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# Report of the Online Expert Consultation on Global Forest Resources Assessment: Towards FRA 2025

Online consultation: 12.–23. September 2022

David Henderson Howat, Kari T. Korhonen, Tapio Eerikäinen, Anssi Pekkarinen, Monika Garzuglia and Örjan Jonsson (eds.)

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## Introduction

This Report presents the Key findings and Recommendations of the Expert Consultation on Global Forest Resources Assessment: Towards FRA 2025, which took place online in written form through the FAO Global Forum on Food Security and Nutrition (FSN Forum), from 12 to 23 September 2022. The report has been produced in collaboration with the Natural Resources Institute Finland (Luke).

The event was organised by the FAO Forestry Division in collaboration with FAO Global Forum on Food Security and Nutrition (FSN Forum).

The objectives of this Expert Consultation are set out in Section 1 of the Report. Section II explains the Background and Organisation, including participation. Section III contains the Key Findings and Recommendations. The Annexes to the Report are in Section IV. Annexes 1–5 contain Summaries of the online discussions; Annex 6 contains the proposed list of FRA 2025 Tables; Annex 7 contains the List of participants; and Annex 8 contains the Background papers presented for online discussion.

## I. Objectives of Expert Consultation

1. The development objective of this online expert consultation was to contribute to progress towards sustainable forest management and better understanding of forest resources and their changes, through improved quality and frequency of information on forest and land use for better policy formulation, implementation and monitoring of the progress towards Sustainable Development Goals (SDGs) at national and international levels.

2. The immediate objectives of this online expert consultation were to:

- Provide recommendations on the scope of next global assessment including the country reporting process and the remote sensing component;
- Agree on standard definitions that will ensure increased consistency of reporting across countries;
- Enhance collaboration with other forest related reporting processes and organizations in order to reduce the reporting burden on countries and improve consistency of data across organizations/processes;
- Elaborate technical modalities for capacity building in developing countries;
- Discuss frequency of reporting on core variables and annual reporting on SDG indicators and other forest related indicators (e.g. for Post-2020 Biodiversity Framework targets of the Convention on Biological Diversity CBD and targets of the United Nations Strategic Plan for Forests UNSPF); and
- Advice on priority thematic studies.

More specifically, experts were invited to provide comments and share their views on the five background papers listed in paragraph 6.

## II. Background and organisation

3. The Global Forest Resources Assessment programme of the Food and Agriculture Organization of the United Nations (FAO) is a continuously improving process which seeks to meet changing information needs and produce relevant information for forest related decision making by using the latest available data, methods and technologies. FRA has received technical guidance and support from international specialists through expert consultations organized by FAO, with the support of the Government of Finland, at regular intervals over the last 35 years. The first five FRA Expert Consultations (Kotka I-V) were held in 1987, 1993, 1996, 2002 and 2006 in Kotka, Finland. The sixth consultation was held in 2011 in Nastola, Finland, and the seventh Expert Consultation was held in 2017 in Joensuu, Finland.

4. Each FRA is an upgrade of the former one. Due to recent developments in the international forest policy arena, such as the Paris Agreement, the SDGs of Agenda 2030, the United Nations Strategic Plan for Forests 2017–2030 (UNSPF) and the Post-2020 Biodiversity Framework, there is a need for FRA to adapt in order to respond to the evolving information needs, both in terms of scope and reporting periodicity. In this context, this eighth expert consultation is of paramount importance for providing relevant input and guidance for the next assessment, FRA 2025.

5. For the first time, this Expert Consultation was held online, from 12 to 23 September 2022. The consultation was conducted in written form in the FAO Global Forum on Food Security and Nutrition (FSN Forum). As this was an invitation-only event, participation was restricted to invited experts. From 12 to 18 September, participants had access to the forum and Background Papers and were able to provide written comment on these documents. From 19 to 23 September, the forum was open for discussion. At the end of the consultation the FSN forum compiled the results of the discussion in order to provide (i) a summary of discussion on each background paper and (ii) new versions of each background paper containing other specific comments from experts. These inputs formed the basis for this report.

6. A total of 56 experts from 24 countries and 8 organisations participated in this Expert Consultation. The number of experts providing comment on the Background Papers is as follows:

<b>Background Papers</b>	<b>Number of experts who commented</b>
Paper 1. <i>FRA 2025 –What has changed and why?</i>	24
Paper 2. <i>FRA 2025 country reporting process</i>	10
Paper 3. Proposal for voluntary updates in-between regular FRA reporting cycles	13
Papers 4a and 4b. <i>Improved reporting on primary forests – an update</i>	7
Paper 5. <i>FRA 2020 Remote Sensing Survey (RSS) and the way forward</i>	11

As noted above, Annexes 1–5 contain summaries of the discussions on each Background Paper, and Annex 8 contains the Background Papers as presented for online discussion.

7. The event was organised by the FAO Forestry Division in collaboration with FAO Global Forum on Food Security and Nutrition (FSN Forum).

### III. Key findings and recommendations

8. The key findings and recommendations from the Expert Consultation are as follows:

#### **A. Overall scope and framework for FRA 2025 and Reporting variables**

##### *General*

- There was general support for the overall scope and framework for FRA 2025, as set out in the Background Papers.
- In general, the proposed FRA Tables (see list in Annex 6) were well received, subject to the refinements and points for consideration set out below.
- There is a need to clarify that the “Status tier” is only required for the latest year, typically 2025, and that the “Trend tier” refers to the type of data sources used to report change over the entire time series.
- Consideration should be given to the proposal that Tier 1 should be “Other (Specify)”, allowing countries to provide further information if data sources are not in Tier 3 or Tier 2.

##### *Introduction*

- Consideration should be given to the proposal that countries should also report the date (year) of any updates to selected variables that could be expected between FRA 2025 and FRA 2030.

##### *Table 1a. Extent of forest and other wooded land*

- The category “Other land” should be replaced by the term “Remaining land area”.
- The annual reporting years e.g. 2016, 2017, 2018 and 2019 should be omitted from the table and the year 2025 added.
- Consider proposal to include 2021 and 2022 as annual reporting years in Table 1a and related Tables
- Consideration to be given to the proposal to place Table 1f immediately after

##### *Table 1b. Forest characteristics*

- The category “Primary forest” should be moved from Table 1c to Table 1b, as a sub-category of “Naturally regenerating forest”.
- Clarification to be given regarding the definition of the four climatic domains, using FAO Global Ecological Zones.<sup>1</sup>
- Consideration to be given to the proposal to rename “Naturally regenerating forest” as “Naturally regenerated forest”.
- Consideration to be given to the proposal to place the “planted forest” row above the “plantation forest” row.

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<sup>1</sup> FAO, 2012. Global ecological zones for fao forest reporting: 2010 Update. Forest Resources Assessment Working Paper 179. <https://www.fao.org/3/ap861e/ap861e00.pdf>

*Table 1c. Special forest categories*

- The name of this Table should be changed as primary forest is being moved to Table 1b.
- Strong support for calling this Table "Specific forest categories" rather than "Special forest categories".
- Further consideration to be given to removal of the category "Temporarily unstocked and/or recently regenerated".
- There should be a definition of "rubber wood".
- Consideration to be given to reporting on additional categories, such as peatlands, wet-lands and swamp forests, possibly in the context of future FRAs.

*Table 1d. Annual forest expansion, deforestation and net change*

- "Calculated" values will be replaced with a consistency check.
- Consideration to be given to adding "(a1)" and "(a2)" after afforestation and natural regeneration respectively, and replacing "(a)" with "(a= a1+a2)".
- Consider request to clarify definition of "afforestation" with regard to former forest land that has reverted to grassland and is subsequently afforested.

*Table 1e. Annual reforestation*

- Further consideration to be given whether or not to delete this Table.

*Table 1f. Other land with tree cover*

- "Total" row to be deleted.

*Table 2a. Growing stock*

- Further consideration to be given to whether or not to remove reporting for total growing stock.

*Table 2b. Growing stock composition:*

- Further consideration to be given to proposal that reporting on "Growing stock composition" be changed, from ranking species in terms of total volume to ranking species according to percentage of total growing stock.
- Drop-down" menu to be added for assigning the scientific name. Consideration to be given to providing an option to add a scientific name manually and to be able to note where data is partial.

*Table 2c. Biomass stock*

- Reporting years to be changed, to correspond to the reporting years in Table 1a "Forest area".

*Table 2d. Carbon stock*

- Consideration should be given to including carbon stocks in harvested wood products.

*Table 3a. Designated management objective*

- There should be a clear explanation of the difference between “unknown” or had “no” designation.
- Further consideration should be given to whether or not to delete the table on “Total area with designated management objectives”.

*Table 4a. Forest ownership*

- Further consideration to be given to the proposal that the sub-category of private ownership by individuals is further sub-divided into “...of which female”.
- The FRA 2020 category “Unknown/other” to be separated into “Unknown” and “Other” ownership.
- The category “Local, tribal and indigenous communities” to be renamed as “Indigenous Peoples and local communities”.

*Table 4b. Holder of management rights of public forests*

- The FRA 2020 category “Unknown/other” to be separated into “Unknown” and “Other”.
- The category “Individuals” to be deleted.
- The category “Local, tribal and indigenous communities” to be renamed as “Indigenous Peoples and local communities”.

*Table 5a. Disturbances*

- The “Total” row to be removed.
- Consider proposals to revise wording, by replacing “Disturbances” by “Damage” in the name of the Table; by inserting the word “predominant” in the heading within the Table; and by replacing the word “Damage” by “Disturbance” in the definition of Disturbance.
- Consider proposal to include anthropogenic disturbances (such as agriculture and logging in the Table.)

*Table 5b*

- Consider proposal to make reporting years consistent with other tables.

*Table 5d. Forest restoration*

- There should be a new reporting table on forest restoration.
- Consideration should be given to placing this Table in another, more relevant, section.
- Consideration should be given to including questions adapted from Table 5c – Degraded Forest.
- Consideration should be given to including questions about areas restored and about sources of funds.
- Consideration should be given to changing “forest law” to provide a wider formulation.

*Table 6a. Policies, Legislation etc.*

- Further consideration should be given to whether or not this Table should be omitted.

*Table 7a Employment in Forestry and Logging and Table 7b Graduation etc.*

- Further consideration should be given to whether collection of data on Employment and on Graduation of students in forest-related education should be sourced directly from other data collectors such as ILO and UNESCO rather than be collected through the FRA data collection process.

*SDG indicator 15.2.1*

- Consideration should be given to the proposal to standardise reporting years in SDG Tables with those for other Tables.

*Sub-indicator 5*

- Consideration should be given to adding a category “Other certification schemes (specify)”.

**B. FRA 2025 country reporting process**

- There was general support for the proposals set out in Background Paper 2.

*Revised terms of reference for the NCs*

- Consideration should be given to mentioning the time commitment required for undertaking the tasks required of an NC in the terms of reference.

*Strengthening the NCs’ network*

- Consideration should be given to the suggestions that FAO should facilitate further consultation and cooperation among NCs through a platform allowing them to communicate; that capacity building activities for NCs should continue beyond the period of report preparation and submission; that virtual meetings should be held, when necessary, to complement training; and that, in addition to email, other methods –

such as WhatsApp and Skype – should be used by the FRA Secretariat to communicate with NCs.

### Regional and sub regional workshops

- Clarification is needed to explain that, immediately after the second workshop, country reports will be submitted for validation by the Heads of Forestry (HoF); such validation allows national authorities to review their country reports, but if no action is taken within two weeks, the report is considered validated and will be locked for editing in the platform.
- Consideration should be given to the suggestion that at least five days be allotted particularly for the second workshops and if possible they should be held in person.
- The FRA Secretariat invited expressions of interest from countries interested in hosting and supporting the organisation of the regional workshops scheduled for 2023.

### **C. Proposal for more frequent voluntary reporting**

- There is a need to remove prescriptive language and make it absolutely clear that the entire process of making updates will be voluntary.
- Further consideration should be given to the proposals regarding the revision/update of all related tables when tables related to forest area and/or stock are changed, and to the recommendation to revise/update the entire report.
- When the results are disseminated, there should be clear identification of actual data years and clear indications of where data has been interpolated or extrapolated.
- The Country Report used for global FRA analyses should be kept on the FRA platform and version numbers/publication dates should be used to avoid any potential confusion caused by publishing different reports with different data.

### **D. Improved reporting on primary forests – an update**

- There was general agreement with the changes in the explanatory notes of the primary forest definition, which are seen as improvements taking into account the recommendations made during the special study initiated in 2019 on primary forest. The reintroduced Tier approach will provide greater transparency regarding data quality and reliability of estimates.
- Consideration should be given to improving the information provided in the section on Data Sources in the FRA reports in order to have a clearer understanding about how the primary forest area was obtained, and to allow countries to provide country-specific examples. This will help address the need to recognize differences between countries in relation to the way in which some of the terms in the explanatory notes are understood – for example point (a) - “management practices”, point (e ii) - “area is large enough”, point (e.iii) - “the last significant human intervention was long enough ago to have allowed natural ecosystem elements ... to have become re-established”.

- In general, there was support for the proposed changes in the reporting tables regarding primary forest, and in particular for moving primary forest area reporting from table 1c (special categories) to 1b (forest characteristics) - although there is a need to decide upon its exact format.
- As noted for Table 1b, clarification is to be given regarding the definition of the four climatic domains, using FAO Global Ecological Zones. The breakdown by biomes is well accepted and there is a need to provide a reference classification for the climatic domains/biomes, with shapefiles.
- There are remaining challenges such as data availability and the development of comparable methodologies.
- There was general support for the proposed operational guidance for improved reporting on primary forest, recognizing it as a useful document for improving and harmonizing the reporting on primary forest. However, challenges remain as there are so many variables that are difficult to evaluate and there are also concerns regarding the reporting burden on countries with several biomes.
- Consideration should be given to pilot studies involving a set of countries that share similar forests to help test the methodologies and improve the unification of criteria. These could include subnational analyses to help address problems of variability in forests and data within countries.
- Detailed drafting comments should be reflected in revised versions of these papers.

#### ***E. FRA 2020 Remote Sensing Survey (RSS) and the way forward***

- Experts made positive remarks about the methodology used in FRA 2020 Remote Sensing Survey. It was suggested that RSS could help with providing annual estimates (as discussed in Paper 3).
- There was general agreement on the variables proposed in the Background Paper, and a number of suggestions were made for further development:
  - Consideration should be given to the suggestions for further development in using RSS, as noted in Annex 5.
  - Further consideration should be given to sampling issues in the light of comments made during the online Expert Consultation.

## **IV. Annexes**

9. This Report contains the following Annexes:

Annex 1.	Summary of online discussions on Paper 1
Annex 2.	Summary of online discussions on Paper 2
Annex 3.	Summary of online discussions on Paper 3
Annex 4.	Summary of online discussions on Paper 4
Annex 5.	Summary of online discussions on Paper 5
Annex 6.	Proposed list of FRA 2025 Tables
Annex 7	List of participants
Annex 8	Background papers presented for online discussion

## **Annex 1. Summary of online discussions on Paper 1**

### **PAPER 1. FRA 2025 - WHAT HAS CHANGED AND WHY?**

This paper aimed to document and explain the rationale for the main proposed changes in the FRA 2025 specification/scope. It also included proposals for a slightly modified section for the SDG indicators 15.1.1 and 15.2.1., and for the reintroduction of a tiers classification system.

Experts were invited to respond to the following questions:

1. Do you agree with the proposed changes to the reporting tables? If not, please explain why and provide your suggestions or comments.
2. Do you agree including the proposed Tier assessment for some of the variables?
3. Do you have any suggestion on other ways to improve the scope (variables and reporting years) for the FRA 2025 country reporting process?

In general, experts expressed support for the proposed changes, including changes in the reporting tables, as well as efforts to reduce reporting burdens. This summary highlights areas where further consideration, or clarification, is needed.

#### General

It was noted that the "pre-filled" cells will contain values from the FRA2020 Report and that countries will have the option to accept this data or update it.

There is a need to recognize that some data may be unavailable in some countries.

There was a request to continue to provide information about the methods used for interpolation and extrapolation of values. FRA Reports should explain that, at the time of reporting, all 2025 data will be forecast values and that (e.g.) 2020 values will be a mix of some actual values for the year 2020, some forecast values for that year and some "backcasted" values.

There is a need to clarify that the "Status tier" is only required for the latest year, typically 2025, and that the "Trend tier" refers to the type of data sources used to report change over the entire time series.

It was proposed that Tier 1 should be "Other (Specify)", allowing countries to provide further information if data sources are not Tier 3 or Tier 2.

Questions were asked about why Tier 3 indicates the highest level of quality and Tier 1 the low-est. It was noted that this follows practice for IPCC (though not SDG indicators).

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In addition to reporting the date (year) of updated country reports expected between the regular FRA 2025 and FRA 2030 reporting cycles, it was proposed that countries should also report the date (year) of any updates to selected variables that could be expected during this period. It was noted that if the estimate of forest area is updated then all forest area related

variables should be updated. A table similar to Table 1 could be used to collect this information.

Table 1a – Extent of forest and other wooded land

There was a proposal to merge Table 1f with Table 1a. It was noted, however, that this would be a major change in structure, requiring that 5 more rows be added to Table 1a. A merger would also cause difficulties because Table 1a is mandatory for all countries but it is recognized that many countries lack the data to report on Table 1f.

There was a proposal to include a row for “other land with tree cover” immediately before “remaining land area” in Table 1a, so that palms, tree orchards, agroforestry and trees in urban settings etc are excluded in the calculation of “remaining land area”. On the other hand, it was noted that it is helpful to have a clear separation between the reporting of “forest” and “other wooded land” areas (Table 1a) and the reporting of “other land with tree cover” (Table 1f).

There was a proposal to include 2021 and 2022 as annual reporting years in Table 1a and related Tables

There was a proposal to place Table 1f immediately after Table 1a.

Table 1b – Forest characteristics

There was a request for clarification as to what definition of “climatic domain” (e.g. Köppen climate classification) should be used for the delineation of the different climatic domains. It should be clarified that the definition of the four climatic domains will use the FAO Global Ecological Zones. There was a question about why climatic domain data is not also requested for total forest area. It was noted that tropical forest could be further sub-divided into rain-forest and dry forest.

There were proposals to rename “Naturally regenerating forest” as “Natural forest”. This would simplify language, and it was also argued that natural forest is by definition naturally regenerating, and that the term “natural forest” is more widely used in scientific papers and official documents. On the other hand, it was noted that “naturally regenerating forest” is a more specific term than “natural forest” - for example, naturally regenerating forests comprising introduced species are not necessarily categorized as “natural forests”.

It was noted that the principle behind Table 1b is categorize forest area according to its “naturalness”. Thus, the first distinction is between forests established through natural regeneration, and forests established through planting. Both categories are then further sub-divided.

There was a proposal to rename the category “Naturally regenerating forest” as “Naturally regenerated forest” on the grounds that this refers to the origin of the forest rather than ongoing processes - for example, a plantation forest can be naturally regenerating.

There was some concern over the layout of Table with regard to “planted forest” and “plantation forest”. It was not clear that “Plantation forest” is a sub-category of “Planted forest” and it was proposed that “planted forest” row should be placed above “plantation forest”, using “of which” rows to sub-categorize. On the other hand, it was noted that this would

require a double “of which” (i.e. “planted forest” of which “plantation forest”, of which introduced species”).

There was a request for clear definition of “Other planted forests”. It was noted, however, this is defined as “Planted forest” which is not classified as “plantation forest”.

It was that noted that some countries may find it challenging to identify the area of plantation comprising “introduced species” where, for example, national forest inventories rely heavily on remote sensing interpretation. On the other hand, information about the extent of plantations with introduced species is of wide interest.

#### Table 1c – Specific forest categories

There was a proposal to align the Title and with the name of the Table, using “Specific forest categories”, and not “Special” forest categories” for both.

There were different views about removing the category “Temporarily unstocked and/or recently regenerated”. It was suggested that this requires further thought, as remotely sensed surveys can overstate forest loss where this category is not recognized. One possibility is to allow optional reporting on temporarily unstocked forest where this is helpful in understanding apparent discrepancies between changes in forest area and changes in forest cover.

It was suggested that the International Bamboo and Rattan Organization (INBAR) should consider providing support to countries for mapping/assessing bamboo forests. It was noted, however, that INBAR is carrying out this work, which has already started and available results will be obtainable on the platform for possible use in reporting.

There was comment about adding a footnote to the category “Mangroves” to explain that mangroves can contain “Other wooded land”. It was noted that the mangrove reporting has always included both forest and other wooded land (see definition) and that the intention of this footnote is to make this clearer, highlighting that mangrove area cannot be deducted cleanly from total forest area. However, some experts considered that this approach can lead to inconsistent data within FRA. There was a proposal to cross-reference this footnote to a footnote on “other wooded land” in Table 1a; however, the explanatory notes to the definition of “other wooded land” already refer to mangroves. It was also noted that FRA uses the definition of mangroves contained in Tomlinson’s Botany of Mangroves, which lists true mangrove species.

There was a request for a definition of “rubberwood” (e.g. “Forest area with predominant rubber vegetation”).

It was noted that both planted and naturally regenerated areas of bamboo, mangroves and rubber wood should be reported on.

There were proposals to include other forest land in this Table, such as peatlands, wetlands and swamp forests, recognising their importance for climate change mitigation. It was noted that, while this may be too challenging for FRA 2025, it could be considered for future FRAs.

#### Table 1d – Annual forest expansion, deforestation and net change

There was a proposal to clarify this Table by adding (a1) and (a2) after afforestation and natural expansion, respectively, and replacing (a) with (a=a1+a2).

It was noted that the FRA definition of deforestation (“the conversion of forest to other land use independently whether human-induced or not.”) is not the same as the UNFCCC (Marra-kech Accord) definition (“the direct human-induced conversion of forested land to non-forested land”).

There was a request to clarify whether former forest land that had reverted to grassland and was subsequently afforested as, for example, plantation forest should be reported as “afforestation”.

#### Deletion of Table 1e - Reforestation

There were requests for further explanation about reason for deleting this Table and further discussion with countries before deleting this table.

#### Possible new Table before Table 1f

There was a proposal for a new table providing more detail about “other wooded land”, possibly using similar categories to those contained in Table 1b-1e for “forest”.

#### Table 1f – Other land with tree cover

There were requests that this Table should be considered as optional, depending on availability of country specific data. It was noted that this information is missing in many countries as these categories are not typically covered in traditional NFIs.

#### Table 2a – Growing stock

There was some disagreement over the proposal to remove reporting for total growing stock. It was argued on the one hand that this information is more important than the (weighted average) per hectare values, and that removal will not significantly reduce reporting burden as growing stock must be assessed in order to calculate growing stock per hectare. On the other hand, the rationale for change is to try to reduce the reporting burden and facilitate easier update of reported data in the future.

Some countries are unable to report against this Table, or Table 2b.

#### Table 2b – Growing stock composition

There was some concern about the proposal that reporting on “Growing stock composition” be changed, from ranking species in terms of total volume to ranking species according to percentage of total growing stock; it was suggested that this would mean losing information that is useful for understanding how the forest resource composition changes over time.

There was a request for an option to manually add a scientific name if it is missing from the drop-down menu, and a request to note where data is partial.

#### Table 2c – Biomass stock

It was suggested that FAO continue to provide the Biomass Calculator introduced for FRA 2020 to help the countries in estimating the Biomass and its equivalent carbon.

Table 2d – Carbon stock

There was a proposal to include carbon stocks in harvested wood products for those countries that collect this information. It was noted that this would require additional reporting effort and there would be a need to ensure consistent methodology (e.g. consistency with IPCC guidelines and consistent approach to dealing with imports and exports).

Table 3a – Designated management objective

It was recognized that where forests have multiple functions, it can be difficult to define primary management objective for each forest area; but noted that some countries do classify forests according to their predominant function. There was concern that, especially if the Table on “Total area with designated management objectives” is deleted, it can appear as though entire countries are unmanaged for, for example, protection of soil and water. While Table 3a restricts reporting to a binary ‘yes/no’ for multiple use, or a particular management objective, that Table provides an opportunity to identify areas managed for each of the various management objectives, including areas that provide multiple objectives, recognizing that this is not necessarily mutually exclusive.

There was a proposal to place “Multiple use” first, followed by a series of “of which” sub-categories to identify areas contributing to each multiple use management objective.

There were requests for clarification of the difference between “No designation” and “Unknown”.

Table 3b – Forest area within protected areas and with long-term management plans

It was noted that “long-term” management plans are defined as those plans for a period of “ten years or more”.

It was noted that the word forest was removed in “Forest area with long-term forest management plan” because “forest management” can include zero intervention when this is appropriate. It was also noted that management plans may be for other purposes, such as tourism.

It was noted that “Protected Areas” are defined in terms of IUCN Categories I – IV.

Table 4a – Forest ownership

It was noted that FAO is keen to incorporate gender data in FRA reporting. However, there was concern that countries would be unable to report on areas of forest owned by individuals who are female. It was also noted that, even where owners are female, management may be undertaken by a male family member. In addition, it was noted that there are new considerations to consider in terms of gender terminologies. It was proposed that if this category is included it should be optional, depending upon availability of country data.

It was also noted that the uppercase ‘I’ should be used for Indigenous Peoples or Indigenous communities as Indigenous is a proper noun.

Changing the name of the category from “local, tribal and indigenous communities” to “Indigenous People and local communities” could have unexpected consequences if areas of

Communal Forest, previously reported as being in public ownership, are now be reported under this category.

Table 4b – Holder of management rights of public forests

The guidance document should explain that these categories are mutually exclusive. It was noted that in some countries management rights to public forests in areas of Indigenous land are held by the public administration.

Table 5a - Disturbances

There was a proposal to change the title of Table 5 to “Damage” or “Damage to Forest”, but to retain “Forest disturbance” as the title of this section. This recognizes that not all disturbance is damaging - for example, fire (Table 1b) is a disturbance that may be damaging, but can also be a key ecological process and may be planned.

There was a proposal to change the heading in the Table to “Predominant disturbance type or event” to emphasize that countries should try to avoid double-counting where more than one disturbance affects the same area. It was recognized, however, that data may come from different sources, and it may difficult to identify which is the predominant disturbance.

There was a proposal to replace the word “Damage” by “Disturbance” in the definition of disturbance.

There was a proposal to include anthropogenic disturbances (such as logging and agriculture) in the Table.

Table 5b

There was a proposal to make reporting years consistent with other tables.

Table 5d – Forest Restoration

It was noted that inclusion of this new Table follows a request from COFO. As there is no precise definition of “forest restoration” for FRA reporting purposes, and there are differences between countries, countries are being asked to state whether they have forest restoration commitments; to explain how they have identified areas in need of restoration; and to list any targets. The results from this exercise may help in future development of an operational definition.

There was a proposal to place this Table in another section, as it is linked to forest management rather than forest disturbance.

There was a proposal to include questions similar to those in Table 5c - Degraded forest, asking whether there is a national definition of “Forest restoration” and “If Yes” to describe the monitoring process and results.

There was a proposal to include a metric quantifying the area restored per year, or over the reporting period. However, other experts noted that it is likely to be difficult to collect quantitative data on forest restoration and referred to the imprecise definition and the difficulty in reporting on areas of reforestation. (Table 1e in FRA 2020).

There was a proposal for a question asking whether the country allocates specific funds for restoration.

It was noted that, in some countries, there are legal mechanisms aimed at supporting forest restoration which are not strictly speaking "forest laws". It was proposed that the wording is changed to reflect this (e.g. "is there a law or other government mandate in support of restoration?").

It was noted that answers to the question about how areas in need of restoration have been identified are likely to be diverse and hard to compare between countries or over time; and that the question about targets relates to political aspirations rather than achievements.

#### Table 6 -Forest policy and legislation

In general, there was agreement to delete this Table, which overlaps with UNFF Voluntary National Reports, where countries report on relevant legislation, policies and systems for stakeholder engagement, and provide links to the respective publications. However, some experts preferred to retain it or provide another way to report this information.

#### Table 7 – Employment, education

There was some concern about deleting these Tables on the grounds that information collected by other international organizations might not be specific enough for forest-related purposes.

#### Table 7c – NWFP removals and value

There was a proposal for a similar Table for wood products, but it was noted that data on wood removals is collected through the Joint Forest Sector Questionnaire (JFSQ) and this data is used for FRA analysis to avoid the need for double reporting.

Some countries do not have consistent and comprehensive data but are able to report case studies.

#### Sustainable Development Goal Indicator 15.2.1

There was a proposal to standardize reporting years in SDG Tables with those for other Tables.

#### Sustainable Development Goal Indicator 15.2.1, sub indicator 5

It was noted this data is sourced from FSC and PEFC, who ensure that there is no "double accounting". Further details are available from them.

There was a proposal to include a category "Other certification schemes (specify)". It was noted that some countries have national protocols/initiatives/schemes for conducting independently verified forest management certification.

## Annex 2. Summary of online discussions on Paper 2

### PAPER 2. FRA COUNTRY REPORTING PROCESS

This paper provided an overview of the FRA 2025 reporting process for discussion during the online Expert Consultation. More particularly, it provided a summary of (1) the FRA 2025 timeline, (2) the National Correspondents (NCs) network, (3) the Capacity development plan, (4) review and validation of FRA 2025 Country reports and (5) data analysis and dissemination of results.

Experts were invited to respond to the following questions:

- Q1) Do you think that the revised terms of reference for the NCs are clear and comprehensive, or do you have any suggestions on this matter?
- Q2) Do you have any other suggestions on ways to strengthen the NCs' network?
- Q3) In your view, is the proposed plan for the regional and sub regional workshops adequate? Or would you suggest any change that would make the workshops more efficient?
- Q4) Do you have any change to propose for what concerns the list of FRA outputs?

In general, experts expressed support for the proposals. This summary highlights areas where minor changes, clarification or further consideration is needed.

#### Q1. Revised terms of reference for the NCs

- Experts responding to Q1 agreed that the revised terms of reference for the National Correspondents (NCs) are clear and comprehensive.
- There were requests for the terms of reference to mention the time commitment required for undertaking the tasks required of an NC. It was noted, for example, that during 2023 NCs will need to allocate enough time to meet FRA deadlines, and that in future NCs may also need to dedicate additional time to FRA as it moves toward more frequent reporting.
- It was noted that Heads of Forestry should use the terms of reference presented as bullet points in section 2 as criteria for the nomination of the NCs.

#### Q2. Strengthening the NCs' network

- There was a suggestion that FAO should facilitate further consultation and cooperation among NCs through a platform allowing them to communicate about FRA activities and processes.
- There were suggestions that capacity building activities for NCs should continue beyond the period of report preparation and submission, and that virtual meetings should be held, when necessary, to complement training on topics where there are different areas/institutions involved in providing information and there is a need to deepen/unify the criteria.

- There was a suggestion that, in addition to email, other methods – such as Whatsapp and Skype – should be used by the FRA Secretariat to communicate with NCs.

### Q3. Proposed plan for the regional and sub regional workshops

- A number of experts disagreed with the proposed requirement that country reports be submitted for final approval at the end of the second workshop. It was noted, for example, that country reports might require further discussion with national colleagues after the workshop. The proposals to extend the deadline included allowing “15-30 days” and allowing “one month” after the second workshop. In this context, it was noted that it should be clarified that the submission at the end of the workshops is a submission for validation as referred to in section 4 of the background paper: “Once the review process is complete, the reviewers will change the status of the country report in the platform to “pending validation” and an automated message is sent to the NC and the alternate, informing them that the report has been cleared and it is ready to be validated by the HoF. The validation allows national authorities to review the country reports and to provide feedback, before their publication. If no action is taken within two weeks, the report is considered validated and it will be locked for editing in the platform.”
- It was noted that benefits of workshops include the opportunity they provide for NCs to have dedicated time for completing their reports, with technical advice and support from the FAO FRA Team/Reviewer.
- It was suggested that at least five days be allotted particularly for the second workshops and if possible they should be held in person (face to face).
- It was noted that ideally the first and second workshops would be held in different countries. It was also noted that the first workshops will introduce the reporting process and provide any newly nominated NCs with support to become familiar with the platform and the reporting process; meanwhile, the second workshops will focus on review of the reports.
- The FRA Secretariat invited expressions of interest from countries interested in hosting and supporting the organization of the regional workshops scheduled for 2023.

### Q4. Proposed changes to the list of FRA outputs

- There were no proposals for change. It was noted that the Key Findings, Main Report, Full Database and all Country Reports can provide enough information for users on all levels.

### Other points

- Table 1 to be amended by placing “establishment of FRA 2025 NC network” (October 2022) above “Finalization of improvements and changes of the FRA platform” (December 2022).
- It was noted that finalization of the scope/format of FRA 2025 is a task for the FRA team, who will make use of inputs from the Expert consultation. NCs will be notified as soon as the reporting is open so that they can access the Platform and start compiling their country reports.

## Annex 3. Summary of online discussions on Paper 3

### PAPER 3. PROPOSAL FOR MORE FREQUENT VOLUNTARY REPORTING

The paper discussed issues related to the COFO request that FAO should develop a flexible FRA reporting process that allows voluntary updates of key indicators. It covered the scope of updates, process and timing, as well as implications for countries and the FRA secretariat. It also presented a proposal, for further discussion, for the implementation of voluntary updates. Experts were invited to respond to the following questions:

- Q1) What is your opinion and recommendations regarding the proposed scope of the voluntary updates?
- Q2) What is your opinion and recommendations regarding the proposed time schedule for implementation of voluntary updates?
- Q3) What is your opinion and recommendations regarding the proposed annual process for voluntary updates?

In addition, experts made a number of general comments on this paper.

#### General

- Several experts highlighted potential limitations and challenges in developing a flexible FRA reporting process that allows voluntary updates of key indicators. These included: the additional workload and the human/financial resources required for making updates; the fact that there may be little new data as much of the underlying information, such as land cover data and national forest inventory, is usually collected on a cycle of at least five years and that there is generally little significant change on an annual basis beyond statistical error; the difficulty of analyzing results or aggregating them in a meaningful and unbiased way unless a large number of countries, representing a large proportion of the forest area, provide annual updates; and concern that frequent updates can be confusing for users/consumers of the data.
- On the other hand, it was recognized that it would be desirable to have the facility to update data when major changes occur or to correct errors when problems are discovered, and it was noted that this might help lessen the workload for FRA 2030.
- It was noted that in the first instance updates would be included in SDG submissions and visualized on the FRA portal; other forms of dissemination could also be discussed.
- There was a suggestion that there could be a pilot program with voluntary countries and/or regions, immediately after release of the FRA 2025 results, to assess whether the implementation of this proposal is achievable and data reported is reliable.

#### Proposed scope of the voluntary updates

- There is a need to remove prescriptive language and make it absolutely clear that entire process of making updates will be voluntary. This will require a reformulation of any sentences which imply that there is a mandatory element (such as the sentences stating that "Updates of the remaining reporting tables would be optional ...", "As a

minimum, revise/update all tables...” and “It is strongly recommended to revise/update the entire report ...”).

- It was noted that while it makes sense for countries to update tables for which new data are available between the FRA five-yearly reporting periods, they are unlikely to be willing to produce a full update of the entire report. It was also noted that in some countries it might be feasible to update forest area more frequently, but it would not be feasible to up-date all the other tables.
- There was a proposal that the guidance should suggest which Tables might be more important when updating, but leave it to countries to decide what it is feasible.
- There was uncertainty about the rationale for the sentences reading “The update of the FRA tables should cover the same reporting years as the last full FRA report. For disturbances and fire, additional years can be added.” An expert asked whether this meant that the update should, for example, only change values already provided, without extending the historical series.
- It was noted that when the results are disseminated, there should be clear explanations to help the reader understand the real timeline of data, for example by identifying actual data years and by showing when data has been interpolated or extrapolated.

#### Proposed process for implementation of voluntary updates

- It was suggested that updates should not be initiated until after the launching of every FRA Report so that the NCs and reviewers of the full country report will not be burdened by the updates while still working with the full report.
- There is a need to clarify that the “full FRA country reporting” in “2028 and onwards” relates to the normal FRA 2030 process.

#### Comments on implications and dissemination

- It is not clear how the collected data from the annual updates will be used.
- When the results are disseminated, there should be clear identification of actual data years and clear indications of where data have been interpolated or extrapolated to ensure that the users of both platform and report understand the real timeline of data.
- It was suggested that the Country Report used for global FRA analyzes should be kept on the FRA platform and that version numbers/publication dates should be used to avoid any potential confusion caused by publishing different reports with different data.

## **Annex 4. Summary of online discussions on Papers 4 and 4b**

### **PAPER 4. IMPROVED REPORTING ON PRIMARY FORESTS – AN UPDATE**

#### **PAPER 4B. DRAFT OPERATIONAL GUIDANCE FOR IMPROVED (BOREAL) PRIMARY FOREST REPORTING FOR THE GLOBAL FOREST RESOURCES ASSESSMENT**

Background Paper 4 summarized the findings of the FRA special study on improving reporting on primary forest, which aims to enhance consistency, comparability, completeness and quality of data reported to FRA on primary forest. It also included proposed changes to the reporting on primary forest for FRA 2025.

In addition to this Background paper, a draft guidance document (Paper 4b) has been elaborated to provide operational guidance, practical steps and recommendations to support the countries in establishing their national report to FRA on primary forest extent and changes, as well as improving their consistency. This guidance document provides clarifications supporting a common understanding of the FAO primary forest definition as well step-by-step approach to report on primary forest. The document has been elaborated with the boreal group and revised by a few other experts. It will be later refined taking into account all received feedback from the experts and expanded to the other biomes.

Experts were invited to respond to the following questions:

Q1. What is your opinion and recommendations regarding the proposed changes in the explanatory notes of the primary forest definition?

Q2. What is your opinion and recommendations on the proposed changes in the reporting table(s) regarding primary forest (Table 2)?

Q3. What is your opinion and recommendations regarding the proposed guidance document for improving the reporting on primary forest?

Q4. Do you have any suggestion on other ways to improve the reporting on primary forest and other forest characteristics?

#### *Proposed changes in the explanatory notes of the primary forest definition*

- There was general agreement with the changes in the explanatory notes of the primary forest definition. It was noted that this is much improved over previous reporting, although there are remaining challenges such as data availability and the development of comparable methodologies.
- On point (a) - "management practices", there was a suggestion that these should be defined by each country in line with its conditions and management practices for primary forests. There was also a question about why some human activities (such as Indigenous use) are considered not to affect categorization as primary forest, while other do affect categorization.
- On point (e ii) - "area is large enough", there was a question about having a minimum threshold (such as 0.5 hectare).

- On point (e.iii) - "the last significant human intervention was long enough ago to have allowed natural ecosystem elements ... to have become re-established", it was noted that time required to re-establish sufficient natural ecosystem elements and functions to meet the criteria of primary forests differ from country to country and climatic domain to domain, and so each country should define a proper time span, after the last significant human intervention to categorize primary forests in accordance with country's forest conditions.

*Proposed changes in the reporting table(s) regarding primary forest (Table 2)*

- In general, there was support for the new table, although the heading should be "Area" not "Growing stock".
- There is a need to decide the exact format of the Table, as this version is different from the format of Table 1b in Background Paper 1. There was also a suggestion to include a (calculated) row for "other natural forest" (i.e. area of natural forest minus area of primary forest).
- It was noted that the source of information and methodology for assigning each category should be clear and uniform between countries.
- There is a need to provide a reference classification for the climatic domains/biomes, with shapefiles. It was noted that climatic zones are often defined by latitude lines but there can be many different maps. It should be clarified that the definition of the four climatic domains will use the FAO Global Ecological Zones.

*Proposed guidance document for improving the reporting on primary forest*

- There was general support for this document, and it was noted that the sequence of steps is logical.
- It was suggested that pilot studies involving a set of countries that share similar forests could be carried out to help test the methodologies and improve the unification of criteria.
- It was noted that challenges remain, even with information from the national forest inventory and a monitoring system based on remote sensing data, as there are so many variables that are difficult to evaluate.
- There was some concern over increased reporting burden, especially for large countries that cross multiple biomes
- It was noted that this exercise will be more complex for tropical forests than for boreal forests, and some additional criteria may be required. It will be an important challenge to establish the most appropriate threshold values according to the circumstances of each country.

*Ways to improve reporting on primary forest and other forest characteristics*

- It was noted that it is difficult for countries to present comparable data on primary forest before objectively measurable and repeatable assessment criteria have been implemented in NFIs – the issue is one of data, not one of definition. Even if the assessment criteria were operational, not all countries could meet the requirements of the criteria in FRA 2025.
- There is a need to recognize the limitations in primary forest reporting data, and work towards achieving greater consistency among countries. The section on Data Sources

in the FRA reports can be used to provide a clearer understanding about how the primary forest area was obtained, and to allow countries to provide country-specific examples.

- There was a suggestion to conduct subnational analyses in order to help increase availability of information between FRA reports and address problems of variability in forests and data within countries.

Other

- There were a few detailed drafting comments on the papers, including the addition of additional references. These should be taken into account in the revised versions.

## Annex 5. Summary of online discussions on Paper 5

### PAPER 5. REMOTE SENSING SURVEY AND THE WAY FORWARD

The paper described the main performance indicators on the FRA 2020 Remote Sensing Survey (FRA 2020 RSS) with a focus on the design aspect. The objective is to provide elements for discussion about the potential improvement of subsequent cycles of this exercise and how to make the estimates generated in this context useful for the FRA country reporting process.

Experts were invited to respond to the following questions:

- Q1) What do you think about the methodology used in FRA 2020 Remote Sensing Survey (FRA 2020 RSS) to estimate global and regional variables?
- Q2) Do you agree on the variables reported by FRA 2020 RSS? Are there any variables you would like to propose to be included in the next FRA RSS Cycle in addition to those proposed on this background paper?
- Q3) Do you agree on building on top of the samples already collected by adding additional samples on changes detected between 2018 and 2023?
- Q4) Were you involved in the FRA 2020 RSS data collection phase? If yes, do you think that the exercise contributed to the comprehension of the FRA categories (Forest, Other Wooded lands, other) used in the FRA country reporting process?

#### Methodology used in FRA 2020 Remote Sensing Survey

- Experts made positive remarks about the methodology used in FRA 2020 Remote Sensing Survey, stating for example that it was “a very comprehensive global, yet country-led and owned process of collecting important forest area and change estimates”, “scientific and feasible”, “a technical milestone on global estimates, particularly for the capacity building efforts to the countries”, and “cost-efficient, reliable, and accurate for estimating forest area and forest area changes”.
- It was suggested that the methodological approach implemented by the FRA 2020 RSS could be useful for reporting forest area and forest area changes at subregional, regional, and global levels more frequently than every five years, and help with providing annual estimates (as discussed in Paper 3).
- It was noted that there is consistency between FRA 2020 RSS results and FRA reported results, although a question was asked about what the implications would be if there were large differences between global/regional and national estimates.

#### Variables

- There was general agreement on the variables proposed in the Background Paper, and a number of suggestions were made for further development:
  - Identify more detail about land use following forest loss and about the land cover/use before forest expansion. In this context, it was noted there is currently a lack of data but such information is needed to increase understanding of land use changes, including deforestation, reforestation and restoration.
  - Use sample data to create a global map of forests, and perhaps forest change.

- Explore, perhaps through country case studies, the use of RSS for deriving bio-mass estimates.
- Record the intensity/type of uses in natural (or primary) forest, including timber harvesting, roads/settlements, extensive cattle ranching, silvopastoral use and other uses that have an impact on the coverage and functions of the forest.
- Pilot the assessment of forest degradation and forest restoration.
- Examine the impact of fires, assessing the extent to which forests recover, are lost or replaced by other land uses.
- Examine fragmentation by, for example estimating the proportion of forests that are retained as windbreaks when felling and/or are left as isolated patches surrounded by another type of land use.
- Improve FRA 2020 RSS methodology by including IPCC land use categories used for reporting activity data within the national GHG inventories.

### Samples

- There was detailed online discussion between experts regarding sampling issues. Points that were raised included the consideration of sample size; consideration of the costs/benefits of altering the numbers of 39.6 hectare hexagons and 1 hectare centroids; the need to make adjustments where sample polygons lie on country boundaries; the difficulty of detecting forest recovery (the small areas involved and the lack of available maps make stratification difficult and there are difficulties in photo-interpretation); and the need to keep the sample as stable as possible.
- It was suggested that there is a need for “permanent” samples to underpin global and regional forest area estimation and to track changes - particular effort should also be made to identify and characterize areas of forest expansion and restoration.

### FRA 2020 RSS data collection phase

- Experts who were involved in the FRA 2020 RSS data collection phase said that this had contributed to their understanding of the FRA categories, but it was noted that it could be difficult to classify certain categories, such as forest loss, through visual interpretation.
- There was a request for FAO to share national results so that they could be compared with national statistics on forest area and forest area change.

## **Annex 6. Proposed list of FRA 2025 Tables**

### **1 Forest extent, characteristics and changes**

- 1a Extent of forest and other wooded land
- 1b Forest characteristics
- 1c Special [or Specific] forest categories
- 1d Annual forest expansion, deforestation and net change
- 1e Annual reforestation [proposed for deletion]
- 1f Other land with tree cover [to be renumbered if Table 1e deleted]

### **2 Forest growing stock, biomass and carbon**

- 2a Growing stock
- 2b Growing stock composition
- 2c Biomass stock
- 2d Carbon stock

### **3 Forest designation and management**

- 3a Designated management objective
- 3b Forest area within protected areas and forest area with long-term management plans

### **4 Forest ownership and management rights**

- 4a Forest ownership
- 4b Holder of management rights of public forests

### **5 Forest disturbances**

- 5a Disturbances [or Damage]
- 5b Area affected by fire
- 5c Degraded forest
- 5d Forest restoration [? in a different section]

**6 Forest policy and legislation [to be changed if Table 6a deleted]**

6a Policies, legislation and national platform for stakeholder participation in forest policy [proposed for deletion]

6b Area of permanent forest estate [to be renumbered if Table 6a deleted]

**7 Employment, education and NWFP [to be changed if Tables 7a and 7b deleted]**

7a Employment in forestry and logging [proposed for deletion]

7b Graduation of students in forest-related education [proposed for deletion]

7c Non wood forest products removals and value 2020 [to be renumbered if Tables 7a and 7b are deleted]

**8 Sustainable Development Goal 15**

SDG Indicator 15.1.1 Forest area as proportion of total land area

SDG Indicator 15.2.1 Progress towards sustainable forest management

## Annex 7. List of participants



**ATTENDANCE LIST AT THE ONLINE EXPERT CONSULTATION ON  
"GLOBAL FOREST RESOURCES ASSESSMENT: TOWARDS FRA 2025"  
12-23 September 2022**

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## Annex 8. Background papers

### Background paper #1

# FRA 2025 – what has changed and why?

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*Background paper 1*

*for discussion at the FRA 2025 Online Expert consultation*

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## Introduction

This paper aims at documenting and explaining the rationale for the main proposed changes in the FRA 2025 specification. The guiding principle in the preparations of the FRA 2025 has been to reduce the reporting burden on countries, minimize reporting duplication, make the reporting more relevant, and to the extent possible, increase the quality, consistency and transparency of reported data.

A constant and reoccurring recommendation for FRA and similar processes is to reduce the reporting burden on countries and increase the quality and transparency of reported data. Despite this, every global assessment between FRA 2000 and FRA 2015 increased the reporting burden on countries (e.g. FRA 2005 covered about 45 broad variables, FRA 2010 covered about 90 and FRA 2015 about 120 variables). FRA 2020 marked, for the first time, a reduction in the reporting burden and the number of variables collected were reduced to about 60. The intention is to continue on the path of reducing the reporting burden and making FRA data more consistent, transparent and relevant. Furthermore, the reporting burden will be greatly reduced by pre-filling unchanged reporting tables with data reported for FRA 2020.

The proposed changes are the result of a thorough review of the FRA 2020 reporting process and scope with inputs from:

- the FRA team, together with the different teams of the FAO Forestry Division and the FRA Advisory Group;
- the FAO Office of the Chief Statistician; and
- in-depth user consultations targeting the FRA National Correspondents (NCs) and users at large.

The outline of this background paper follows the structure of the FRA 2020 country reports (table 1).

**Table 1. FRA 2020 structure of country reports**

<b>1 Forest extent, characteristics and changes</b>
1a Extent of forest and other wooded land
1b Forest characteristics
1c Primary forest and special forest categories
1d Annual forest expansion, deforestation and net change
1e Annual reforestation
1f Other land with tree cover
<b>2 Forest growing stock, biomass and carbon</b>
2a Growing stock
2b Growing stock composition
2c Biomass stock
2d Carbon stock
<b>3 Forest designation and management</b>
3a Designated management objective
3b Forest area within protected areas and forest area with long-term management plans
<b>4 Forest ownership and management rights</b>
4a Forest ownership
4b Holder of management rights of public forests
<b>5 Forest disturbances</b>
5a Disturbances

5b Area affected by fire
5c Degraded forest
<b>6 Forest policy and legislation</b>
6a Policies, legislation and national platform for stakeholder participation in forest policy
6b Area of permanent forest estate
<b>7 Employment, education and NWFP</b>
7a Employment in forestry and logging
7b Graduation of students in forest-related education
7c Non wood forest products removals and value 2015
<b>8 Sustainable Development Goal 15</b>
8a Sustainable Development Goal 15

Some of the reporting tables have undergone a major revision, others have been modified slightly and a few have been removed. In this document, all FRA 2025 reporting tables are presented together with corresponding FRA 2020 tables. Items that are proposed to be excluded are displayed "~~like this~~" and new additions are shown "like this".

### Introduction

Open text box -import FRA 2020 introductions and pre-fill

Pre-filled text box with introductory text provided in the FRA 2020 reporting for countries to edit and update where necessary. The introductory section should be mandatory and countries which did not provide an introductory text will be asked to do so.

In the introduction countries would also be asked to report the expected date (year) for next update/revision of the country report. This information would be very useful in order to know which countries can be expected to make a voluntary update of information in between the regular FRA 2025 and FRA 2030 reporting cycles.

	<b>Year</b>
<b>Expected date/year for next update of the country report</b>	

## 1. Forest extent, characteristics and changes

**Table 1a. Extent of forest and other wooded land**

FRA 2025 categories	Area (1000 ha)					
	1990	2000	2010	2015	2020	2025
Forest (a)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Other wooded land (b)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Other land Remaining land area (c-a-b)</b>	Calc.	Calc.	Calc.	Calc.	Calc.	Calc.
Total land area (c)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled

- The category "Other land" is suggested to be replaced by the term "Remaining land area". The reason for the name change is that "Other land" is already defined in FAO Questionnaire on Land Use, Irrigation and Agricultural Practices. There, "Other land" is defined as "Land area not classified as agriculture and forestry". It includes the categories of the System of Environmental Accounting (SEEA) "Land used for aquaculture", "Built-up and related areas", "Other uses of land not elsewhere classified" and "Land not in use". Instead, using the terminology "Remaining land area" for the purpose of FRA reporting makes more sense, as it is defined as "All land that is not classified as "Forest" or "Other wooded land".
- The annual reporting years e.g. 2016, 2017, 2018 and 2019 are suggested to be omitted from the table and the year 2025 added.
- The official total land area maintained by FAOSTAT will be used to pre-fill the FRA reporting years and the most recent land area will be used for 2025 with a footnote.

To increase the understanding of data quality countries are asked to clearly identify data sources and rank them in reliability classes or Tiers (see below). Tier 3 indicates the highest level of quality and Tier 1 the lowest.

Forest area tier criteria		Tier
<b>Status</b>	Data sources: Recent (less than 10 years ago) National Forest Inventory or remote sensing-based assessment with ground truthing, or statistical remote sensing survey with accuracy assessment	3
	Data sources: Older (more than 10 years ago) National Forest Inventory or remote sensing-based assessment with ground truthing or recent (less than 10 years ago) remote sensing based assessment without ground truthing.	2
	Other	1
<b>Trend</b>	Estimate based on repeated compatible Tier 3 status assessments or recent forest area change estimates (i.e. from a REDD+ FREL)	3
	Estimate based on repeated compatible Tier 2 or combination Tier 3 and 2 (tier for status)	2
	Other	1

**Table 1b. Forest characteristics**

FRA 2025 categories	Forest area (1000 ha)					
	1990	2000	2010	2015	2020	2025
<b>Naturally regenerating forest (a)</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<i>...of which primary forest</i>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Plantation forest (b1)</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<i>...of which introduced species</i>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Other planted forest (b2)</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Planted forest (b = b1+b2)</b>	Calc.	Calc.	Calc.	Calc.	Calc.	Calc.
<b>Total (a+b)</b>	Calc.	Calc.	Calc.	Calc.	Calc.	Calc.

- The previous reporting years remain the same and will be pre-filled with data reported in FRA 2020, the year 2025 has been added.
- In the FRA 2020 reporting “Primary forest” was reported in table 1c “Primary forest and special forest categories”. We are proposing moving the category “Primary forest” to table 1b as a sub-category of “Naturally regenerating forest”.

Primary forest by climatic domain	Area (1000 ha)					
	1990	2000	2010	2015	2020	2025
<i>...of which boreal primary forest</i>						
<i>...of which temperate primary forest</i>						
<i>...of which sub-tropical primary forest</i>						
<i>...of which tropical primary forest</i>						

- We propose that the reporting of “Primary forest” specifies in which climatic domain the area of primary forest is located, considering that, from a biodiversity point of view, it is relevant knowing the extent of primary forest by different domains.

**Table 1c. Primary forest and special forest categories**

<b>1c Primary forest and special Specific forest categories</b>						
FRA 2025 categories	Forest area (1000 ha)					
	1990	2000	2010	2015	2020	2025
<b>Primary forest</b>						
<b>Temporarily unstocked and/or recently regenerated forest</b>						
<b>Bamboos</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Mangroves<sup>1</sup></b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Rubber wood</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	

<sup>1</sup> Note the area of mangroves not only includes Forest but also Other wooded land

- Suggest changing the name of the table to “Specific forest categories” as we are proposing moving primary forest back to table 1b “Forest characteristics”.
- For consideration, should the category “Temporarily unstocked and/or recently regenerated” be removed? – conceptually difficult for countries to delineate this area consistently
- Global and regional estimates can be generated from Remote Sensing Surveys.
- “Bamboos” – the International Bamboo and Rattan Organization (INBAR) is conducting bamboo mapping exercises and we propose making the results of the mapping available on the platform for countries to use for reporting if they want.
- Suggest adding a footnote to the category “Mangroves”, explaining that mangroves may contain areas of “Other wooded land” as well.

**Table 1d. Annual forest expansion, deforestation and net change**

FRA 2025 categories	Area (1000 ha/year)				
	1990-2000	2000-2010	2010-2015	2015-2020	2020-2025
<b>Forest expansion (a)</b>	Calc.	Calc.	Calc.	Calc.	Calc.
<i>...of which afforestation</i>	pre-filled	pre-filled	pre-filled	pre-filled	
<i>...of which natural expansion</i>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Deforestation (b)</b>	Calc.	Calc.	Calc.	Calc.	Calc.
<b>Forest area net change (from table 1a should match a-b)</b>	pre-filled	pre-filled	pre-filled	pre-filled	

No substantial changes are suggested for this reporting table.

- The reporting period 2020-2025 has been added
- We suggest replacing the "Calculated" values with a consistency check that the values add up. In FRA 2020 there were some issues with the calculated values: for some countries there was an inconsistency in the difference between forest expansion and deforestation which was not exactly equal to the calculated forest area net change. Automatically calculating either "Forest expansion" or "Deforestation" did not allow countries to report slightly different values. Replacing the "Calculated" values with a consistency check would allow accepting data not adding up 100%.

**Table 1e. Annual reforestation**

FRA 2025 categories	Forest area (1000 ha/year)				
	1990-2000	2000-2010	2010-2015	2015-2020	2020-2025
<b>Reforestation</b>					

It is suggested for consideration deleting table 1e. In the FRA 2020 reporting it was found that it was quite difficult for countries delineating the area of "Reforestation", where "Reforestation" was defined as:

Re-establishment of forest through planting and/or deliberate seeding on land classified as forest.

Explanatory notes

1. Implies no change of land use.
2. Includes planting/seeding of temporarily unstocked forest areas as well as planting/seeding of areas with forest cover.
3. Includes coppice from trees that were originally planted or seeded.

Further, the reported data was deemed inconsistent and thus not used in the analysis and, in addition, the reporting on this category was relatively low.

**Table 1f. Other land with tree cover**

FRA 2025 categories	Area (1000 ha)					
	1990	2000	2010	2015	2020	2025
Palms (a)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Tree orchards (b)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Agroforestry (c)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Trees in urban settings (d)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Other (Specify) (e)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Total (a+b+c+d+e)</b>						

No major changes are suggested for this reporting table:

- Adding the reporting year 2020.
- Suggest deleting the "Total", as it is a bit misleading since almost no country has data on all categories ("a" to "e"), as they often only have scattered information on some of the categories.

## 2. Forest growing stock, biomass and carbon

**Table 2a. Growing stock**

FRA 2025 categories	Growing stock m <sup>3</sup> /ha (over bark)					
	1990	2000	2010	2015	2020	2025
<b>Naturally regenerating forest</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<i>...of which primary forest</i>						
Plantation forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<i>...of which introduced species</i>						
Other planted forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Planted forest</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Total Forest</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Other wooded land</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	

This reporting table matches the reporting categories contained in reporting table 1b "Characteristics".

We are proposing removing the reporting for total growing stock and only maintaining the reporting of "Growing stock" per hectare. The rationale for the proposed change is based on the following:

- For biomass and carbon, we only collect per hectare values.
- Maintaining only per hectare values makes updates much less complicated e.g. if a country has only a new forest area estimate, there is no need to update the total growing stock.
- The total growing stock can always be calculated using growing stock per hectare multiplied by the total forest area.
- Volume per hectare will allow both countries and reviewers to have an idea of the reasonability of the reported data and improve the quality of the reported data, which in turn will provide better assessments of biomass and carbon stocks.

In addition, the usefulness of reported data for further analysis will be greatly improved if growing stock is broken-down by different forest types or characteristics. Introducing reporting average growing stock per hectare does not necessarily imply an increased reporting burden, as these values can be calculated using area from table 2a "Forest characteristics".

Furthermore, this will greatly facilitate reporting for countries that may have to rely on expert estimates.

Growing stock tier criteria		Tier
Status	Data sources Recent 10 years National Forest Inventory or programme for repeated compatible NFI 10 years	3
	Data sources/registers and statistics modelling or old NFI 10 years or partial field inventory	2
	Other	1

**Table 2b. Growing stock composition**

**FRA 2020 reporting table**

FRA-2020 categories	Scientific name	Common name	Growing stock in forest (million m <sup>3</sup> over bark)				
			1990	2000	2010	2015	2020
<b>Native tree species</b>							
#1 Ranked in terms of volume	Scientific name	Common name					
#2 Ranked in terms of volume	Scientific name	Common name					
#3 Ranked in terms of volume	Scientific name	Common name					
#4 Ranked in terms of volume	Scientific name	Common name					
#5 Ranked in terms of volume	Scientific name	Common name					
#6 Ranked in terms of volume	Scientific name	Common name					
#7 Ranked in terms of volume	Scientific name	Common name					
#8 Ranked in terms of volume	Scientific name	Common name					
#9 Ranked in terms of volume	Scientific name	Common name					
#10 Ranked in terms of volume	Scientific name	Common name					
Remaining native tree species							
TOTAL volume of native tree species							
<b>Introduced tree species</b>							
#1 Ranked in terms of volume	Scientific name	Common name					
#2 Ranked in terms of volume	Scientific name	Common name					
#3 Ranked in terms of volume	Scientific name	Common name					
#4 Ranked in terms of volume	Scientific name	Common name					
#5 Ranked in terms of volume	Scientific name	Common name					
Remaning introduced tree species							
TOTAL volume of introduced tree species							
TOTAL growing stock							

New proposal for FRA 2025 reporting table

FRA 2025 categories	Scientific name	Common name	Growing stock in forest (% of total)
			Most recent year
<b>Native tree species</b>			
#1 Ranked % of total GS	<i>Scientific name</i>	Common name	
#2 Ranked % of total GS	<i>Scientific name</i>	Common name	
#3 Ranked % of total GS	<i>Scientific name</i>	Common name	
#4 Ranked % of total GS	<i>Scientific name</i>	Common name	
#5 Ranked % of total GS	<i>Scientific name</i>	Common name	
#6 Ranked % of total GS	<i>Scientific name</i>	Common name	
#7 Ranked % of total GS	<i>Scientific name</i>	Common name	
#8 Ranked % of total GS	<i>Scientific name</i>	Common name	
#9 Ranked % of total GS	<i>Scientific name</i>	Common name	
#10 Ranked % of total GS	<i>Scientific name</i>	Common name	
Remaining native tree species			
TOTAL % of native tree species			
<b>Introduced tree species</b>			
#1 Ranked % of total GS	<i>Scientific name</i>	Common name	
#2 Ranked % of total GS	<i>Scientific name</i>	Common name	
#3 Ranked % of total GS	<i>Scientific name</i>	Common name	
#4 Ranked % of total GS	<i>Scientific name</i>	Common name	
#5 Ranked % of total GS	<i>Scientific name</i>	Common name	
Remaining introduced tree species			
TOTAL % of introduced tree species			

In line with the proposed change for the reporting on table 2a "Growing stock", we are proposing changing the reporting on "Growing stock composition" in the following way:

- Instead of reporting and ranking the species in terms of total volume we propose ranking the species according to percent of total growing stock. This would greatly facilitate future updates of the country report. This means if a country updates the forest area there would be no need to update the "Growing stock composition" table unless new inventory data on growing stock composition is available.
- Previous reporting asked countries to report "Growing stock composition" and "Total volume by species" for 5 reporting years (1990, 2000, 2010, 2015 and 2020). For FRA 2025 we propose reporting volume by species expressed as percent of total growing stock for the most recent inventory year. The main reasons for this change are:
  - Maintaining the report updated is easy e.g. if a new forest area estimate is needed.
  - The table does not have to match table 2a.
  - The previous reporting showed that often the change in total volume over time was explained by differences in the data collection methods or random errors, rather than showing the actual trend by species.
  - It is deemed that having a better and more consistent estimate for growing stock composition for the most recent inventory year when data were

collected is more relevant, as typically the changes in growing stock composition over time are slow and difficult to monitor.

- We are further suggesting adding a “drop-down” menu for assigning the scientific name, as in previous reporting there were a lot of inconsistencies in the scientific names for different species.

**Table 2c. Biomass stock**

FRA 2025 categories	Forest Biomass (tonnes/ha)					
	1990	2000	2010	2015	2020	2025
Above-ground biomass	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Below-ground biomass	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Dead wood	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	

The only change to this reporting table is related to the reporting years. Instead of asking for annual data, it is proposed that the reporting years in this reporting table correspond to the reporting years in table 1a “Forest area”.

Biomass estimation methods tier criteria		Tier
Status	Country specific or biome specific biomass conversion expansion factors applied or allometric equations	3
	Application of a combination of country/biome specific conversion factors and International default biomass expansion factors or allometric equations	2
	International/regional default biomass expansion factors/generic allometric equations applied e.g. using the "biomass calculator" for reporting	1

**Table 2d. Carbon stock**

FRA 2025 categories	Forest carbon (tonnes/ha)					
	1990	2000	2010	2015	2020	2025
Carbon in above-ground biomass	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Carbon in below-ground biomass	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Carbon in dead wood	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Carbon in litter	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Soil carbon	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Soil depth (cm) used for soil carbon estimates	pre-filled					

The only change to this reporting table is related to the reporting years. Instead of asking for annual data, it is proposed that the reporting years in this reporting table correspond to the reporting years in table 1a “Forest area”.

### 3. Forest designation and management

**Table 3a. Designated management objective**

FRA 2025 categories	Forest area (1000 ha)					
	Primary designated management objective					
	1990	2000	2010	2015	2020	2025
Production (a)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Protection of soil and water (b)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Conservation of biodiversity (c)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Social Services (d)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Multiple use (e)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Other (specify in comments) (f)	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
No/unknown (g)						
No designation						
Unknown						
Total forest area	Calc.	Calc.	Calc.	Calc.	Calc.	Calc.

Only one minor change is proposed for this reporting table. In FRA 2020 reporting countries could report on the category “No/unknown”, however this created a slight challenge for the data analysis, as it was not possible to determine to what extent was “unknown” or had “no” designation.

FRA 2020 categories	Forest area (1000 ha)				
	Total area with designated management objective				
	1990	2000	2010	2015	2020
Production					
Protection of soil and water					
Conservation of biodiversity					
Social Services					
Other (specify in comments)					

It is proposed to delete the table on “Total area with designated management objectives”. The data reported in this table was not used in any of the analyses and the reasons for that are the following:

- The different reporting categories are not mutually exclusive and, in principle, the entire forest area could be reported for each of the categories.
- Countries appeared to interpret the reporting in very different ways, leading to highly inconsistent data sets.
- Many countries faced problems in interpreting the actual designated management objective and service/function provided by forests.
- Producing aggregate findings was not meaningful.

**Table 3b. Forest area within protected areas and forest area with long-term management plans**

FRA 2025 categories	Forest area (1000 ha)					
	1990	2000	2010	2015	2020	2025
Forest area within protected areas						
Forest area with long-term forest management plan						
...of which in protected areas						

The main change to this reporting table is related to the reporting years. Instead of asking for annual data, it is proposed that the reporting years in this reporting table correspond to the reporting years in table 1a “Forest area”.

## 4. Forest ownership and management rights

FRA 2025 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
<b>Private ownership (a)</b>	pre-filled	pre-filled	pre-filled	pre-filled	
<i>... of which owned by individuals</i>	pre-filled	pre-filled	pre-filled	pre-filled	
<i>... of which female individuals</i>					
<i>... of which owned by private business entities and institutions</i>	pre-filled	pre-filled	pre-filled	pre-filled	
<i>... of which owned by indigenous peoples and local communities</i>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Public ownership (b)</b>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Unknown/other (specify in comments) (c)</b>					
<b>Other (specify in comments) (c)</b>					
<b>Unknown (d)</b>					
<b>Total (a+b+c+d)</b>	Calc.	Calc.	Calc.	Calc.	Calc.

- It is proposed that the sub-category of private ownership by individuals is further sub-divided into “...of which female”.
- In the FRA 2020 reporting, countries could report on the category “Unknown/other”, however, this created a problem during the analysis of the data, as it was not possible to determine to what extent was “Unknown” or “Other” ownership.
- We are proposing changing the name of the category “Local, tribal and indigenous communities” to “Indigenous peoples and local communities” as the terminology “tribal/tribes” are rarely used in UN documents.

**Table 4b. Holder of management rights of public forests**

FRA 2025 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
<b>Public Administration (a)</b>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Individuals (b)</b>					
<b>Private business entities and institutions (b)</b>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Indigenous peoples and local communities (c)</b>	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Unknown/other (specify in comments) (c)</b>					
<b>Other (specify in comments) (d)</b>					
<b>Unknown (e)</b>					
<b>Total public ownership (a+b+c+d+e)</b>	Table 4a	Table 4a	Table 4a	Table 4a	Table 4a

Only minor changes are proposed for this reporting table:

- In FRA 2020 reporting countries could report on the category “Unknown/other” however this created a slight problem during the analysis of the data as it was not possible to determine to what extent was “unknown” or “other” ownership.
- In FRA 2020 only about 10 countries reported that “Individuals” held management rights of public forests. Considering that it was so few countries, it is suggested to delete this category and countries can report Individuals under the category “Other” and specify in comments that it refers to Individuals.
- As for Table 4a, we are proposing changing the name of the category “local, tribal and indigenous communities” to “Indigenous peoples and local communities” as the terminology “tribal/tribes” are rarely used in UN documents.

## 5. Forest disturbances

**Table 5a. Disturbances**

Disturbance type or event	Forest area affected area (1000 ha)						
	2000	2001	...	2017	2018	...	2022
Insects (a)	pre-filled	pre-filled	pre-filled	pre-filled			
Diseases (b)	pre-filled	pre-filled	pre-filled	pre-filled			
Severe weather events (c)	pre-filled	pre-filled	pre-filled	pre-filled			
Other (specify in comments) (d)	pre-filled	pre-filled	pre-filled	pre-filled			
<b>Total (a+b+c+d)</b>							

- Propose removing the "Total" as there are in some cases issues/inconsistencies in reporting, mostly related to non-exclusiveness of some data.

**Table 5b. Area affected by fire**

FRA 2025 categories	Area affected (1000 ha)						
	2000	2001	...	2017	2018	...	2022
Total land area affected by fire	pre-filled	pre-filled	pre-filled	pre-filled			
...of which on forest	pre-filled	pre-filled	pre-filled	pre-filled			

No major change is proposed for this reporting table.

**Table 5c. Degraded forest**

Does your country monitor area of degraded forest	Yes/No
If "Yes"	What is the national definition of "Degraded forest"?
	Describe the monitoring process and results

No major change is proposed for this reporting table.

**Table 5d. Forest restoration**

Has your country forest restoration commitments?	Yes/No						
If "Yes"	Is there a forest law in support of restoration?						
	What areas in need of restoration have been identified and how have they been identified?						
	What are the targets set for the restoration? E.g xxx hectares by year yyyy						

- For FRA 2025 we are proposing introducing a new reporting table on forest restoration. The idea is to do a stock tacking assessment to understand how many countries have forest restoration commitments in place and to understand what these commitments entail.

## 6. Forest policy and legislation

Indicate the existence of	Boolean (Yes/No)	
	National	Sub-national
Policies supporting SFM		
Legislations and regulations supporting SFM		
Platform that promotes or allows for stakeholder participation in forest policy development		
Traceability system(s) for wood products		

It is proposed that this reporting table is omitted:

- How can the data be analyzed in a meaningful way?
- Is the FRA process the right one for collecting this data?
- One way forward could be to let the FAO regional and sub-regional offices spearhead this type of data collection. The FRA Secretariat does not always have the capacity to properly review reported data.

## 7. ~~Employment, education and NWFP removals and value 2020~~

7a Employment in forestry and logging (3-year average)												
FRA-2020-categories	Full-Time-Equivalents (1000-FTE)											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Employment in forestry and logging												
...of which silviculture and other forestry activities												
...of which logging												
...of which gathering of non wood forest products												
...of which support services to forestry												

7b Graduation of students in forest-related education (3-year average)												
FRA-2020-categories	Number of graduated											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Doctoral degree												
Master's degree												
Bachelor's degree												
Technician certificate / diploma												

It is proposed to discontinue the collection of data on Employment and Graduation of students in forest-related education for the following reasons:

- As part of the FAO's strategy to improve the collection and dissemination of FAO data, the FAO Office of the Chief Statistician prepared an assessment report to support the data collection on employment covered by the FRA reporting process. Among other things, the assessment recommended FRA to "use data already collected by other international organizations that regularly disseminate harmonized national, regional and global employment data, instead of collecting employment data through the FRA process" and to partner with the International Labour Organization and FAO Statistics Division to support reporting on employment.
- In line with the general recommendation to reduce duplication among the UN agencies, data on Education could potentially be sourced from the United Nations Educational, Scientific and Cultural Organization (UNESCO).
- This does not mean that these areas will not be covered in the next FRA report, but rather than asking the FRA NCs to report on these variables it is proposed that data from external data providers would be sourced if need be.

**Table 7. Non wood forest products removals and value 2020**

No changes are proposed for this reporting table.

	Name of NWFP product	Key species	Quantity	Unit	Value (1000 local currency)	NWFP category
1 <sup>st</sup>	Ranking based on monetary value					
2 <sup>nd</sup>						
3 <sup>rd</sup>						
4 <sup>th</sup>						
5 <sup>th</sup>						
6 <sup>th</sup>						
7 <sup>th</sup>						
8 <sup>th</sup>						
9 <sup>th</sup>						
10 <sup>th</sup>						
	All other plant products					
	All other animal products					
	Total					
<b>NWFP Categories</b>						
<b>Plant products / raw material</b>						
1 Food						
2 Fodder						
3 Raw material for medicine and aromatic products						
4 Raw material for colorants and dyes						
5 Raw material for utensils handicrafts construction						
6 Ornamental plants						
7 Exudates						
8 Other plant products						
<b>Animal products / raw material</b>						
9 Living animals						
10 Hides skins and trophies						
11 Wild honey and bee wax						
12 Wild meat						
13 Raw material for medicine						
14 Raw material for colorants						
15 Other edible animal products						
16 Other non-edible animal products						

## 8. Sustainable Development Goal 15

### SDG Indicator 15.1.1 Forest area as proportion of total land area

Indicator	Percent									
	2000	2005	2010	2015	2020	2021	2022	2023	2024	2025
Forest area as proportion of total land area <b>2015</b>	Table 1a		Table 1a	Table 1a	Table 1a					Table 1a
						Pre-filled using interpolation (countries can override interpolated value(s))				

Data for this table is populated based on reported data in table 1a “Extent of forest and other wooded land”. The table is populated with data reported for the “FRA reporting years”.

- The annual data 2021-2024 is proposed to be automatically interpolated using the data reported for the FRA reporting years 2020-2025 and the data for year 2005 is interpolated using the 2000 and 2010 data. Noting that countries will have the option to override interpolated data with their own estimates.

### SDG Indicator 15.2.1 Progress towards sustainable forest management

#### Sub-indicator 1

Sub-Indicator 1	Percent						
	2000-2010	2010-2015	2015-2020	2020-2025		2005-2015	2015-2025
Annual forest area annual change rate	Table 1a	Table 1a	Table 1a	Table 1a			Table 1a

2005-2015 change rate calculated and pre-filled using SDG indicator 15.1.1 value for 2005 and forest area for 2015

Data for this table is populated based on reported forest area in table 1a. The table is populated with data reported for the “FRA reporting years” the annual data 2021-2024 is automatically interpolated using the data reported for the FRA reporting years 2020-2025. Countries will have the option to override interpolated data with their own estimates.

#### Sub-indicator 2

Sub-Indicator 2	Forest Biomass (tonnes/ha)								
	2000	2010	2015	2020	2021	2022	2023	2024	2025
Above-ground biomass in forests	Table 2c	Table 2c	Table 2c	Table 2c					Table 2c
					Pre-filled using interpolation 2020-2025 (countries can override interpolated value)				

Data for this table is populated based on reported biomass stock in table 2c. The table is populated with data reported for the “FRA reporting years” the annual data 2021-2024 is automatically interpolated using the data reported for the FRA reporting years 2020-2025. Countries will have the option to override interpolated data with their own estimates.

#### Sub-indicator 3

Sub-Indicator 3	Percent (2015 forest area baseline)									
	1990	2000	2010	2015	2020	2021	2022	2023	2024	2025
Proportion of forest area located within legally established protected areas	Direct link (Table 3b/Table 1a)									
						Pre-filled using interpolation 2020-2025 (countries can override interpolated value)				

Data for this table is populated based on table 3b “Forest area within protected areas and forest area with long term management plans” and table 1a “Extent of forest and other

wooded land”. The table is populated with data reported for the “FRA reporting years” and the annual data 2021-2024 is automatically interpolated using the data reported for the FRA reporting years 2020-2025. Countries will have the option to override interpolated data with their own estimates.

### Sub-indicator 4

Sub-Indicator 4	Forest area (1000 ha)								
	2000	2010	2015	2020	2021	2022	2023	2024	2025
Proportion of forest area under long-term forest management	Direct link (Table 3b/Table 1a)				Pre-filled using interpolation 2020-2025 (countries can override interpolated value)				

Data for this table is populated based on table 3b “Forest area within protected areas and forest area with long term management plans” and table 1a “Extent of forest and other wooded land”. The table is populated with data reported for the “FRA reporting years” and the annual data 2021-2024 is automatically interpolated using the data reported for the FRA reporting years 2020-2025. Countries will have the option to override interpolated data with their own estimates.

### Sub-indicator 5

Sub-Indicator 5	Forest area (1000 ha)								
	2000	2010	2015	2020	2021	2022	2023	2024	2025
Forest area under independently verified forest management cer	External data	External da	External da	External da	External da	External da	External da	External da	External da
	Will be updated when data is available								

Data for this table is populated with external data sourced from Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC). Overlaps and double accounting have been addressed by the FSC and PEFC Secretariats. Countries will not have the option to override interpolated data with their own estimates. If there are any issues with the data, countries will have to contact the FSC and PEFC Secretariats.

## Background paper #2

# FRA Country reporting process

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*Background paper 2*

*for discussion at the FRA 2025 Online Expert consultation*

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## **Introduction**

The FAO's Global Forest Resources Assessment programme (FRA) has received technical guidance and support from international specialists through expert consultations at regular intervals over the last three decades. The first consultation was held in 1987 in Kotka, Finland and it was followed by a series of periodical expert consultations, each of which has provided specific guidance for every consecutive global assessment.

This background paper provides an overview of the next reporting process for discussion at the Expert Consultation toward FRA 2025. More particularly, it provides a summary of the following:

4. FRA 2025 timeline
5. National Correspondents network
6. Capacity development plan
7. Review and validation of FRA 2025 Country reports
8. Data analysis and dissemination of results

### **1. FRA 2025 timeline**

The scope of FRA 2025 will be finalized based on the recommendations from the Expert Consultation and the reporting platform implemented accordingly.

Until the end of 2022, the work will concentrate on the establishment and strengthening of the FRA 2025 national correspondents' (NC) network. The reporting and review process will take place mainly in 2023, while the analysis of the results and preparation of dissemination material will happen in 2024. The launch and dissemination of the results are scheduled for 2025.

Table 1 outlines FRA 2025 milestones, while the following sections will describe in detail some of the main components of the process.

**Table 1. FRA 2025 Milestones**

<b>Activity</b>	<b>Date</b>	<b>Notes</b>
Finalization of FRA 2025 scope	November 2022	See background paper #1
Finalization of improvements and changes of the FRA platform	December 2022	
Establishment of FRA 2025 NC network	October 2022	Official letters sent to the Heads of Forestry to confirm current NCs or nominate new ones
Launch of reporting process	February 2023	All NCs are granted access to the prefilled country reports in the online platform
Regional/sub regional workshops	February to December 2023	NCs and reviewers meet to work at the compilation and review of the FRA 2025 country reports
Closure of the reporting process	December 2023	The platform is locked and it is not possible to edit reports
Analysis of preliminary results	December 2023-January 2024	Preliminary analysis and cleaning of data
Validation of FRA 2025 country reports	February 2024	Country reports are sent to the Heads of Forestry for final validation
Analysis and write up	February 2024-June 2024	Data analysis, followed by report writing
Editing, layout, translations of FRA publications and fine tuning of platform user interface	June 2024-February 2025	
Launch of FRA 2025 results	March to October 2025	Release of the FRA 2025 results and publications

## **2. Establishment of FRA 2025 National Correspondents network**

National data submitted by the countries through a network of officially nominated national correspondents constitute the backbone of FAO's Global Forest Resources Assessment since FRA 2005. The establishment of a formal FRA's national correspondent network started with an official request sent by the Director of the FAO's Forest Department to the Heads of Forestry (HoF). Each country nominated a national correspondent and an alternate national correspondent. Since FRA 2005, countries have been asked to confirm or provide a new nomination for each new FRA cycle.

The 342 national correspondents and alternates that were nominated for FRA 2020, established a national team of experts to work on the compilation of their country reports and more than 700 national experts contributed to the reporting process through the online platform.

The process for the nominations of the new NCs for FRA 2025 is planned to start immediately after the Expert Consultation in September 2022.

Taking into consideration that FRA is moving toward more frequent reporting to respond to the need for updated information on key indicators, including the Sustainable Development Goals indicators, and the possibility to do so through the new online reporting platform, there is the need to adapt the NCs nomination process accordingly.

For this reason, countries will be asked to nominate an NC and an alternate (or confirm the previous ones) who will be in charge of the FRA 2025 country reporting and following assessments until a new nomination will be communicated to the FRA Secretariat. Nominations of qualified women will be strongly encouraged.

Before the beginning of a new reporting cycle, the national forestry authorities will be reminded/informed of the nominations in place, but without a new nomination, it will be assumed that the same experts are still in charge.

To take into account these changes, the letters to request the NC nomination will include revised terms of reference for the NCs, whose immediate task is to assist the FRA Secretariat in the implementation of the reporting process and more specifically to:

- act as a focal point for communication with FAO on matters related to the FRA Programme;
- set up and coordinate a national team of collaborators to assist with the FRA reporting, including the coordination of inputs from different national institutions to ensure completeness and consistency of the reporting;
- access the online FRA platform to input and process national data in accordance with the reporting methodology and timeframe; this may include the voluntary update in case the country wishes to update or correct any reported figure in between two FRA reporting cycles;
- participate (or designate the participation of another expert from the national team) in meetings and workshops organized in the context of FRA;
- communicate and share information with national stakeholders, the national statistical office for the SDGs and UNFCCC focal points to ensure consistency of reported data

and increase awareness and knowledge of the FRA process at the national level before the final submission of the country report;

- liaise with the HoF for validation of national information before publication; and
- maintain updated contact details in the online platform and liaise with HoF to make sure that in case of any change, a new nomination will be communicated to the FRA Secretariat.

### **3. Regional/subregional training workshops**

Considering the continued complexities in international travels, there will be no global meeting of NCs to launch the beginning of the reporting process. Instead, capacity development will be carried out through a number of regional and subregional workshops with an increased focus on region-specific discussions.

If the COVID-19 pandemic allows and the financial resources are made available, the regional/subregional workshops will be in person events to which the NCs of the region will be invited.

The intention is to organize in every region or subregion a first workshop where NCs will be introduced to the reporting process and familiarized with the platform in order to start entering data.

A second workshop will focus on the review of reported data and metadata to ensure consistency both of the reported data and transparency and traceability of the estimates. Between the first and second workshops, NCs and their team of collaborators will have four to five months to continue working on the compilation of their country reports. At the end of the second workshop, participants are expected to submit their country reports for final approval.

Compared to previous FRAs, countries will have a shorter reporting period to finalize their report, during the time between the first kick-off workshops and the second review workshops.

By shortening the reporting period, it will be easier to maintain the momentum following the nomination process and to have closer and more intense communication with the NCs between the two workshops.

Moreover, this time the reporting will be substantially facilitated by the fact that country reports will be prefilled with the information provided to previous FRA. Also, having doubled the time dedicated to the regional workshops will help reduce the reporting time for NCs. This is because, as learned from previous assessments, NCs usually work more efficiently at the regional workshops when they can concentrate for few days exclusively on the reporting task and at the same time benefit from the assistance of a dedicated team of FAO reviewers that can address any issues they may encounter.

A draft plan for the regional workshops is reported in the Annex. The majority of the regional/subregional workshops are scheduled to take place in 2023, but we are currently evaluating the possibility to anticipate some of them in November-December 2022.

#### **4. Review and validation of FRA 2025 country reports**

The review process will be carried out with similar modalities to previous FRAs. Identified regional focal points together with a selected number of additional reviewers will provide technical assistance to the NCs for the compilation of the country reports.

The regional focal points and the reviewers will provide technical assistance and guidance to the NCs both during the regional and sub regional workshops (where it is expected that most of the review work will be carried out), and remotely in between the first and second workshop, through the FRA platform.

Once the review process is complete, the reviewers will change the status of the country report in the platform to “pending validation” and an automated message is sent to the NC and the alternate, informing them that the report has been cleared and it is ready to be validated by the HoF. The validation allows national authorities to review the country reports and to provide feedback, before their publication.

If no action is taken within two weeks, the report is considered validated and it will be locked for editing in the platform.

In the past, the validation process has been carried out through official letters sent from the FAO Forestry Director to the national authorities and the absence of any reply from the HoF was considered as a silent consent to the publication of the data. Having the validation performed through the platform will considerably simplify the entire process and will increase the level of involvement of the National Correspondents in the validation process. Further, the platform will keep a record of which country reports have been actively validated and which by silent consent.

#### **5. Data analysis, preparation of the dissemination material and launch**

Similarly to previous FRAs, analysis and aggregation of national data will begin after the validation and will allow extracting preliminary key messages that can be published and released several months earlier than the release of the complete database and the main report.

A longer period between the release of the Key findings and the publication of the Main report is needed to allow working simultaneously at the production of the report in all UN official languages.

As summarized in table 2 below, it is proposed to have a first set of key messages published by the first quarter of 2025, the full database and the country reports released by the second quarter and the Main report in all 6 UN official languages before the end of 2025.

The possibility of collaboration for the publication of a scientific paper based on FRA data, similarly to what has been done in FRA 2020, will also be investigated. In addition, FRA data will also be used and disseminated through the SDG submissions.

**Table 2. FRA 2025 dissemination material**

<b>Product</b>	<b>Period of releases 2025</b>	<b>Notes</b>
FRA 2025 Key findings	1 <sup>st</sup> quarter	Available In all UN official languages in a digital and interactive format (not printed)
FRA 2025 Country reports	2 <sup>nd</sup> quarter	236 country and territories reports available for pdf download on the FRA website
FRA 2025 Full database	2 <sup>nd</sup> quarter	Available in all UN official languages for data analysis and download
FRA 2025 Main Report	3 <sup>rd</sup> quarter	Available In all UN official languages, digital and printed
FRA 2025 data based scientific papers	4 <sup>th</sup> quarter and 2026,2027	

## Annex: Draft plan for the regional training workshops

	2023										
Regional groups	F	M	A	M	J	J	A	S	O	N	D
Caribbean	2nd half					1st half					
Anglophone Africa		1st half					2nd half				
Francophone Africa		2nd half						1st half			
Pacific			1st half					2nd half			
Latin America			2nd half						1st half		
North America and Europe				1st half					2nd half		
Asia				2nd half						1st half	
<i>Central Asia</i>					1st half					2nd half	
Near East and Northern Africa					2nd half						1st half

First workshop: 3 days. To launch the new reporting process, go through the platform functionalities and the data needed, as well as establish the work plan at the national level for reporting and validation. For experienced countries or countries with no new data, part of the reporting could already take place at the first workshop.

Second workshop: 3 days. To provide technical assistance with the reporting and review the reports for final submission by the end of the workshop. This workshop is optional for countries that already completed the reporting process during the first workshop.

**Background paper # 3**

# **Proposal for more frequent voluntary reporting**

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*Background paper 3*

*for discussion at the FRA 2025 Online Expert consultation*

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## Introduction

The possibilities of implementing voluntary updates within the regular 5-year FRA reporting cycles have been discussed over the last five years, mainly as a result of the Sustainable Development Goals (SDG) reporting requirements where several of the indicators draw information from FRA and are reported upon annually by FAO to the SDG secretariat. While the SDG reporting process allows for repeating previous data arguing that no new data are available, FAO, as well as Member Nations, would like to see more up-to-date information reported to the SDGs, as well as in the dissemination of FAO statistics.

In July 2020, the 164<sup>th</sup> session of the FAO Council requested FAO to analyse the consequences of reducing the FRA reporting cycle to two years, to respond to an increased demand for timely and accurate information about the world's forest resources for the monitoring of progress towards the SDGs as well as other international processes.

This request was further deliberated by the 25<sup>th</sup> session of the Committee on Forestry (COFO) held in October 2020, where the way forward for the Global Forest Resources Assessment (FRA) was discussed. Among other, the Committee requested FAO to:

- a. *continue to produce an FRA report every five years;*
- b. *develop, in consultation with Members, Collaborative Forest Resources Questionnaire (CFRQ) partners, international experts and other stakeholders, a flexible FRA reporting process that allows voluntary updates of key indicators related to SDG15 and other indicators at the discretion of Members, as new information allows, while ensuring data quality and transparency.*

The introduction of voluntary updates between regular reporting cycles is a major change to the FRA process and will have an impact on many parts of the process, including the terms of reference of the National Correspondents (NCs) and their Alternates, the review and quality control of reported data, and the validation process.

This background paper contains a proposal for the implementation of voluntary updates and presents a series of issues and implications that must be considered. It is a complement to the background paper on the process for the regular FRA reporting cycle. The Expert Consultation is expected to provide recommendations that allow FAO to further refine the proposal and implement it as part of the regular FRA reporting cycle.

## Proposal – voluntary updates in-between regular FRA cycles

This chapter discusses the key aspects to consider in order to implement voluntary updates, such as the scope and content of the updates, the timeline for implementation, the process, and the implications for countries as well as for the FRA Secretariat.

In the sections below, each of these aspects is further developed and a proposal for the way forward is presented.

## 1. Scope

Considering the request expressed by COFO, voluntary updates should at least include the following FRA variables used to derive the indicators for the SDG reporting:

- Forest area and forest area change
- Above-ground biomass in forest
- Area of forest with a long-term management plan
- Area of forest within formally established protected areas

However, limiting an update to only these variables would lead to an inconsistent data set as many variables are intrinsically linked to each other. Forest area and biomass are linked to several other reporting variables, and although an update may not have to cover all FRA reporting variables, at least all variables related to forest area must be updated when there are new data on forest area/area change. Likewise, all variables related to stocks must be updated when new data on any of the stocks (growing stock, biomass, carbon) are available. This would ensure that the internal consistency of the data set is maintained.

The scope of the updates will have to be adjusted to the scope of each individual FRA, and considering the proposed reporting tables for FRA 2025, at least the following tables must be included in an update to ensure a consistent report:

Forest area related reporting tables:

- Table 1a – Extent of forest and other wooded land
- Table 1b – Forest characteristics
- Table 1c – Primary forest and special forest categories
- Table 1d – Annual forest expansion, deforestation and net change
- Table 3a – Designated management objective
- Table 3b – Forest area within protected areas and forest area with long-term management plans
- Table 4a – Forest ownership
- Table 4b – Holder of management rights of public forests

Stock-related reporting tables:

- Table 2a – Growing stock
- Table 2b – Growing stock composition
- Table 2c – Biomass stock
- Table 2d – Carbon stock

Updates of the remaining reporting tables would be optional; however, it is recommended to revise and update the entire report. For example, some countries may wish to update data on fires or disturbances to have new information displayed on the FRA platform.

Regarding the reporting years, the FRA 2025 specifications indicate the following reporting years for the FRA tables:

1990	2000	2010	2015	2020	2025
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There are a few exceptions, such as disturbances and fire that will have individual years up to 2022, and ownership where the latest reporting year is 2020.

In addition, the Sustainable Development Goal 15 indicator tables displayed at the end of the report are generated using the data reported in the FRA tables. These tables begin in the year 2000 and have individual years between 2020 and 2025, so the time series will be:

2000	(2005) <sup>2</sup>	2010	2015	2020	2021
2022	2023	2024	2025		

The annual data points between 2020 and 2025 are interpolated and countries will be able to override the interpolated values if they have data available for these years. Forest area reported in Table 1a will be interpolated to generate the 2005 value.

Based on the above, the FRA Secretariat proposes that a country that wishes to make a voluntary update should:

- As a minimum, revise/update all tables related to the SDG reporting where new data are available and/or there is a reason to modify previously reported data. If there are new data on forest area and/or forest area change, all tables related to forest area should be updated. Likewise, if there are new data on stocks (growing stock/biomass/carbon) all stock-related tables should be updated. This is to ensure that all area and stock estimates are consistent.
- It is strongly recommended to revise/update the entire report and also update other tables for which new data are available.
- All tables with new data should also have corresponding updates of the metadata, including data sources, national data, reclassification and estimation/forecasting.
- The update of the FRA tables should cover the same reporting years as the last full FRA report. For disturbances and fire, additional years can be added.
- The SDG tables should be updated with data for individual years up to 2025 with a possibility to add individual years up to the year before the update is done if new data are available for these years. No forecasting should be done beyond 2025. *Example: a voluntary update of forest area estimates made in 2027 should include all reporting years as of FRA 2025 (including an update of annual data between 2020 and 2025) and also 2026 if new data are available for 2026.*
- For all tables that are updated, historical data should be revised to ensure consistent time series.

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<sup>2</sup> Reporting year 2005 is included in the SDG reporting section only for forest area (Indicator 15.1.1) and for computing annual forest area change rates (indicator 15.2.1).

## 2. Time schedule for implementing voluntary updates

The following table presents a proposal for a time schedule for implementing voluntary updates, for the consideration of the Expert Consultation.

<b>2023</b>	SDG submission based on FRA 2020 – no updates included <b>Full Country reporting</b> for FRA 2025. All country reports should be submitted, reviewed and validated by end of 2023.
<b>2024</b>	Analysis of FRA 2025 data and preparation of FRA 2025 report SDG submission includes new FRA data up to 2023 <sup>3</sup> <b>Voluntary updates can be made</b> , maintaining the same reporting years for FRA tables and SDG tables as in FRA 2025.
<b>2025</b>	Launch of FRA 2025 SDG submission includes new FRA data up to 2025 (under embargo until FRA launch). <b>Voluntary updates can be made</b> , maintaining the same reporting years for FRA tables and SDG tables as in FRA 2025.
<b>2026</b>	SDG submission based on FRA 2025 + updates made in 2025 <b>Voluntary updates can be made</b> , maintaining the same reporting years for FRA tables and SDG tables as in FRA 2025.
<b>2027</b>	SDG submission based on FRA 2025 + updates 2025 and 2026 <b>Voluntary updates can be made</b> , maintaining the same reporting years for FRA tables as in FRA 2025, and for <u>SDG tables also including 2026.</u>
<b>2028 and onwards</b>	SDG submission based on FRA 2025 + updates 2025, 2026 and 2027 2028 is the year <b>for full FRA country reporting</b> , hence no voluntary updates are made this year. After evaluation, the cycle continues with necessary modifications depending on changes in scope and specifications for next FRA as well as possible changes in the SDG reporting framework.

## 3. Process for voluntary updates (to be implemented the years when updates are offered)

In order to implement voluntary updates, the process must follow a well-established and quite a strict timeline. If new data are to be included in the annual SDG reports, data must be available, reviewed and validated by the end of the calendar year.

Voluntary updates should only be made when countries have new data available and/or have found errors in previously reported data. Updates should not be made just to extend a forecasted time series based on data previously submitted for the FRA report, nor just for updating the metadata in the report.

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<sup>3</sup> An SDG submission in 2024 that includes new FRA data up to 2023 will show that FAO is taking action on the more frequent reporting. However, it also means that new FRA data would be in the SDG database before the launch of FRA 2025. And as SDG submissions requires data to be aggregated at regional and global levels, it would be possible to extract regional and global aggregates up to 2023 from the SDG database, and there is a potential risk that someone will publish new findings, sourcing the SDG database, before the FRA 2025 report is launched. This risk should be carefully assessed before deciding on how to manage the 2024 SDG submission.

A country that wishes to make a voluntary update has to communicate this to the FRA secretariat. This could be done through a functionality in the platform, or by other means. The process for this has to be further discussed with countries. This communication is important as it allows the FRA secretariat to selectively open the database only for the countries that wish to update and limit the review process to those countries.

The annual reporting process for voluntary updates is proposed to follow the general schedule outlined below. Some flexibility can be allowed to accommodate the needs of individual countries; however, the updated report must be ready for validation by the end of the third quarter to allow for the validation and possible final adjustments before the end of the year.

First quarter	Countries communicate to the FRA secretariat that they want to update the FRA report. A mechanism for this is to be further elaborated.
Second quarter	The database will be opened for updates for those countries that have communicated that they wish to update. Updated data should have been entered into the platform by end of June.
Third quarter	Review by the Secretariat, interaction with NCs to clarify issues and to ensure a transparent and consistent data set.
Fourth quarter	Validation, final adjustments if necessary, and closing of database before the end of the year. Data can thereby be available for the SDG reporting which is done in January-February the following year.

#### **4. Implications for countries**

Voluntary updates during regular reporting cycles have important implications for the countries. It provides an opportunity to include new national data, correct errors in previous reports and make new data accessible on the FRA platform as well as in the SDG database. However, it also implies additional work for the NC and his/her team to compile and enter new data and metadata into the platform; this may however reduce the workload for future FRA reporting.

A country that wishes to update, must communicate this to the FRA secretariat following a mechanism yet to be established.

As the reporting period is short, countries must allocate enough time for the NC and his/her team to make the update and interact with the FRA secretariat during the review process. The NC will be directly involved in the validation process.

Under this scheme, NCs will have a more permanent role and will be involved continuously in the FRA process. The terms of reference for NCs, therefore, need to be revised.

#### **5. Implications for the FRA secretariat**

The introduction of voluntary updates also has implications for the FRA secretariat. A strict time plan for the annual update process must be developed. Fluid communication must be maintained with the NCs of those countries that have notified their interest to update, and the FRA platform must be adjusted to allow for annual voluntary updates as well as ensure that updates are made visible.

It will also require more work on reviewing updated reports as well as validation, analysis, preparation of aggregates and dissemination. All this will generate an additional permanent workload on the FRA Secretariat, as well as a temporary additional workload, in the beginning, to further develop and adapt the FRA platform to facilitate these updates. The financial implication of the increased workload has to be further analyzed.

On the positive side, the review burden will be spread over more years and there will be more time to individually support some countries and build their capacities, which could contribute to increasing the quality of the reports.

#### **6. Implication related to dissemination of new data**

Voluntary updates in-between regular FRA reporting cycles have some implications on the dissemination of data. New data will be disseminated on the FRA platform, as well as in the SDG database and reports. Each update will in some way affect regional and global aggregates, and these aggregates will no longer be exactly the same as in the latest FRA report. It is important to consider how to disseminate the new data and make sure that new findings are communicated at the same time as they are made publicly available on the FRA platform. For example, an annual bulletin with the latest global forest statistics could be prepared and disseminated. Selected updated statistics could be included in the biannual SOFO publication. In summary, the dissemination package related to the voluntary updates needs further discussion and deliberations, as it also depends on how many countries (and corresponding forest area) decide to make voluntary updates.

**Background paper #4**

# **Towards improved reporting on primary forest**

## Conclusions and recommendations from the FRA special study on primary forest reporting

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*Background paper 4*

*for discussion at the FRA 2025 Online Expert consultation*

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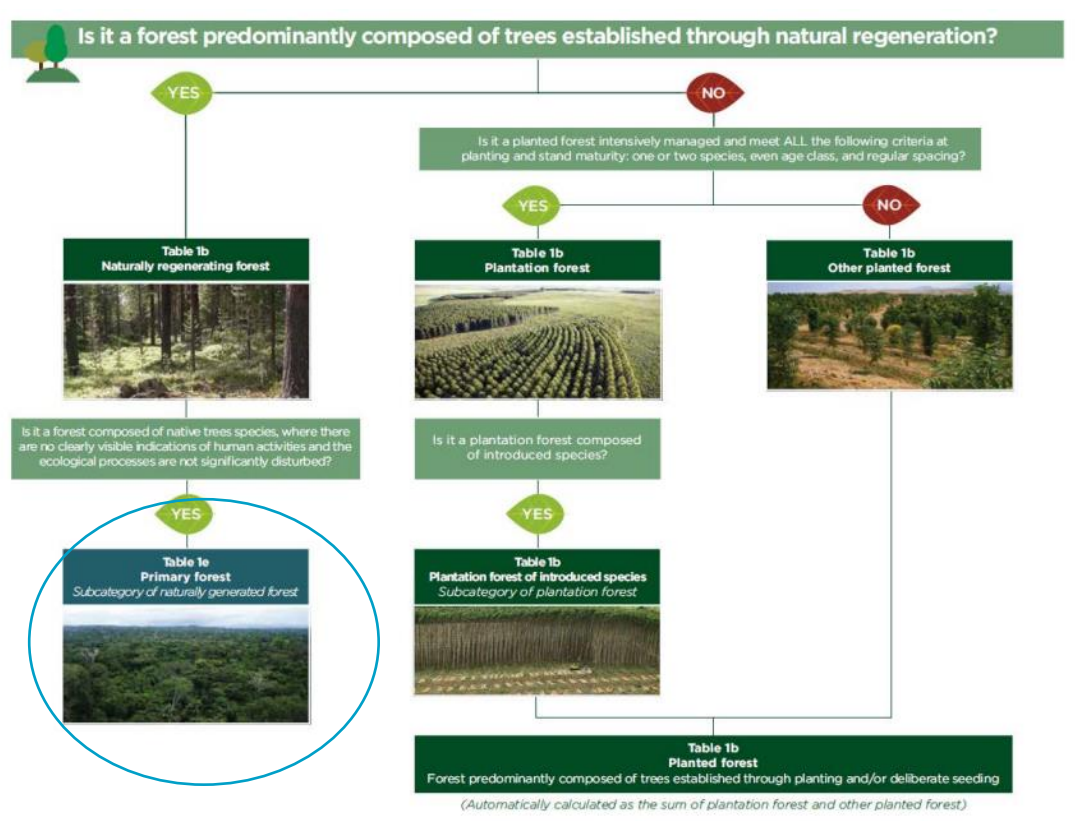
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## Introduction

The FAO Global Forest Resources Assessment (FRA) distinguishes between different forest types, dividing them into two main types: “naturally regenerating forests” and “planted forests” (Figure 1). “Primary forest” is a subcategory of “naturally regenerated forests” and is defined by FAO as “Naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities, and the ecological processes are not significantly disturbed”.

**Figure 1.** Forest characteristics decision tree applied during FRA 2020 reporting. “Primary forest” is identified as a subcategory of “naturally regenerating forest” (Source: FAO, 2020a.)



The area of primary forest and how it changes over time are among the key biodiversity and environmental indicators collected in FRA and it relates to a number of other global or regional processes. In particular, the change in area of primary forest is one of the Global Core Set of forest-related indicators (FAO and CPF, 2022) and has been considered as a potential indicator in the monitoring framework of the post-2020 Global Biodiversity Framework of the United Nations Convention on Biological Diversity (CBD)<sup>4</sup>. The importance of primary forests, including intact forest landscapes, and knowledge on them, has also been recognized by the International Union for Conservation of Nature (IUCN) in a policy statement (IUCN, 2020). Primary forests have been specifically addressed in the European Union biodiversity strategy for 2030 (European Commission, 2021) and primary forest and/or intact forests have been mentioned as part of the certification criteria in some of the documents of the two main certification bodies – the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC).

<sup>4</sup> <https://www.cbd.int/sbstta/sbstta-24/post2020-monitoring-en.pdf>

Consequently, there is a pressing need for consistent reporting on the extent of primary forest and its changes over time. However, consistently measuring the area of primary forest has proven to be challenging in previous FRAs due to differences in the ecologies of tropical, temperate and boreal forest biomes, divergent approaches and data availability among countries. Most critically, there has been considerable variation in definitional interpretations or application, which raises questions about the comparability of data reported to FAO by countries and their applicability for informing policy decisions.

An FRA special study was initiated in late 2019 to provide further guidelines and propose methodologies to improve reporting on primary forest area by enhancing the consistency, comparability, completeness, transparency and quality of data reported to FRA. The special study was conducted in collaboration with several partners, including but not limited to FAO member countries, the Convention on Biological Diversity (CBD) Secretariat, Griffith University (Queensland, Australia), the Center for International Forestry Research (CIFOR), the Joint Research Centre (JRC) and the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) as well as the Collaborative Forest Resources Questionnaire (CFRQ) partners<sup>5</sup>.

In the context of this special study, a discussion paper was elaborated by Griffith University to serve as a basis for the discussions (Mackey et al., 2021) and review definitions, data and methods for country level assessment and reporting of primary forest. Subsequently, an online consultation was held on the FAO Global Forum on Food Security and Nutrition (FSN) (FAO, 2020b) from 11 to 25 February 2020 to collect feedback on the discussion paper. Then, a series of expert workshops and pilot studies were organized in 2020–2022 at biome and regional level, to foster discussion around an operational methodology for the assessment of primary forests in different environmental settings.

A number of questions were addressed in the discussion paper as well as during the whole consultation process (online consultation, regional/biome workshops and pilot studies), regarding in particular FAO primary forest definition and its operational applicability for harmonised reporting on primary forest.

The findings and conclusions of this process are summarized in this paper. Then proposed changes to primary forest reporting for FRA 2025 are provided.

## **1. Current status of FRA reporting on primary forest area and trends**

### **Reporting coverage on primary forest area to FRA 2020 was relatively high**

FAO has collected information on primary forest area since FRA 1980. FRA 2020 received information on the area of primary forest in 2020 from 146 countries and territories representing 81 percent of the world's forest area and on the trends of primary forest in 2010–2020 from 137 countries and territories representing 57 percent of the world's forest area (Table 1).

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<sup>5</sup> In 2011, FAO, the International Tropical Timber Organization, FOREST EUROPE, the United Nations Economic Commission for Europe, the Observatory of Central African Forests and the countries of the Montréal Process combined to create the CFRQ. This joint questionnaire was established with the aim of reducing the reporting burden on countries and increasing data consistency across organizations through standardized definitions and the common timing of data collection. <https://www.fao.org/forest-resources-assessment/partnerships/cfrq-partners/>

**Table 1.** FRA 2020 Data availability on the primary forest area in 2020 and area trends in 1990-2020, by region and subregion.

Region/sub-region	Data availability on forest area in 2020		Data availability on trends in 1990- 2020	
	Number of reporting countries/territories	% of total forest area	Number of reporting countries/territories	% of total forest area
Eastern and Southern Africa	10	49	9	27
Northern Africa	5	77	5	77
Western and Central Africa	16	72	16	72
<b>Africa</b>	31	62	30	51
East Asia	3	95	3	95
South and Southeast Asia	12	87	11	85
Western and Central Asia	18	95	18	95
<b>Asia</b>	33	91	32	90
<b>Europe</b>	41	95	35	44
Caribbean	13	67	13	67
Central America	1	16	1	16
North America	4	100	4	100
<b>North and Central America</b>	18	97	18	97
<b>Oceania</b>	14	7	14	7
<b>South America</b>	8	72	8	72
<b>World</b>	<b>175</b>	<b>81</b>	<b>137</b>	<b>57</b>

### Current national practices to report on primary forest are inconsistent

Despite the relatively high percentage of reporting on the primary forest area variable, the reliability of the data is a cause for concern. The review of FRA 2015 and FRA 2020 national reports carried out by independent experts (Mackey et al., 2021) as well as for the regional/biome level workshops organized during the primary forest special study process showed that countries currently use a wide variety of country-specific guidelines and methodologies to estimate primary forest area.

In particular:

- A small number of countries report all natural forests as primary forests, which could result in an over estimation;
- Many countries calculated primary forest area based on the use of land tenure proxies such as the area of forest in legally established protected areas (national parks and other types of forest reserve/conservation areas). This may result in increasing trend in primary forest area when new protected areas are established and in excluding primary forest area outside protected areas.
- Some countries used intact forest landscape as a proxy, considering the whole forest landscape trends and not only the forest area.
- Some countries considered that, given that humans have been everywhere, there is no remaining primary forest.
- Many countries reported climax, old-growth or mature forest as primary forest and did not consider early successional stages of primary forests (after natural

disturbances) in their reporting. Depending on the biome, only including late age class forest may result in an underestimation of primary forest area as patches of early successional stage forest stands, resulting from natural disturbances are excluded.

- In addition, several countries which are likely to have primary forests do not report against this variable due to lack of national data on primary forest area or insufficient guidance or understanding on reporting methodology.

Further discussions during the regional workshops showed that countries have used a wide variety of country-specific methods to determine the area of primary forest, including inaccessibility or remoteness, lack of observable human activities using satellite data (wall-to-wall or sampled based), degrees of naturalness, structure and composition of forest (dead wood, age, number of tree layers), and protection status. The methods used also depends on national data availability, as most countries do not collect specific data on primary forest or do not have official national figures on primary forest area.

The low number of countries and territories reporting on trends is also an issue and reduces the reliability in the trend analysis. Moreover, the data do not indicate whether decreases in the area of primary forest are due to deforestation or conversion to another forest type (such as naturally regenerating or planted forest).

Information gaps in the metadata of the country reports were also highlighted. The documentation provided is largely insufficient in many countries to fully understand the calculation methods applied to derive primary forest area and trends and what is actually measured.

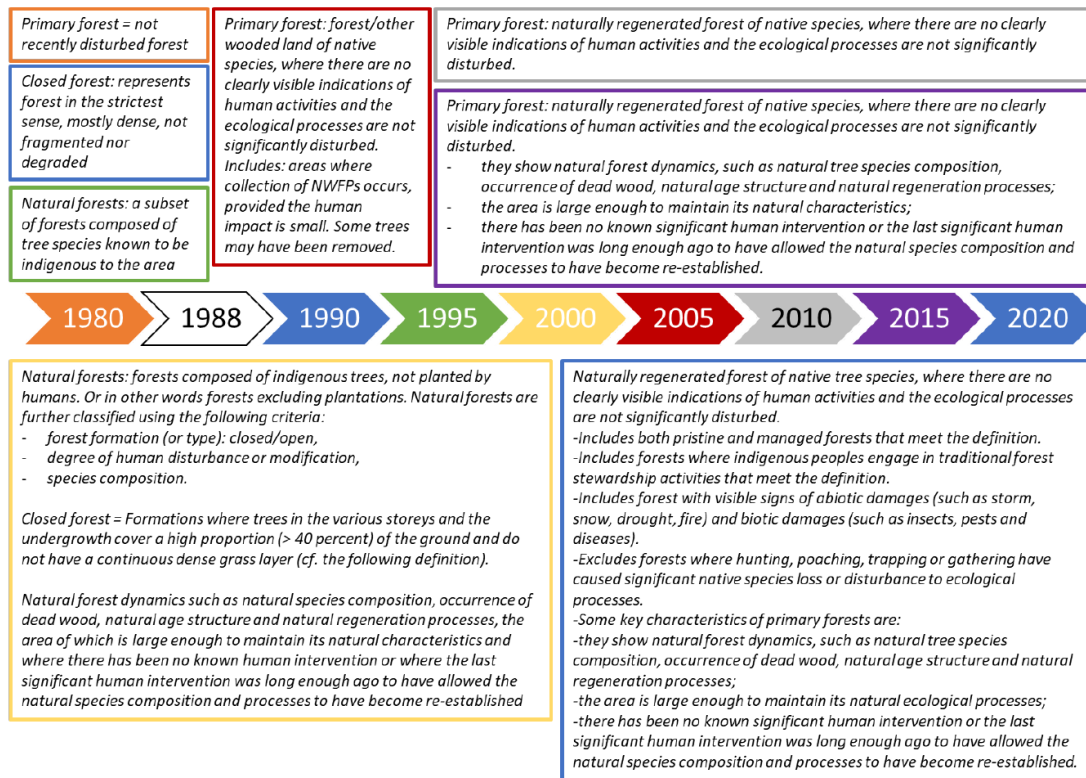
The conclusion of the review on FRA reporting on primary forest indicates that current national practices to report on primary forest are inconsistent. There is a pressing need to increase completeness and consistency in data collection requirements for primary forest in order to enhance comparability of statistics among countries and over time as well as the reliability of the global and regional figures.

## **2. FAO primary forest definition and its application in FRA reporting**

### **FAO FRA definition of primary forest is broadly accepted and consistent with the scientific literature**

Primary forest related terminology has been used by FRA since 1980 and the primary forest definition has changed over time. The current definition as outlined in FRA 2020 (FAO, 2018) was used with small adjustments since FRA 2005, while explanatory notes have been gradually expanded to include more clarifications and facilitate more consistent reporting (Figure 2).

**Figure 2.** How the term “primary forests” changed over time within FAO Global Forest Resources Assessments (FRA) (Source: Mackey et al. 2021)



The discussion paper elaborated by independent experts (Mackey *et al.* 2021) shows that there is general agreement that primary forest represents the more natural “bandwidth” of the forest condition gradient and that FAO definition is “sufficiently consistent with how the term is used in the scientific and applied literature.” The definition is aligned with many other primary forest definitions used, including the definitions applied by the Convention on Biological Diversity and the International Union for Conservation of Nature.

Therefore, it was agreed not to revise and further debate the core definition of primary forest during the regional workshops while giving the possibility to improve the explanatory notes to eventually complement and clarify some concepts.

It can be noted that very few countries have their own definition of primary forest.

**The definition is more descriptive than operational, which hinders a meaningful, comparable and replicable way to estimate primary forest area across countries, resulting in inconsistent reporting**

While the current primary forest definition is widely accepted, its mainly descriptive nature poses limitations to operational and harmonised reporting. The study has found considerable variation in the interpretation of the definition across countries, and the experts agreed on that the definition was difficult to apply in a meaningful, comparable and replicable way among countries and does not, alone, allow a consistent international reporting.

The current definition leaves open a wide range of possibilities for countries, including vague terminology (such as “natural”, “significant”, and “traditional” forest use) and very little quantitative guidance on how to interpret it in practical terms. Consequently, some countries have developed their own internal meanings for e.g. “natural” stand development and what

constitutes "*significant*" or "*traditional*" forest use. Other countries have chosen not to report against this variable due to the lack of more detailed guidance.

The consultation process highlighted the need to clarify ambiguous terms and expressions used in the definition and its explanatory notes. The main points of confusion identified in the consultation workshops consisted in the following:

- The inclusion in explanatory note "a" of both "*pristine and managed forests*" creates some confusion. The notion of "managed" can be interpreted in different ways. For instance, it might be understood as "traditional forest stewardship" oriented to wood production. However, the term "managed" may also refer to nature conservation management in some countries. Other issue would be how to tackle the "contradiction" of considering managed forest as primary forest as well. To clarify this, it was recommended to provide some examples of management practices that are compatible with the definition of primary forest. Another proposed recommendation to countries would be to focus on the existing forest conditions rather than the management prescriptions that the forest is subject. Forest management strategies and prescriptions, such as the establishment of a protected area or the allocation of areas to resource extraction (such as timber, mining, oil and gas) can be an indicators of what forest conditions could exist but, without direct measurements of the absence of human disturbance, its use can derive in inaccurate area primary forest area estimation (for example, in the cases where protection regulations are not enforced in the field, or when concessions for resource extraction have not yet been licensed. The use of "significant species loss" is a vague reference that can be interpreted in different ways. The lack of comprehensive biodiversity/in-situ studies, including historical, make this criterion challenging to apply. The presence or absence of indicators species could be applied as a proxy to indicate significant species loss or degradation in forest conditions, or environmental changes.
- Human vs natural disturbances: Information on the attribution of forest disturbance is often not available in many countries. Even when it exists, it may be difficult to determine if the cause of disturbance is of natural or human origin, particularly in the cases where a particular causal disturbance agent can be either natural or anthropogenic (such as wildfires, which can be caused by a natural phenomenon or human action). There is also some uncertainty on how to treat indirect human disturbance, such as the effects of climate change or those natural disturbances that create irreversible forest disturbance.
- What is "large enough" to display "natural" characteristics? The minimum area criterion under explanatory note "e" was the subject of intense debates during the consultation workshops. It is also one of the components of the definition with strong impact of the reported values, as the decision on which area threshold to apply strongly affects primary forest area estimation. There is considerable lack of clarity on the criteria to be applied to determine minimum forest area thresholds. This can result in very different threshold values thus affecting the comparability of estimations across countries. For example, minimum area thresholds based on avoiding disturbances such as the edge effect can result in thresholds of about 4 km<sup>2</sup> (Briant *et al.*, 2010). In contrast, minimum area thresholds determined based on the scale at which the most extensive processes (e.g. fire) occur and large roaming forest species function can result in minimum area thresholds of hundreds of km<sup>2</sup> (Potapov *et al.*, 2008) and must be applied to forest landscapes (defined as large unbroken expanses of natural ecosystems in the zone of current forest landscape, that can include other natural treeless areas, such as

grasslands, wetlands, lakes, etc.) not forest patches alone. Some countries also highlighted the fact that certain forest types are naturally fragmented, such as riparian forests or of small size (e.g. in small islands).

- The explanatory notes specifies that primary forest also includes forests "*where indigenous people engage in traditional forest stewardship activities that meet the definition*", without further details on the type of forest activities that would be allowed and ignoring the role of other local communities that do not self-identify as indigenous. For this reason, it was suggested to add local communities as part of the explanatory note and further highlight that even in case of forest use by indigenous people, the ecological processes should not be significantly disturbed.

Further capacity building and practical guidance are required to support a common and complete interpretation of the definition and its accompanying explanatory notes. The regional/biome workshops carried out during the special study allowed to discuss in depth and explain the definition with involved countries and those efforts should be pursued during FRA 2025 data collection process.

### **Existing national datasets are not always directly applicable to report against the definition**

Issues were raised in the workshops about the applicability of various existing (or future) datasets as proxies for reporting primary forests, and whether countries were or were not sensibly using various existing datasets. Some countries provided, e.g. the areas of old-growth forests or forests in protected areas as proxies to primary forests, as these were the closest datasets to a primary forests dataset, while sometimes acknowledging that this might result in a significant underestimate or overestimation.

More guidance should be provided on how to best use and apply existing datasets, including regional and global datasets, to align with the FAO definition, and on documenting properly the limitations of the estimates when the best available data cannot fully meet the definition.

## **3. Towards more operational guidance for reporting on primary forest**

### **Four key features – anthropogenic activity, vegetation structure and related ecological processes, biodiversity and ecological attributes, geographical area/ landscape – can be used to interpret and operationalize the definition of primary forest**

Four key features can be used to further understand and align to the definition to estimate primary forest area and its trends over time more accurately.

#### **a) Anthropogenic activity: primary forests are characterized by the absence of human activities that modify forest condition.**

The definition of primary forest states "*(...) there are no clear visible indications of human activities and the ecological processes are not significantly disturbed.*" However, it is also indicated in the explanatory notes that "*(...) the last human intervention was long enough to have allowed the natural species composition and processes to have become re-established.*," and that "*primary forest includes both pristine and managed forest that meet the definition.*" Primary forest also includes forests "*where indigenous people engage in traditional forest*

*stewardship activities that meet the definition.*" Human activities associated may still be present as long as they do not alter the primary forest characteristics indicated in the definition.

It is recommended to provide further clarification on those human activities compatible or incompatible with the definition of primary forest. This could also facilitate a more harmonized reporting. For instance, human impacts such as forest management and logging for commodity production, other industrial forestry practices, or large-scale infrastructure such as transportation and utility corridors, significantly change the forest structure, taxonomic composition and ecological processes. In addition, signs of fragmentation by human infrastructure (e.g. roads and settlements) and other human activities clearly visible in remote sensing data (e.g. logging, harvesting) can be taken into consideration. Therefore, the absence of such activities can be used as proxy for where primary forest occurs irrespective of the cultural identity of the humans involved. This approach of using the presence or absence of certain categories of human activities should consider forest where some activities have occurred long ago, and no further human impact have followed. In this case, the forest condition can reflect natural ecological processes to be labelled as primary forest.

**b) Vegetation structure and related ecological processes: primary forest include all successional stages from early stages to ecological matureness and may include natural disturbances.**

The FAO definition of primary forest adopts a broad ecological meaning that primary forests include the full range of successional stages from pioneer to ecological mature. For example, a forest stand in an early succession stage as result of a natural disturbance could still be a primary forest. The definition considers that in primary forest *"the ecological processes are not significantly disturbed"* and one explanatory note clarifies that it *"includes forests with visible signs of abiotic damages (such as storm, snow, drought and fire) and biotic damages (such as insects, pests and diseases)"*.

For the purposes of quantifying primary forest, it should be considered, in general, that natural disturbances (abiotic and biotic) do not change the attribution of primary forest. However, it was noted that the origin of certain disturbances, in particular fire, is not always clear or the related information is not always available. In that case disturbances remote from human infrastructures could be attributed to natural processes to facilitate reporting. Fire is a disturbance requiring specific considerations. For example, where fire has been deliberately introduced by humans for the purpose of clearing the forest for human activities, such as agriculture or pasture, the forest should be considered degraded, thus, not corresponding to primary forest. Periodic stand replacing fire is an essential part of natural forest dynamics in some boreal and tropical ecosystems. Therefore, in this case, fires are considered part of the natural dynamics that characterize primary forest. In other ecosystems it seems appropriate to classify as primary forest only forest undisturbed by fire. This suggests the need of contextual information for classifying primary forest.

**c) Biodiversity and ecological attributes: primary forests have native tree species composition associated with natural regeneration processes, and shows particular forest characteristics (biodiversity, deadwood, etc.).**

The definition of primary forest considers that primary forest must be *"naturally regenerated forest of native tree species."* An explanatory note also indicates that key characteristics of primary forests include that *"they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure, and natural regeneration processes."*

This is key for a series of biodiversity features observed commonly in primary forest such as occurrence of deadwood and natural age structure, but also for the exceptional value of the biodiversity hosted by primary forest.

A few key biological and ecological attributes should be selected by biome/ecozone to support stand level identification of primary forest based on expert knowledge and literature reviews. It is worth noting that the assessment of biological and ecological characteristics requires field data from forest inventories, which may not be available in all countries.

**d) Landscape level: landscape parameters that allow maintaining ecological condition in particular minimal geographical area and connectivity should be considered to identify primary forest.**

The explanatory notes of the definition of primary forest indicate that the “area is large enough to maintain its natural ecological processes.” The consultation and pilot studies carried out found that different thresholds for minimum area can be considered depending on context and biome. However, no univocal solution seems to be applicable to this parameter. In some ecosystems, even relatively small patches of primary forest provide refuge for wildlife, a source of propagules for landscape restoration, and serve as anchors for connectivity conservation initiatives (Lamb *et al.*, 2005, Castillo-Campos *et al.*, 2008, Jacquemyn *et al.*, 2001, cited in Mackey *et al.*, 2021). Some forest types may be naturally fragmented/small size due to environmental conditions (e.g. riparian forest, mangrove forests or forest in small islands).

In general, minimal area is an ecosystem specific landscape indicator, which should be taken into consideration together with connectivity and it was recommended that connectivity, in addition to size, be considered for labelling primary forest. In this case, a small patch which retains a degree of connectivity such that its natural ecological processes are maintained should be labelled as primary forest. It may also be well appropriate in some countries (e.g. small islands) or biomes that no size threshold is applied. To define the minimal area edge effects, the scale in which the most extensive natural disturbances occurs (an area should be large enough to include the full suite of natural processes, including regular disturbance regime) as well as the habitat size of forest-dependent species that are strong indicators of primary forest health (e.g. woodland caribou, jaguars) can be taken into consideration but, as previously mentioned, these should be applied to forest landscapes (large unbroken expanses of natural ecosystems in the zone of current forest landscape, that can include other natural treeless areas, such as grasslands, wetlands, lakes, etc. (Potapov *et al.*, 2008), not to homogenous patches of forests- alone, as it is understood that wide-ranging species have certain capacity to move between forest patches

**Deeper consideration of primary forest characteristics is needed to identify, by biome, measurable parameters and characteristics**

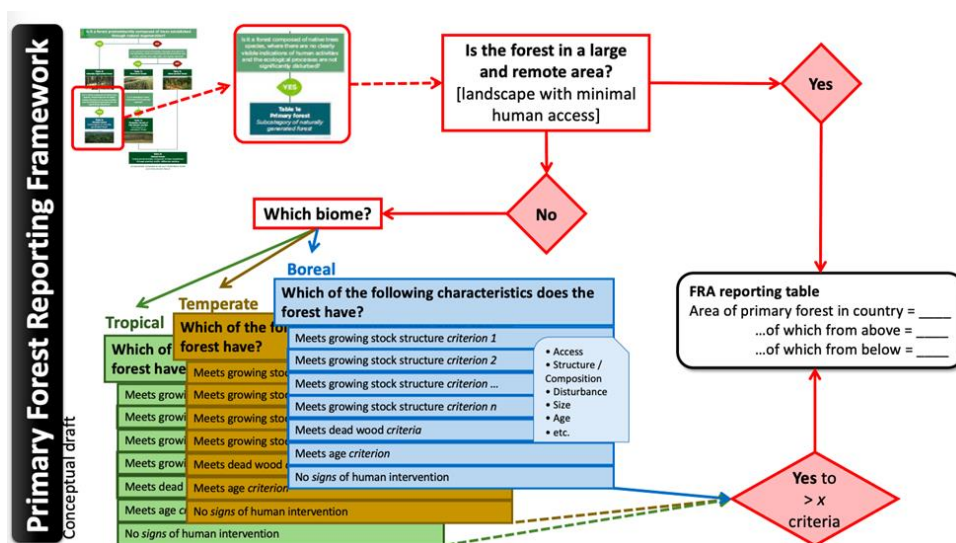
The FAO definition of forest based on land use, forest canopy structure and area extent is fit for the purpose of accommodating the full scope of national situations where forest is recognised to occur. However, for reporting primary forest, a deeper consideration, by biome, of forest characteristics is required. The current FAO approach to primary forest is difficult to apply across all biomes, because stand structure varies across climatic and biophysical gradients. Identifying and applying measurable parameters and characteristics attributed to primary forest for various biomes would be a way improve data comparability. This will facilitate for instance to look into the naturalness level of a forest to be considered primary forest.

Biomes and ecozones provide important context on how to account for primary forest as these forests exhibit rather contrasting difference among biomes. In this case, one-size-fits-all solutions do not seem appropriate. Indeed, the study suggests that structure and biodiversity benchmarks, the absence of certain human activities as well as remoteness/accessibility, can be considered for monitoring and reporting of primary forest.

Countries should be encouraged to consider regional/biome traits of primary forest for an appropriate reporting and ensure comparability within biome. For instance, it is necessary to have an ecological insight into the natural canopy structure. In the humid tropics, for example, primary forest is typically considered to have a canopy cover of >60 percent, whereas in some boreal regions a primary forest may have a low canopy cover. This is particularly important if assessments are reliant upon remotely sensed data on forest canopy cover.

Various participants of the consultation provided suggestions on how to make the definition more operational by using specific criteria and thresholds. Providing a set of measurable and replicable criteria and thresholds to estimate primary forest area would improve reporting. However, defining criteria and thresholds per biome (or at a finer scale) is necessary for accommodating the diversity of primary forest across regions. The boreal area group came out with a decision tree including both landscape and stand level criteria (Figure 3), the Latin America and Asia Pacific regional workshops started the development of tables with potential criteria to be applied in their respective regions (see Annex 1).

**Figure 3.** Primary Forest Reporting Decision Tree Framework



The need for setting thresholds in particular variables, e.g. on canopy cover and tree height, as part of the definition or in the explanatory notes, was highlighted and discussed and it was suggested to define biome-specific thresholds. However, the pilot studies also demonstrated the difficulties in selecting thresholds that would embrace the vast primary forest ecosystem diversity, not only between biomes but also within each biome. Thresholds need to be defined according to scientific knowledge and ecosystem characteristics, and further studies would be required to support this. Research shows that in some boreal forests, tree cover and height vary by ecological zone at such a rate that setting specific canopy cover and tree heights is largely meaningless for determining primary forest (Montesano *et al.*, 2016; Keith *et al.* 2009).

### **A variety of data sources can be used to support primary forest assessment and reporting**

Assessing forest attributes and characteristics would ideally require using data from **National Forest Inventories (NFI)** where available. Many countries now have some national system of forest monitoring field plots in place that measure key attributes including tree heights and canopy cover, tree diameters and tree species. Many NFIs do include assessment of forest biodiversity in terms of species composition, occurrence of dead wood and measures of forest health. Some countries also do draw upon field survey data on species composition, vegetation structure and anthropogenic disturbances to classify forest land including primary forest. The use of these data sets is suggested in order to distinguish reliably primary forest from other forests. The information of NFI can be complemented with remote sensing data in order to enable a more spatially consistent characterisation of primary forest across its entire extent and a more frequent monitoring of primary forest area, given that NFIs are not best suited to detect changes in forest cover and may not rely on permanent plots or repeated at frequent intervals.

**Remote sensing data and landscape metrics** are essential for large, remote areas that are difficult to monitor using plot-based NFI sampling and allow a more frequent assessment of area changes. Satellite-based data provides a range of data, over large areas, on forests including canopy cover, canopy height, fragmentation and vegetation greenness, along with human impacts such as roads and other infrastructure, settlements and intensive human activities such as commercial agriculture. Table 4 in Mackey *et al.* (2021) shows examples of landscape-level metrics for identifying and mapping primary forests.

**Many regional or global geospatial datasets** can be applied, especially in the absence of national datasets, to support primary forest monitoring. A table providing examples of available global spatial datasets that can be used or assist when measuring the extents of primary forest has been elaborated, during the special study. As those spatial datasets get easily outdated, not allowing e.g., trend assessment, the methods applied could be replicated and adapted at other scales using national data sources and adapting the criteria to ecosystems characteristics.

### **Better guidance is necessary to support a more consistent reporting process**

In summary, consultation participants indicated that rather than changing the primary forest definition the focus should be on ensuring a consistent understanding of the definition by countries. Further guidance is deemed necessary for achieving a harmonised reporting of primary forest.

In order to provide answers to the key questions identified in the consultation from a practical point of view, a guidance document was elaborated which includes both clarifications on the FAO primary forest definition and step-by-step guidelines that can be applied by countries to report on primary forest using different types of data.

## 4. Proposed changes on primary Forest reporting for FRA 2025

### Proposed changes to the definition and explanatory notes of primary forest

No major change is proposed on the definition itself, which would remain same as the one used in FRA 2020 reporting, with the exception of replacing “regenerated” with “regenerating” to align with the upper-level FRA category.

*Primary forest is a **“naturally ~~regenerated~~ ~~regenerating~~ forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed”.***

However, the following amendments are proposed to the **explanatory notes** to clarify certain aspects of the definition:

- a. Includes both pristine and managed forests that meet the definition. **Management practices in primary forests should imply minimum human intervention and aim for the long-term conservation of native vegetation and wildlife habitat.**
- b. Includes forests where **Indigenous Peoples** and **local communities** engage in traditional forest stewardship **and management/use** activities that meet the definition.
- c. Includes forests with visible ~~signs of abiotic damages~~ impacts of natural disturbances (such as storms, snow, drought, ~~wildfire~~) ~~and biotic damages (such as or insects, pests, and diseases outbreaks)~~
- d. Excludes forests where hunting, poaching, trapping, or gathering have caused significant native species loss or disturbance to ecological processes.
- e. Some key characteristics of primary forests:
  - i. they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure, and natural regeneration processes;
  - ii. the area is large enough **and retains a degree of connectivity such that its natural ecological processes are maintained**; and
  - iii. there has been no known significant human intervention or the last significant human intervention was long enough ago to have allowed **natural ecosystem elements (including species diversity) and functions** ~~the natural species composition and processes~~ to have become re-established.

**Justifications for proposed changes:** the definition and accompanying explanatory notes are broadly accepted and consistent with the scientific literature, but a few changes in the explanatory notes are needed to clarify ambiguous terms and strengthen common understanding.

- Changes in explanatory note "a" aim to provide details on the limited types of management practices that are compatible with the concept of primary forest as defined by FAO.
- Inclusion of local communities in the explanatory note "b": it is proposed to include both Indigenous Peoples and local communities as part of the explanatory note. The terminology "Indigenous People and local communities" is widely used in multilateral forest resolutions, across the CBD, IPBES, UNFCCC, IUCN and FAO and in other international processes and organizations, with reference to communities that have a long association with, and depend on, the lands and waters that they have traditionally live on or used. This terminology recognizes that there are mixed-ethnicity and non-Indigenous groups in places such as the Amazon, that engage in long-standing traditional activities. FAO capitalizes "Indigenous Peoples".
- "Abiotic" and "biotic damage" is more accurately expressed as impacts on forest from severe natural disturbances (storms, wildfire, drought, insect/pests/disease outbreaks) so it is proposed to change the explanatory note "c" accordingly.
- Inclusion of connectivity in explanatory note "e": the size is not the only important geographical feature of primary forest. In case of small patches, the degree of connectivity is important to ensure that its natural ecological processes are maintained.
- Slightly reformulation of the last characteristics to "natural ecosystem elements and functions" to be more holistic and include both biotic (all living organisms) and abiotic (non-living components such as soil, water, oxygen, minerals...) elements of the ecosystem.

**Proposed change in the reporting tables:**

- Include primary forest as a subcategory of "naturally regenerating forest" in table 1b, including subcategories of primary forest area by main biome, following the structure below.

**Table 2.** Proposed table template to report primary forest area.

FRA 2025 categories	Growing stock m <sup>3</sup> /ha (over bark)					
	1990	2000	2010	2015	2020	2025
Naturally regenerating forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
...of which boreal primary forest						
...of which temperate primary forest						
...of which sub-tropical primary forest						
...of which tropical primary forest						
Planted forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Plantation forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
...of which introduced species						
Other planted forest	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
<b>Total forest</b>	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	
Other wooded land	pre-filled	pre-filled	pre-filled	pre-filled	pre-filled	

### Justifications for proposed changes:

Differentiating primary forest by broad ecological zone (boreal, temperate, tropical and sub-tropical domains) at the reporting level will allow finer analysis. Biomes and ecozones provide important context on how the characteristic biodiversity of primary forests vary, reflecting their distinctive evolutionary pathways, local adaptations and ecological relationships (Mackey *et al.*, 2021). Guidance to countries to reporting on primary forest can also better tailored to fit forest variation between ecological zones.

Most countries/territories have forest only in one ecological domain (192 countries in 1, 36 countries and territories in 2, 6 countries in 3 and 2 countries in 4), so it should not increase significantly the reporting burden over countries.

### **Recommendations for the metadata of the national reports on primary forest**

Discussions during consultation workshops highlighted the need to improve the information provided in the metadata section of the FRA reports, as it is sometimes not clear how primary forest area has been obtained. FRA reviewers will be encouraged to carefully review metadata section and provide advice to adequately fill each section to improve the overall quality of the metadata and better understand the limitations of the estimations. Particular emphasis would be placed on potential issues of over or underestimation, or comments on possible weaknesses of the measurement and reporting approach.

### **Guidance document for FRA reporting on primary forest**

As the definition of primary forest is quite generic, countries proposed methods, such as decision-trees or tables of criteria and indicators to help determine what constitutes "primary forest" for the purposes of FRA reporting. Such methods would be the most beneficial and perhaps most efficient way forward for FRA national correspondents.

A draft guidance document has been elaborated with the boreal group and is being expanded for the other biomes. This guidance document intends to provide operational guidance, practical steps and recommendations to support the countries in establishing their national report to FRA on primary forest extent and changes, as well as improving their consistency. The guidance document provides clarifications supporting a common understanding of the FAO primary forest definition as well step-by-step approach to report on primary forest. In addition to recommendations to data producers, some recommendations are provided to help data users understand and make well-informed use of the data.

### **Proposed next steps to improve reporting on primary forest**

- Test the applicability of the guidance document in a few countries of the boreal biome.
- Expand the guidance document to the other biomes (tropical/subtropical and temperate).
- Continue analysis to refine or select suitable measurable parameters and characteristics to identify primary forest by biome.
- Carry out pilot studies at national level at different biomes to develop analytical workflows to estimate primary forest area and change.
- Develop computational tools and guidance materials that implement the above-mentioned workflows, to support countries in assessing and reporting on primary forest area and area changes.

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**Annex 1. Latin and Central America draft primary forest criteria table**

Components of FAO's definition of primary forests	Criteria	Indicators	Methodology to develop the indicator	
<b>"Naturally re-generated forest"</b>	<b>Naturally regenerating forest</b>			
<b>"of native species"</b>	<b>Native species</b>			
<b>"where there are no clearly visible indications of human activities"</b>	Field evidences of non-traditional forest management	Occurrence of stumps; signs of intensive firewood collection; signs of intensive livestock management, presence of invasive species, skid trails, etc.	Analysis of forest inventory data, literature review, etc.	
	Canopy cover	Minimum canopy cover of [XX] %	Analysis of forest inventory plot data in areas of high likelihood of being primary forest, literature review, etc.	
	Areas managed for timber harvesting	Existence/Absence of this legal figure in the area assessed.	Review of geographical boundaries of such areas	
	Burnt areas from human-caused fires			
	Population density	More than [XX] people/Km2	Analysis of forest inventory plot data in areas of high likelihood of being primary forest, literature review, etc.	
	Physical inaccessibility	Slope higher than [X] %		
		Minimum distance of [X] Km from any human infrastructure or other types of anthropic land uses (cropland, etc.)		Analysis of forest inventory plot data, literature review, etc.
	Effective legal inaccessibility	Located within strictly protected areas (IUCN categories I & II)		
Located within Other effective area-based conservation measures (OECMs)				
<b>"the ecological processes are not significantly disturbed"</b>	Occurrence of deadwood	Deadwood volume densities between [XX] and [YY] m3/ha	Average range values from plots of high confidence of being primary forest (forest inventory data), literature review by biome type, etc.	
	Soil degradation			
	Natural age structure	DBH frequency distribution from [XX] to [YY]	Average range values from plots of high confidence of being primary forest (forest inventory data), literature review by biome type, etc.	
	Natural tree species composition	Presence of indicator species (including trees and plants but also animals, fungi, lichens) (Species 1, Species 2, Species 3)	Analysis of forest inventory plot data, literature review .by forest biome, etc.	
	Biomass density	Minimum value of [XX] Tonnes/Ha	Average range values in plots of high confidence of being primary forest (forest inventory data), literature review by biome type, etc.	
	Canopy height	Minimum tree height of [XX] meters.	Average range values in plots of high confidence of being primary forest (forest inventory data), literature review by biome type, etc.	
	Structural complexity	Stand Structural Complexity Index (SSCI)		
	Time since last significant human intervention	Minimum [X] years since last significant intervention.	Literature review, etc.	
	Area is large enough to maintain its natural ecological processes	Minimum forest patch size of [XX] Ha		Literature review, etc.
		Minimum forest mosaic area of [XX] ha		Minimum area required by forest-dependent umbrella species (Jaquar, Andean bear, etc.)
Minimum distance to other patch size of [XX] meters			Literature review, etc.	

**Background paper #5**

# **FRA 2020 Remote Sensing Survey and the way forward**

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*Background paper 5*

*for discussion at the FRA 2025 Online Expert consultation*

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## Introduction

The FAO Office of the Chief Statistician recommended the Global Forest Resources Assessment (FRA) to develop “independent FAO estimates of national forest cover based on Earth Observation data to be used to validate national submissions”. Following these recommendations, FRA, in collaboration with partners has developed a remote sensing component that focuses on three aspects: production of comprehensive and consistent global statistics on forest area and its changes, development of country capacity to use remote sensing for forest monitoring and assessment as well as production of an independent global and regional estimates on forest land use and its changes. For FRA 2020, these objectives were achieved through a series of capacity development workshops, and the implementation of the FRA 2020 Remote Sensing Survey (RSS).

The key results of the FRA 2020 Remote Sensing Survey were released in November 2021, at the 26<sup>th</sup> UN Climate Change Conference of the Parties (COP 26) and the complete FRA RSS 200 report was released (<https://www.fao.org/3/cb9970en/cb9970en.pdf>) in May 2022, during the XV World Forestry Congress in Seoul.

The strengths and challenges of the FRA 2020 RSS approach were both inherent in the use of a remote sensing-based methodology, combined with the participation of a global network of experts with local field knowledge along with the use of an online tool for visual photointerpretation. Also, the RSS, contrary to the main FRA report, provides estimates at global, regional and ecozone levels. To shape the next FRA RSS, imitations and possible improvements of the FRA 2020 RSS needs to be addressed, regarding in particular the production of spatial explicit outputs, annual/more regular updates, adding information on forest condition (i.e. degradation).

The recent and rapid development of affordable cloud-based solutions for storing, accessing and analyzing remote sensing data and products has drastically facilitated remote sensing based assessments even in developing countries with low technical capacity and computing infrastructure. These technical innovations can play an important role in improving national, regional and global databases on forest and land resources and their changes and facilitate monitoring progress towards several SDGs.

This background paper presents a summary of the methodology of the FRA 2020 RSS and, building on lessons learned from FRA 2020 RSS and technological and partnership opportunities, suggest potential areas of improvement for the next cycle of the FRA RSS for review and feedback of the participants of the 2022 FRA Expert Consultation.

## 1. What was done in FRA 2020 RS?

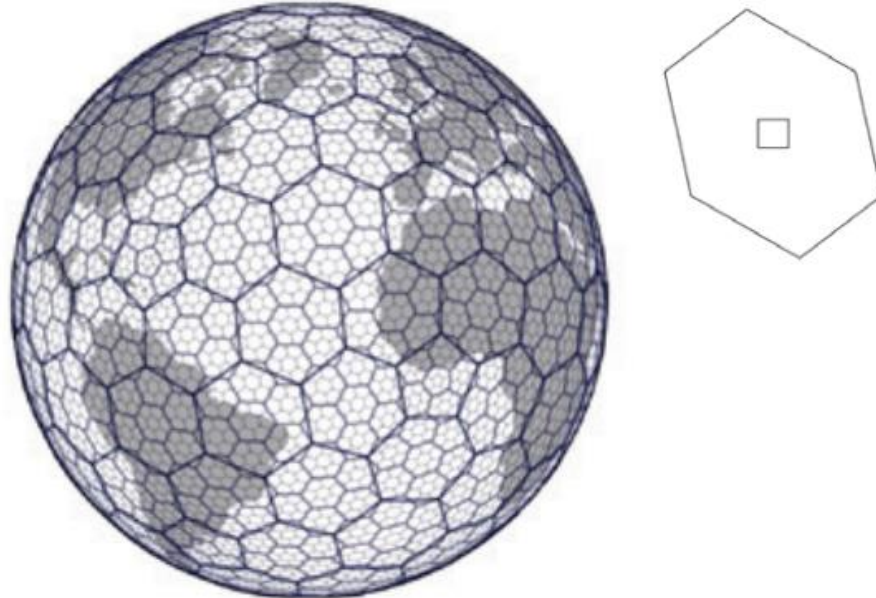
### Tessellation and sampling units

Following good practice recommendations from scientific literature (Olofsson *et al.*, 2014), inferences of forest land use area changes for the FRA 2020 RSS were obtained from a sample-based approach.

Sample data was collected following a stratified random sampling design. The Earth’s surface was divided into equal area hexagons (39.62 ha each), originating from a discrete global grid of equally sized hexagons. This produced more than  $1.2 \times 10^9$  hexagons, out of which approximately 335 million fell on land and constituted our sampling frame. An additional assessment

was carried out for a 1 ha square centroid in each hexagon to collect more detailed information on land use and tree cover, land-use change and related drivers (Figure 1).

**Figure 1.** Hexagonal tessellation of the Earth, based on a truncated icosahedron and single hexagon plot with 1-hectare square centroid



*Source:* Sahr, K. 2019. Central place indexing: Hierarchical linear indexing systems for mixed-aperture hexagonal discrete global grid systems. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 54(1): 16–29.

## Data collection

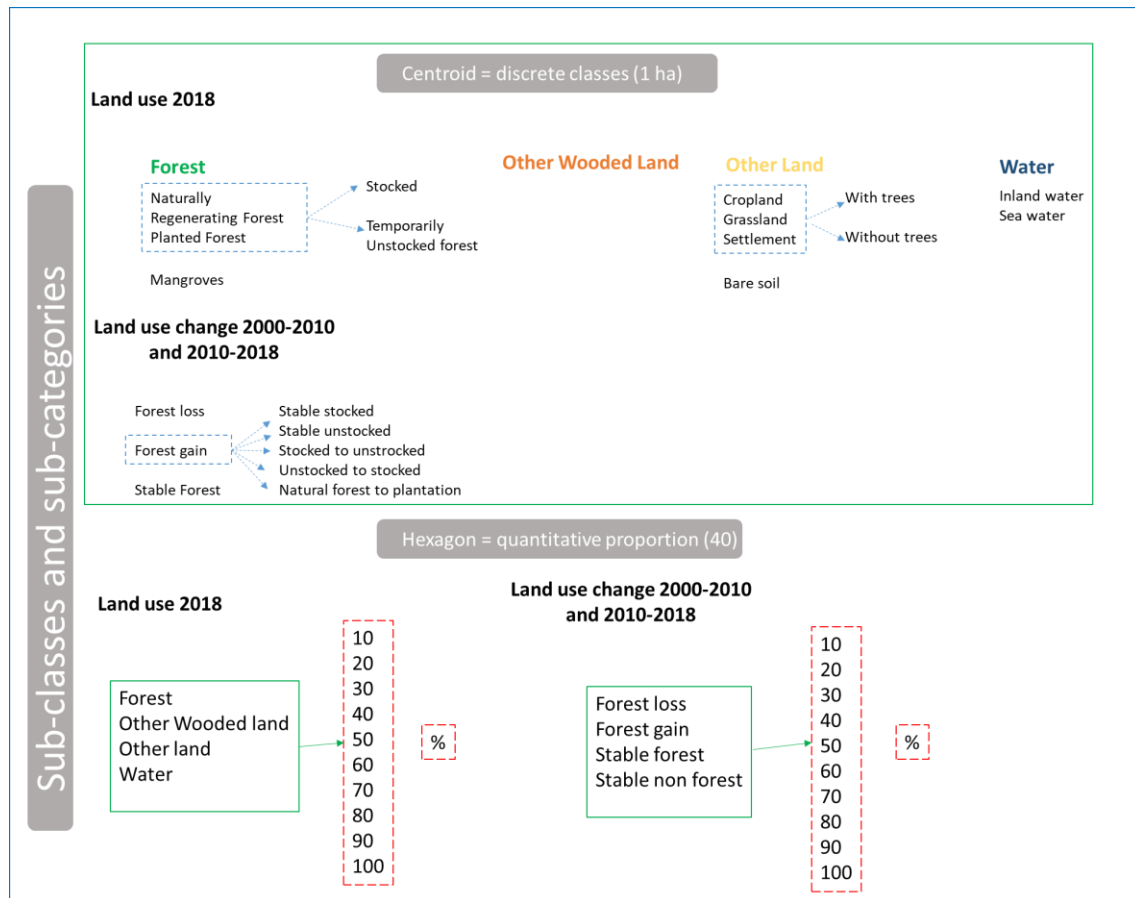
Data for each sampling unit was collected using visual interpretation and Open Foris Collect Earth Online (CEO) (Saah *et al.*, 2019). CEO is a custom-built, free, open-source and user-friendly software that enables the visualization and interpretation of satellite imagery in a cloud-based environment. The analysis was conducted using Landsat and Sentinel images as main data sources. Best available Landsat 5 or Landsat 7 data were used for years 2000 and 2010, and best available Landsat 8 and Sentinel-2 for 2018. VHR images from Bing Maps, DigitalGlobe and MapBox were also available as additional data to support the analysis. In addition, CEO has the option to visualize each plot as a Keyhole Markup Language file on Google Earth.

The following variables were collected for each sampling unit.

- **Hexagon centroid:** Discrete land use class and sub-class for 2018, as defined by the FRA, as well as land-use change classes for the given time intervals (2000–2010 and 2010–2018). The land-use and land-use change classes were assigned according to the majority (i.e. if more than half of the centroid is covered by forest, it will be classified as Forest). The presence of trees was also recorded for the “Other Land” subcategory, to extract the percentage and hectares of other land with tree cover (See Figure 3).
- **Hexagon:** Quantitative estimation of the proportion of the area of the hexagon falling into each main land-use class (Forest, Other Wooded Land, Other Land and Water) in 2018. Forest gains and losses were recorded for 2000–2010 and 2010–2018. In both classifications, discrete 10 percent classes were used (see Figure 3).

At both levels (centroid and hexagon), the land-use type was recorded for 2018. Land-use changes for periods 2000–2010 and 2010–2018 were recorded using the following classes: 1) Stable forest; 2) Stable non forest; 3) Forest loss; 4) Forest gain.

**Figure 2.** Variables collected for both the centroid and the full hexagon.



### Stratification & sample allocation

The full universe of hexagons was stratified to 80 strata, using a combination of the 20 Global Ecological Zones (GEZ) and four strata of tree cover change between 2000 and 2018 from the Global Forest Change product (FAO, 2010; Hansen *et al.*, 2013). These four strata consisted of:

- **big changes:** > 40 percent of pixels in the hexagon with changes;
- **small changes:** between 5 and 40 percent of pixels in the hexagon with changes;
- **no changes in tree-covered areas (no change forest):** < 5 percent of pixels with changes and > 10 percent tree cover; and
- **no changes outside tree-covered areas (no change non-forest):** < 5 percent of pixels with changes and < 10 percent tree cover.

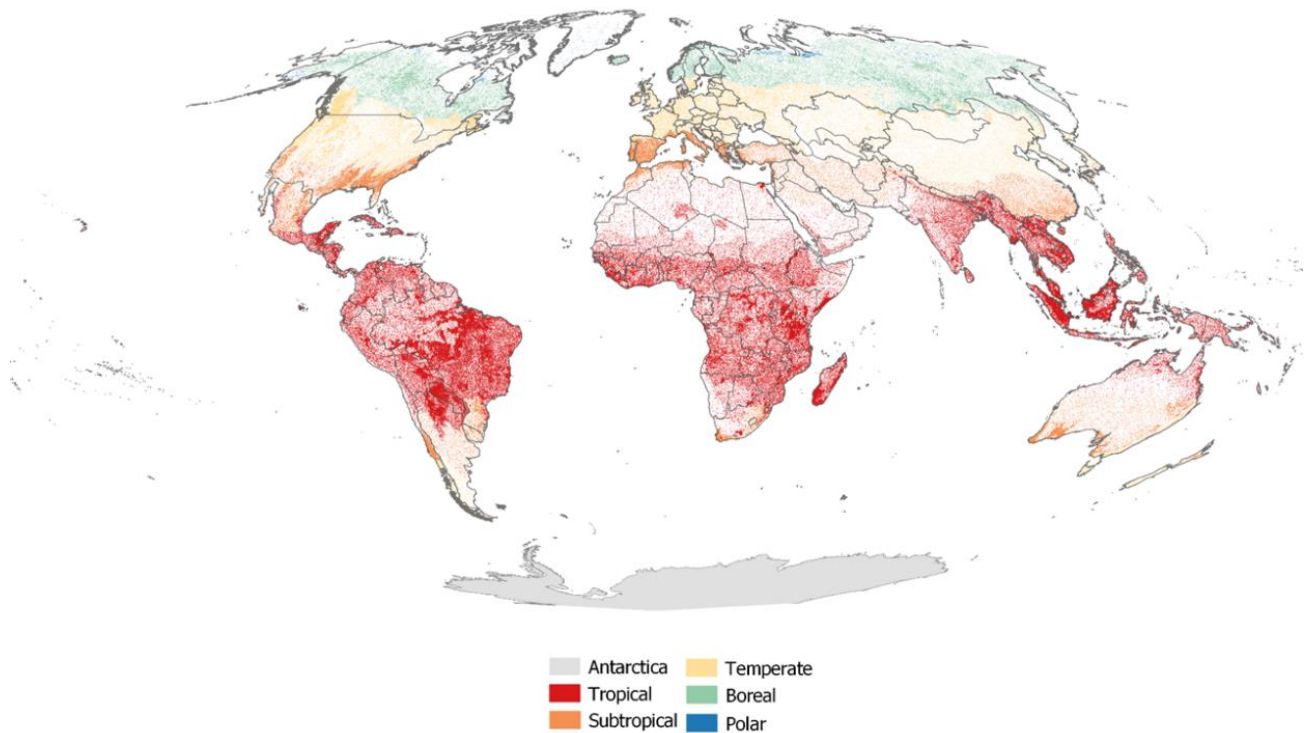
After defining the strata, the sample allocation was carried out in four stages:

- Allocating 50 percent to the two 'no changes' Hansen strata and 50 percent to the two 'changes' strata.
- The sample in the 'no changes' strata is equally divided between 'no change forest' and 'no change non- forest', i.e. 100 000 units to each stratum.
- The sample in the 'changes' strata is divided between 'big changes' (140 000 units) and 'small changes' (60 000 units).

The final number of samples for each 80 strata was calculated using proportional sampling and the samples to be assessed were chosen randomly.

The final distribution of the Remote Sensing Survey samples (400 000 units) is shown in Figure 2. The sample distribution pattern reflects land cover change dynamics in different areas. For example, in the central part of Chile, the high concentration of samples is related to forest management and plantation cycles, while in the north of Paraguay it is related more to deforestation and land-use changes than land cover changes.

**Figure 3.** FRA 2020 RSS Samples distribution by climatic domain



### Accuracy assessment

An interpretation accuracy assessment was conducted at the end of the FRA 2020 Remote Sensing Survey data collection. The assessment was done for approximately 3 percent (about 12 000 units) of the global sample sites. Each unit of the supervised sample was photo-interpreted by three independent operators. Operators were assigned to the regions corresponding to their specific expertise.

## 2. Review of the FRA 2020 RSS approach and recommendations for 2024 RSS

### Tesselation and sampling units

The efficiency of the sampling units (see section 2.1) to collect the data variables used in the FRA 2020 RSS (see section 2.2) was assessed by calculating the ratio between the variance of the centroid and the hexagon (Gallego, 2012). This measurement gives the idea of accuracy of the estimator. For instance, the efficiency of sampling unit of forest loss between the years

2010 and 2018 was 2.25, meaning that the hexagon sample unit was 2.25 more efficient to estimate this variable than the centroid.

Table 1 reports such efficiency for forest area estimation in 2018 and for forest changes (gain and loss) in the time intervals considered.

**Table 1.** Relative efficiency (overall by subregion) of the full hexagons compared to centroid observations for the estimation of forest area and major changes.

	Forest area 2018	Forest gain 2000–2010	Forest loss 2000–2010	Forest gain 2010–2018	Forest loss 2010–2018
Caribbean	1.37	3.18	NR	2.30	10.03
Central America	1.71	2.24	0.82	2.60	4.19
Eastern and Southern Africa	1.34	0.91	1.37	2.47	2.77
East Asia	1.96	1.39	2.50	1.57	4.63
Europe (Including Russia)	1.55	2.27	4.01	2.54	3.51
North Africa	1.38	10.55	7.43	1.03	4.28
North America	1.81	0.16	2.03	0.66	1.83
Oceania	1.26	0.70	2.00	1.21	7.81
South America	1.51	2.13	2.21	2.05	2.25
South and Southeast Asia	1.30	1.63	2.28	2.65	2.22
Western and Central Africa	1.29	1.75	2.44	2.94	2.32
Western and Central Asia	1.80	0.89	7.24	8.99	5.68
Total	1.54	1.78	2.21	2.04	2.76

The efficiency values obtained strongly suggest that estimations from the full hexagons are generally more reliable.

The quantitative photo-interpretation observations on the hexagons have proved to provide more accurate estimates, with a relative efficiency of around 1.5 for forest area estimation and between 2 and 3 for forest changes, although the relative efficiency strongly depends on the heterogeneity of the landscape or the spatial pattern of changes: if the landscape or the pattern of changes is composed of large homogeneous units, large sampling units bring limited benefits. In exchange, the relative efficiency of large units is larger for patterns composed of small, speckled units. This is probably the reason why large sample units (hexagons in this case) have a higher relative efficiency to estimate changes than forest area at a given date. However, there are still some issues to consider:

- The hexagon observations were only conducted for the main variables (e.g. forest area 2018, forest loss, forest change), but not for other variables, such as IPCC classes, deforestation drivers, etc. This obliged to carry out a benchmarking step to improve the consistency of results.

- The cost of large units may be significantly correlated with the heterogeneity of spatial patterns, and therefore would be also correlated with the relative efficiency of large units.
- The increase of effort of photo-interpreters by including the quantitative photo-interpretation observations on the hexagons has not been quantified. Asking photo-interpreters to record the time dedicated to assessing the centroid versus the time dedicated to attributing a quantitative value in the hexagon would result in an increase in the photo-interpreter’s workload. The most frequent feedback from photo-interpreters is that the longest task is understanding the context of the sample unit. This might need to be more systematically confirmed. For the moment, it strongly suggests that semicontinuous data on relatively large units (e.g. 40 ha) are more efficient than 0– 1 observations on a small “centroid”.

### Sample allocation

The sample allocation derived from the 6-country pilot study done in 2017, and later used to define the sample allocation of the FRA 202 RSS resulted in a non-optimal sample allocation, as we will see in the comparison of the optimal sample allocation. Too many samples in the strata big change, and missing samples in the other strata. One of the most usual approaches to optimal sample allocation is the Neyman criterion (Cochran, 1977), which requires choosing a priority variable to tune the sample size in each stratum.

The choice of the priority variable has a degree of subjectivity. The initial proposal is “net forest loss” (forest loss minus forest gain), considering that change detection was the most important goal of this exercise.

### Accuracy assessment

This analysis was done to include the interpreter subjectivity in the confidence interval. The method still needs to be validated by the scientific community, but some general conclusions can be anticipated:

- The uncertainty of the estimations, both for forest area and its changes, is likely to increase by a large factor.

**Table 2.** Sampling error and total error of the main variables

	Mha	Confidence interval (only sampling error)	Enlarged confidence interval including interpreter subjectivity
Forest 2018	3969	±0.37 %	±2.7 %
Forest loss 2000–2018	173	±1.6 %	±5.2 %

### 3. Recommendations and prospects for FRA 2025 RSS

#### Tessellation and sampling units

Considering the results presented in table 1, and the expanded results we obtained from the combination of hexagons and centroids, we recommended keeping the hexagon for key area estimates and the centroids to collect more detailed thematic data.

The global tessellation approach applied in FRA 2020 RSS demonstrated to be enough flexible to incorporate new layers of information for further strata definition, select complementary samples and implement additional studies, such as a special study focusing on mangrove forests.

Considering the advantages of keeping the sampling frame and the sample as constant as possible, we conclude that there is no need of changing the sampling frame for the FRA 2025 RSS.

#### Stratification

The stratification based on the Hansen Global Forest Cover products was good enough for the key variables. The experience gained in FRA2020-RSS suggests a few possible improvements. In particular, the number of EO-based forest mapping products is increasing, so that additional information can be introduced in the stratification. Criteria to choose layers to be combined for an improved stratification may include:

- Reducing the number of samples in stable strata by a combination of auxiliary data.
- Increasing the precision of forest area gain detection with auxiliary remote sensing products.

The strata labels used for FRA2020-RSS can be kept with one substantial modification: The "stable non-forest" stratum can be split, separating areas for which the complete absence of forest is very reliable. Such areas would define an area for reduced intensity sampling or excluded stratum.

Let us assume that we have a considerable part of the tessellation hexagons in the sampling frame for which all available land cover maps coincide that there is no forest at all in the whole timespan 2000–2022. We can decide to reduce sampling intensity in such areas in the sampling process by defining an excluded stratum.

Potential source of auxiliary data to adjust the stratification:

- **ESA World Cover 2020:**

Sentinel 2 and Sentinel 1 base land cover with 10 classes for the year 2020. Pixel size of 10 m. The FnF layer was produced defining "Tree cover" as "*Lands covered with trees, with vegetation cover over 30%*".

Built-up, Bare/sparse vegetation, Snow and Ice, Moss and lichen and permanent water bodies with low probability of tree cover.

- **ESRI 2020:**

Sentinel 2 and Sentinel 1 base land cover with 10 classes for the year 2020. Pixel size of 10 m. The FnF layer was produced defining "Trees" as *"Any significant clustering of tall (~15 feet or higher) dense vegetation, typically with a closed or dense canopy; examples: wooded vegetation, clusters of dense tall vegetation within savannas, plantations, swamps or mangroves (dense/tall vegetation with ephemeral water or canopy too thick to detect water underneath)"*.

Built Area, Bare ground, Snow/Ice, Water and ice could be used to identify area with low probability of tree cover.

- **GlobeLand30:**

Landsat-TM base land cover with 10 classes for years 2000, 2010 and 2020 within a four-year period. Besides multispectral images, other auxiliary data are included in the processing (<http://glc30.tianditu.com>). The FnF layer was produced defining "Forest" as *"Lands covered with trees, with vegetation cover over 30%, including deciduous and coniferous forests and sparse woodland with cover 10–30%"*.

Artificial Surface, bare land and permanent snow and ice and water bodies and ice could be used to identify area with low probability of tree cover..

#### Keeping the sample as stable as possible with an updated stratification

The thresholds to define "large change", "small change" and "no change" are currently set at 40% and 5% in Hansen-GFC.

In any case, even if the strata labels are kept unchanged, the stratification will change because the reference time interval changes and new land cover maps will be probably integrated. If we maximize the stability of the sample of hexagons with an updated stratification, we face a problem with the computation of estimators and their variances: we will have in the same updated stratum sample elements that come from different old strata, and therefore have been sampled with different probabilities. We can think of different options to deal with this situation:

- Moving from the simple estimators we have used in FRA 2020-RSS to the Horvitz-Thomson (HT) estimators for unequal probability sampling. The problem with the HT estimators is that the variance computation requires the joint probability for each pair of sample elements. If we consider the overall sample, this will lead to a matrix of  $16 \times 10^{10}$  joint probabilities. The number can be reduced by taking into account that the matrix is symmetric and that we can treat separately each subregion and GEZ, but it remains a considerable problem.
- Considering the intersection of old strata  $h$  and updated strata  $h'$  as post-strata. This is the easiest way to deal with the issue, but anomalies can appear in small intersections with little or no sample. The aggregated size of such small intersections can be assessed.
- Adjusting (complementing or subsampling) sample elements that had been sampled with a probability different from the probability corresponding to the updated stratum in which they fall. This is also feasible, but external observers might have problems understanding the process.

## Sample allocation

Regarding the optimal Neyman allocation based on the FRA 2020 RSS results, there are different options to improve sampling allocation in future cycles. We simulate the optimal sample allocation for two scenarios. The first is collecting 200 000 additional samples and the second is adding 400 000 samples.

### Scenario 1 of reduction to 200 000 units

We assume:

- The next FRA-RSS moves from the current sample of ca. 400 000 units photo-interpreted by one operator and 12 000 interpreted by three supervisors (or only two in some cases) to a scheme based on approximately 200 000 units interpreted by two operators. This assumption is realistic in view of the lessons learnt in FRA 2020 –RSS.
- We keep the same FRA 2020 RSS stratification. We should expect to have a better stratification for the next round, but we need the assumption to compute a hypothetical allocation and make a description of its behaviour.
- For this exercise we have split three subregions:
  - North America has been split into Mexico and “Northern North America”
  - Europe has been split into Russia and “the rest”
  - Oceania has been split into Australia and “the rest”
- We want to keep the sample as stable as possible to save effort and cost by reusing the photointerpretation made for FRA 2020 –RSS.

We apply a slightly modified version of a Neyman allocation using the estimated “Forest loss in 2000-2018” as target variable on what we have called a cross-stratum, i.e.

$$\text{Cross stratum } rgh = \text{Subregion } r \cap \text{GEZ } g \cap \text{Hansen stratum } h$$

The modification applied to the straightforward Neyman allocation consists of adding some sample elements for strata on which FRA 2020 has not found any forest loss, but forest was present in 2018.

The modified Neyman allocation can be aggregated by subregions, GEZ or Hansen strata. 3, 4 and 5 give some indications on the allocation changes suggested for a Neyman-optimized sample using forest loss as a priority variable, even if the allocation should be reviewed when an improved stratification is defined. When we look at these tables, we should consider that the total Neyman-optimized sample refers to a total of ca. 200 000 units instead of the 400 000 units of the current sample. Therefore when  $2m_{***} \approx n_{***}$ , the sampling rate in the corresponding area remains roughly constant.

North America (including Mexico), Europe, Russia and Australia would strongly reduce the sampling rate, while Western and Central Africa and Central America would increase the sample. South America would also increase the sampling rate in some areas.

Most tropical GEZ have a slight decrease in the sample size in number, which means a substantial increase in the share of tropical areas in the adjusted sample. Tropical forest (rainforest, moist forest and dry forest together), would account for 67% of the optimized sample, versus 44% in the current sample allocation. This means a substantial sample reduction in most of the other GEZ.

An apparently surprising fact is that the stratum “(strong) change” would reduce its share from 38.6% to 13.4% in the optimized sample. In exchange, the “small change forest” would increase its share from 10.7% to 27.3%. The main reason for this allocation change is that the “(strong) change” is rather small (2.6% of the sampling frame) versus 8.3% of the “small change forest” stratum. The variability per unit of forest loss per unit is similar for both strata, which means that the contribution to the overall variance of forest loss is much larger for the “small change forest” stratum with the current sample allocation even if the forest loss area is similar in both strata (Table 5).

**Table 3.** Preliminary allocation of a Neyman-optimized sample, scenario 200 k. Aggregation per groups of countries

	$n_r$	$m_r$	Stable sample	New sample
North America North	<b>61318</b>	<b>14019</b>	12456	1563
Mexico	<b>7933</b>	<b>2804</b>	2732	72
Central America	3139	4793	1820	2973
Caribbean	1141	498	419	79
South America	92509	56770	43635	13135
Russia	<b>38750</b>	<b>10505</b>	9443	1062
Europe other	<b>22126</b>	<b>3697</b>	3694	3
North Africa	10705	3585	2792	793
Western and Central Africa	26806	29432	17936	11496
Eastern and Southern Africa	42098	29108	20128	8980
Western and Central Asia	10732	3664	2254	1410
East Asia	16477	8394	7054	1340
South and Southeast Asia	48104	28300	21141	7159
Australia	<b>16605</b>	<b>3696</b>	3545	151
Oceania other	2598	872	830	42
Total	401041	200137	149879	50258

**Table 4.** Preliminary allocation of a Neyman-optimized sample, scenario 200 k. Aggregation per environmental zones

GEZ	$n_g$	$m_g$	Stable sample	New sample
Tropical rainforest	80471	55747	39168	16579
Tropical moist forest	53144	48015	31260	16755
Tropical dry forest	42024	30435	22813	7622
Tropical shrubland	<b>23031</b>	<b>6693</b>	5907	786
Tropical desert	<b>6765</b>	<b>244</b>	244	0
Tropical mountain system	15065	8258	7154	1104
Subtropical humid forest	17182	8899	6634	2265
Subtropical dry forest	<b>18060</b>	<b>2173</b>	2173	0
Subtropical steppe	<b>10172</b>	<b>3471</b>	2633	838
Subtropical desert	<b>9309</b>	<b>2741</b>	2590	151
Subtropical mountain system	<b>10824</b>	<b>3943</b>	3306	637
Temperate oceanic forest	<b>7338</b>	<b>892</b>	892	0
Temperate continental forest	15213	5663	5506	157
Temperate steppe	7958	4478	2193	2285
Temperate desert	<b>8864</b>	<b>573</b>	573	0
Temperate mountain system	<b>21466</b>	<b>4397</b>	4345	52
Boreal coniferous forest	20054	7034	6007	1027
Boreal tundra woodland	<b>12553</b>	<b>2530</b>	2530	0
Boreal mountain system	<b>19139</b>	<b>3635</b>	3635	0
Polar	<b>2409</b>	<b>316</b>	316	0
Total	401041	200137	149879	50258

**Table 5.** Preliminary allocation of a Neyman-optimized sample, scenario 200 k. Aggregation per Hansen-GFC strata

Stratum	$n_h$	$m_h$	Stable sample	New sample
Change	154581	26805	26805	0
Small change	42940	54573	34985	19588
No forest stable	89324	38650	31003	7647
Forest stable	114196	80109	57086	23023
Total	401041	200137	149879	50258

**Table 6.** Contribution of each Hansen-GFC stratum to the forest loss area and to the variance of its estimation with the current FRA2020-FSS sample allocation in scenario 200 k.

Stratum	Area		Variance of	estimates
	Forest loss 2000_10	Forest loss 2010_18	Forest loss 2000_10	Forest loss 2010_18
Change	35.8 %	35.8 %	2.9 %	3.5 %
Small change	38.8 %	40.0 %	33.7 %	35.7 %
No forest stable	6.1 %	5.0 %	19.0 %	16.9 %
Forest stable	19.4 %	19.2 %	44.4 %	43.8 %

Scenario 2: keeping the sample size of 400,000 units

Same splitting of subregions and minimum sample size per cross-strata.

**Table 7.** Preliminary allocation of a Neyman-optimized sample, scenario 400 k. Aggregation per groups of countries

Region	FRA2020		Stable sample 400k	New sample 400k
	RSS sample	N Neyman 400k		
North America North	61318	28046	20277	7769
Mexico	7933	5591	4179	1412
Central America	3139	9645	2235	7410
Caribbean	1141	946	564	382
South America	92509	114044	58090	55954
Russia	38750	20983	16499	4484
Europe other	22126	7210	7132	78
North Africa	10705	6963	3575	3388
Western and Central Africa	26806	59164	21946	37218
Eastern and Southern Africa	42098	58312	24789	33523
Western and Central Asia	10732	7056	3358	3698
East Asia	16477	16666	10902	5764
South and Southeast Asia	48104	56787	31582	25205
Australia	16605	6954	4388	2566
Oceania other	2598	1630	1326	304
World	401041	399997	210842	189155

**Table 8.** Preliminary allocation of a Neyman-optimized sample, scenario 400 k. Aggregation per environmental zones

Number		SN		SStable	SNew
GEZ	GEZ	sam- ples	SN_ Neyman 400k	sample 400k	sample 400k
11	Tropical rainforest	80471	112015	54091	57924
12	Tropical moist forest	53144	96507	39367	57140
13	Tropical dry forest	42024	61121	27825	33296
14	Tropical shrubland	23031	13399	9565	3834
15	Tropical desert	6765	231	231	0
16	Tropical mountain system	15065	16488	10457	6031
21	Subtropical humid forest	17182	17715	8999	8716
22	Subtropical dry forest	18060	4134	4134	0
23	Subtropical steppe	10172	6813	3513	3300
24	Subtropical desert	9309	5466	3034	2432
25	Subtropical mountain system	10824	7813	5568	2245
31	Temperate oceanic forest	7338	1703	1645	58
32	Temperate continen- tal forest	15213	11300	9536	1764
33	Temperate steppe	7958	8763	2983	5780
34	Temperate desert	8864	1056	1056	0
35	Temperate mountain system	21466	8568	8196	372
41	Boreal coniferous for- est	20054	14107	9277	4830
42	Boreal tundra wood- land	12553	5027	4287	740
43	Boreal mountain sys- tem	19139	7171	6478	693
50	Polar	2409	600	600	0
Total	World	401041	399997	210842	189155

**Table 9.** Contribution of each Hansen-GFC stratum to the forest loss area and to the variance of its estimation with the current FRA2020-FSS sample allocation and new sample allocation in scenario 400

Strata		N samples	N_ Neyman 400k	Stable sam- ple 400k	New sample 400k
1	Change	154581	53695	53695	0
2	Small change	42940	109574	38822	70752
3	No forest stable	89324	76448	45029	31419
4	Forest stable	114196	160280	73296	86984
	Total	401041	399997	210842	189155

## Classification Schema

Regarding the FRA 2020 RSS results, we recommend exploring these additional categories of the legend for inclusion in further cycles of the FRA RSS.

- **Forest status:** Degraded forest, burned forest, young secondary forest.
- **Owl status:** Stable owl, transformed owl.
- **Cropland Types:** To be defined by cropland expert, selecting the key cropland types by ecoregion, agroforestry and shifting cultivation systems.
- **Livestock systems:** To be defined by livestock expert, selecting the key livestock systems by ecoregion.
- **Settlement types:** At least mining, high and low human settlement density, urban parks and other infrastructure.
- **Bare soil:** Sand, Rock, permanent ice.
- **Water:** Sea water, inland water bodies, rivers.

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