historical overview and future prospects*. Rome. 74 pp. (also available [www.fao.org/3/i8227EN/i8227en.pdf](http://www.fao.org/3/i8227EN/i8227en.pdf)).

FAO. 2018. *The State of the World's Forests 2018. Forest pathways to sustainable development*. Rome. 139 pp. (also available at [www.fao.org/3/i9535en/i9535en.pdf](http://www.fao.org/3/i9535en/i9535en.pdf)).

FAO. 2019. *Trees, forests and land use in drylands: The first global assessment. Full report*. Rome. 207 pp. (also available at [www.fao.org/3/ca7148en/CA7148EN.pdf](http://www.fao.org/3/ca7148en/CA7148EN.pdf)).

Morales-Hidalgo, D., Oswalt, S. N. & Somanathan, E. 2015. Status and trends in global primary forest, protected areas, and areas designated for conservation of biodiversity from the Global Forest Resources Assessment 2015. *Forest Ecology and Management*, 352: 68–77.

Mosseler, A., Thompson, I. & Pendrel, B. 2003. *Old-growth forests in Canada – A science perspective* [online]. [Cited 4 March 2020]. [www.fao.org/3/xii/0042-b1.htm](http://www.fao.org/3/xii/0042-b1.htm)

Vierich, H.I.D. & Stoop, W.A. 1990. Changes in West African savanna agriculture in response to growing population and continuing low rainfall. *Agriculture, ecosystems & environment*, 31(2): 115–132.

Walljasper, J. 2011. Elinor Ostrom's 8 principles for managing a commons. In: *On the Commons* [online]. Minneapolis, USA. [Cited 26 February 2020]. [www.onthecommons.org/magazine/elinor-ostroms-8-principles-managing-commons#sthash.EevbHb6L.dpbs](http://www.onthecommons.org/magazine/elinor-ostroms-8-principles-managing-commons#sthash.EevbHb6L.dpbs)

## VIDEO

*Elinor Ostrom on resilient social-ecological systems*  
[www.youtube.com/watch?v=LqC7xG8fxHw](http://www.youtube.com/watch?v=LqC7xG8fxHw)

## Global Forum on Food Security and Nutrition ▶ FSN Forum

Agricultural Development Economics Division (ESA)  
Food and Agriculture Organization of the United Nations  
[www.fao.org/fsnforum](http://www.fao.org/fsnforum) ▶ [fsn-moderator@fao.org](mailto:fsn-moderator@fao.org)



Some rights reserved. This work is available under a CC BY-NC-SA 3.0 IGO licence