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Online consultation on the first draft of the FAO voluntary guidelines on national forest monitoring

Collection of contributions received

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Topic note

Reliable information on forests is fundamental for improving the management of forest resources. Often, however, this information applies beyond forest boundaries: it can, for example, be used as an indicator of biodiversity, hydrology, and soil conservation. High quality and accessible forest information is also needed to fulfil the reporting requirements of many international agreements, such as the UN Framework Convention on Climate Change.

To obtain timely and reliable forest information at different scales, there must be clear guidance on how to collect, compile, and analyse it. In this context, the Twenty-First Session of the Committee on Forestry (COFO 21), held in September 2012, recommended that FAO continue to support the efforts of member countries to strengthen their National Forest Monitoring Systems (NFMS).

The preparation of the voluntary guidelines on national forest monitoring began in September 2012. The guidelines will present a set of good practice principles supported by a set of decision-making tools for the planning and implementation of a multipurpose, scientifically sound NFMS.

Phase I of the drafting process has already been completed (and endorsed by COFO 22 in July 2014); this phase included the development of a definition of national forest monitoring, and a description of the guidelines' scope and principles (Sections I and II). Phase II, currently under way, will be a compilation of good practices and technical recommendations on national forest monitoring (Section III).

The first draft of Section III has now been prepared, and as part of the consultative process prior to its finalization and external peer review, the FAO Forestry Department is seeking your input to further improve the draft. This will be carried out through an online consultation managed by the [Global Forum on Food Security and Nutrition](#). The guidelines will be released for the consideration of COFO at its 23rd Session in July 2016.

Comments and input are welcome on all chapters of Section III, but in particular on the following aspects:

- **Does the draft adequately cover all elements needed to establish and sustain an NFMS?**
- **What other technical, logistical or policy issues should the document cover?**
- **Given that the voluntary guidelines are being designed for use by NFMS managers, what aspects of Section III could be improved to meet this objective?**
- **Is there any redundant content that could be removed to make the document more concise?**

We also kindly invite respondents to provide relevant case studies on country experiences, including any instances of "errors to be avoided".

Thank you very much for engaging with FAO Forestry on this consultation. We look forward to a rich and fruitful discussion!

Eduardo Mansur, Director
Forest Assessment, Management and Conservation Division
FAO Forestry Department

Contributions received

1. Bhubaneswor Dhakal, Nepal

I have the following comments on draft report of FAO voluntary guidelines on national monitoring that you call comments on FSN Forum

1. A substantial level of forest inventory work is required for preparing country report for Global Forest Resources Assessment Report. FAO prepares the report. The draft report of FAO voluntary guidelines on national monitoring has not stated the difference in information between the reports. I believe most of the information will be same. I request moderator to clarify the differences and provide supplementary information in this discussion. Does FAO hold hidden interest to separate the project activities?
2. I read the draft report. I felt that many suggestions are general and presented in vague language. This level of information is already available to the monitoring bodies of most countries. If you present in this form the guidelines they make little contribution in institutional capacity building. Your effort and money used in preparing these guidelines will be wasted.
3. Based on the reading of the draft guideline document has focused on wood, carbon and total biomass. If status information of all kinds of forest products (e.g. firewood and fodder) and successions are specified in the inventory report they will be much useful to make forest management decision at both local and national levels. The information, for example, helps to make decisions on improving forest management for biodiversity conservation. They would also help to understand stocks and dynamics of various products available to support livelihoods of local people. If the FAO had genuine interest to collect the useful product specific information the national monitoring guidelines had clear instruction. But the draft guideline document has provided detail instructions for little important things but not given attention on the useful things.
4. Need of indigenous people is a complicated and sensitive subject and ordinary people cannot adequately deal with them. Forest resources are means of food, nutrition, medicines, antibiotics and cultural existence of the people. Specialised inputs are vital to explain the relationship between various forest products and existence of indigenous people. Forestry inventory workers cannot deal with the complex and sensitive issue. Based on my experience on forestry development work in Nepal, they manipulate the leaders of indigenous people by various means and make interpretation of the value of the resources in own value and interest. The work of foresters are rather exacerbated by declining of indigenous population with extinction threat. It can be said that the forest development policy is doing genocide of indigenous people. Therefore, there should be very clear guidelines to address the needs of the people.
5. The word “manpower” is discriminatory from gender perspective. I would use the term “humanpower” instead.

Thanks for providing the opportunity of commenting on your work.

Bhubaneswor Dhakal

2. Lal Manavado, University of Oslo Affiliate, Norway

I shall begin with the obvious, viz., why do we need a forest monitoring system, which obviously requires a considerable amount of human and other resources to establish and maintain?

It would be reasonable to suggest that such a system is essential to nurture and sustain our forest resources, because it would enable us to ascertain to what extent we may utilise them without impairing their sustainability and to undertake appropriate actions whenever their sustainability is under threat.

Indeed, this is the sole context within which NFSM acquires its justification. Forest monitoring then, ought to be embedded not only in the institutional bundle the current draft outlines, but in a more holistic one that includes all institutions involved in national life.

This may seem a trivial point, but I think, unless we have an uncontroversial reason to ensure the continued existence of forests, and their monitoring as a necessary condition for it, one might easily lose one's sense of proportion among technical details.

Nobody will dispute that we all are beneficiaries of forests in that they are vital components of Oxygen and Carbon dioxide cycles, enhance the water table, absorb excess of solar heat and improve the local climate, etc.

Now, the ability of the forest to give us those benefits depends on the equilibrium between the living things in it and its mineral resources required for their continued existence. The latter includes soil nutrients and water.

The quantity of utilizable soil nutrients and water in a given forest area is finite. So, the sustainability of a forest depends on a continued cycle of death and biological degradation of its inhabitants, which would replenish its pool of soil nutrients. Here, death may be due to age, disease or predation.

This process of replenishment depends on the equilibrium among the species living in a forest. This biological equilibrium has a qualitative and a quantitative component. Biodiversity represents this qualitative component, while population of the individual species reflects its quantitative aspect.

Thus, the sustainability of a forest depends on the adequacy of its soil nutrients and water supply for the living there. The adequacy of the former, depends on the equilibrium among them, i.e. Natural biodiversity, which is instrumental in dynamically keeping the populations of individual species at sustainable levels.

If the foregoing is reasonable, then forest monitoring as an adjunct to its sustainability, ought to extend its range and scope to include rivers, streams, lakes, etc., in a forest as well as its smaller plants, and at least some of its fauna. I know this is a tall order, but it can be very significant under some circumstances.

For instance, during drought in some parts of Africa, elephants resort to barking trees as their access to grass becomes limited. This leads to the destruction of many trees. Likewise, unlimited hunting of the carnivores in savanas results in over grazing by the buffalos, which has serious land and climatic implications. Perhaps, some mechanism may be developed so that forest monitoring could cooperate with Wild Life Services of a country to render its data as complete as possible.

After this somewhat critical start, I am delighted to see the two key aspects of an NFSM, foundation elements and their institutionalization are very well put indeed. As for the exchange of students, researchers, etc., is an excellent idea in principle, but it would be useful only if areas of their work and the systems they represent are more or less commensurable.

Even within a given region, this commensurability may not always obtain. As it has been pointed out in the current draft, it is important to begin the work and continue to improve it as one goes along. But, such improvements have to be made gradually owing to the uneven distribution of human and other

resources required for the purpose. So, exchanges between the most advanced countries in forest monitoring and new comers to the field could only lead to unrealistic expectations and abandoned projects.

The draft suggests, “linkages with other national, regional and global institutes partner...”, and there again, their relevance to the overall purpose of an NFSM is paramount to avoid inappropriate practices. I have already mentioned national wild life service as an important contributor to this endeavour.

The current draft states, “here are other “sectors” like agriculture, environmental protection, biodiversity conservation, ecotourism development or other forest-related fields that are interested in the results from national forest monitoring.” Unfortunately, this approach represents a case of putting the cart before the horse in a reductive fashion.

Taken individually, those sectors can hardly undertake steps to ensure the sustainability of forests using NFSM data, and if no forests exist, all of them would be adversely affected. So, it is important to incorporate an NFSM into a national conservation agency with linkages to social practices with environmental implications.

Finally, I think it would be prudent to give permanent employment to trainees in forest monitoring as a means of ensuring a continued supply of competent, and one hopes, dedicated people. In my view, it would be very useful if international resources can be made available to pay them if a country finds it difficult to do so owing to valid pragmatic reasons.

Best wishes!

Lal Manavado.

3. Javier Fernández, Costa Rica

Thank you for making this consultation publicly available. It shows a great deal of transparency and willingness to receive feedback from a wide audience.

My comments and suggestions are mostly related to COFO's mandate in relation to REDD+ and nationally determine goals and strategies under the UNFCCC, especially on measuring and reporting emissions by sources and removals by sinks.

Overall, the document is very easy to read, well-written and concise. It is encouraging to see a specific section on the integration of young experts and I would suggest this is kept in the final version. Along this line, I would suggest that the NFMS shall: “Consider an inter-generational strategy to ensure the long-term sustainability of capacities” (Section 3.5., p 13). This strategy should include students, as mentioned in the text, but also young professionals hired at different government levels.

In terms of the operation of the NFMS, I agree with the need to have a QA/QC plan, which in turn needs to be more clearly linked to the national GHG inventory's QA/QC plan, especially in relation to the AFOLU sector.

At the same time, I was concerned to see the absence of a specific section on the financial sustainability of the NFMS. This could potentially be addressed in Section 2.1. Institutionalization. Especially in developing countries, current efforts to build a NFMS largely rely on international donations/grants. Ideally an institutionalized system would have its own permanent funding, assigned by the government, particularly considering new INDCs under UNFCCC. I would suggest that a section is included (or Section 2.1. is expanded) to address this issue.

Though, as set out in the introductory sections of the document, the NFMS shall seek to providing useful information for a number of initiatives, conventions and commitments, I believe it is very important to make a clear connection to MRV requirements under the UNFCCC and considering IPCC guidelines, as appropriate. Especially for the AFOLU sector, I did not see a link of measurement and reporting processes with the agriculture sector or even within the forestry sector for harmonizing the estimation of emissions by sources and removals by sinks. There is also a lack of guidance on how to link national reports such as FRA, BUR, National Communications and the GHG inventory. In my experience, such guidance is key and many countries have important obstacles to do this. I would suggest adding a new section on MRV under the UNFCCC after Section 4.4. If appropriate, similar sections may be added for FRA and other relevant UNFCCC conventions.

Finally, I have shared my thoughts with other colleagues and international consultants and we have agreed that some of the guidance provided in this document is too broad to help any specific country situation and that efforts should be undertaken to aid countries in implementing the guidelines defined here.

Thanks again for fostering dialogues and promoting transparency,

All the best,

Javier

4. H. Gyde Lund, Forest Information Services, USA

Thank you for the opportunity to review the First DRAFT SECTION III, FAO Voluntary Guidelines on National Forest Monitoring. This is an excellent and very useful document – A job well–done!

Here are some observations that may be of interest.

Page 10 - Information Needs Assessment.

Start with laws, regulations that govern your organization. Next identify criteria and indicators. From these, determine the measurements or observations to be made on various parameters (see figure 1).

You should be able to trace any data element you collect or measure in the field back to a required report or law. If such a link cannot be made, there probably is no need to collect that data.

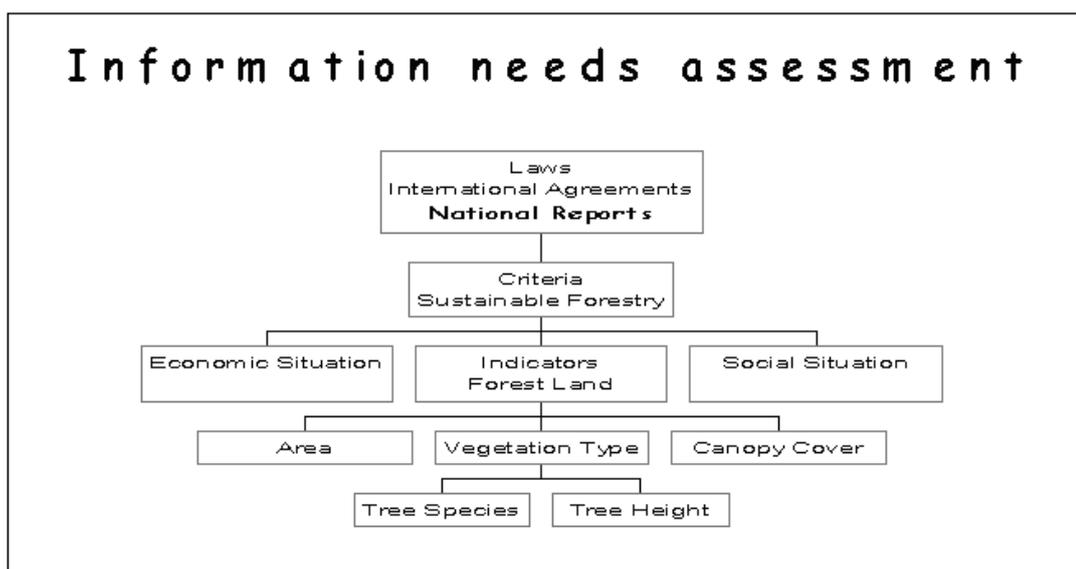


Figure 1 – An information needs assessment flowchart.

Getting more specific, a basic question to ask is "**what data should be collected?**" The answer is simply answered by the following equation: (What do you NEED to know) – (What you already know) = Information you must gather. There are certain key questions that must be answered to help you decide what you truly need.

1. First and foremost "**Why do you need a forest inventory?**" Possible answers – the inventory is needed for national strategic planning, you need to meet international commitments, or your boss says so. Table 1 lists typical information needs by various decision levels.

Table 1. Typical Decision Level Characteristics (Lund 1985)	
Level	Characteristics
International	Goal: To develop international assistance programs or action plans to reverse the depletion of resources and degradation of the environment; foreign trade agreements to shift surplus to meet demands; or cooperative agreements to control Pests and diseases or to address other catastrophic occurrences. Information sought Includes the present state of the resources and the rate and pattern of change. Data are usually assembled by an international group.
National	Goal: To develop long range Federal policies and programs for public and private land-administrating organizations within a given country. National assessments often provide basic and relevant data on renewable resources held by all types of Owners within a nation, appraising changes in supplies of resources and demands for them, the outlooks for future, and possible alterations in these outlooks by changes in national program end policies. National assessments include descriptions of the present situation and estimated changes due to management, cultural influences, and natural or secondary factors The data are usually assembled and compiled by a Federal agency or an association dealing with a specific resource product. The primary users of the information are the executive branch, Congress, and regulatory agencies. Private industries also use long-range estimates of production and trends to

Table 1. Typical Decision Level Characteristics (Lund 1985)	
Level	Characteristics
	develop their own strategies.
Agency	Goal: To develop an overall strategy for the management of resources within the agency's jurisdiction; define a policy; to express that policy as a set of regulations; and to carry out and execute the policy through agency's program. The information required usually reflects current values and rates of change. Inventories conducted at this level may be considered as a prelude to the development of the resource. Inventories focus on the resource stock and the land's capability to produce on a sustained yield basis. The inventory units used in planning are usually based upon political or administrative boundaries. Broad management goals and objectives and financial plans for the organization are the eventual products
Region, Forest, District	Goal: To develop long-term direction for each management or administrative unit (e.g. Region, Forest, District) within an organization. The resources and their condition and potential are described only in sufficient detail to direct the manager's attention to specific portions of the management unit for more intensive planning. Area, volume, and production estimates are usually tied to each unit. For timber planning, information sought includes areas by land class, soil-vegetation types, estimates of growing stock within the classes, and accessibility. The product is a management plan.
Compartment and Stand	Goal: To determine what, where, and when specific treatments are to take place. Decisions regarding timber sale locations and prescriptions for specific stands are examples. Inventories to assist the decision maker often include maps of vegetation conditions by compartments and stands, description of vegetation and terrain within the units, and accessibility and relevant classification of the units with respect to the alternatives selected under the land use planning process. Data observed include vegetation factors, potential productivity, accessibility, and economic factors in order to determine specific management actions to take place within the treatment unit. The inventories are usually conducted by the District. The output is a functional action plan showing the treatment areas and indicating what is to be done when, where, and how. The plan is used for the day-to-day operations of the lowest level field office.

Many nations need a national level inventory for strategic planning and to meet international obligations especially those resulting from the United Nations Conference on Environment and Development in 1992. Documents arising from UNCED include Agenda 21, the Forestry Principles, the Conference on Biological Diversity, the Framework Convention on Climate Change, and the Convention on Desertification. If your last national inventory was carried out before UNCED chances are that you do need a new inventory, as there are new information requirements as a result of these agreements.

- Who wants to know and when?** People requiring the inventory may be the government, NGOs, the public, industry or academia. As to when, the answer is usually as soon as possible. How soon the information is actually required helps dictate the method used to gather the data.
- What do 'they' (those wanting the information) need to know?** Start with the rules, regulations, and laws that apply to your organization. Examine them for data requirements.

Next look at any international obligations you may have. In all probability "they" will want to know the amount, condition, production and location of the ___ resources on ___ lands. (The blanks to be filled in later).

We do know that we have to manage our forest resources on a sustainable basis. Since 1992, the concept of sustainable forest management has changed. The old concept was essentially the use and management of forestland by producing more timber than is harvested. The new concept is the stewardship and use of forests and forestland in a way and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill now and in the future, relevant ecological, economic and social functions, at local, regional, national, and global levels and does not cause damage to other ecosystems.

Tables 2 list the types of areas to be monitored for agreements arising from UNCED.

Table 2 - Areas to be monitored according to documents arising from UNCED (Anonymous 1992, 1993).

Area	Agenda 21	Forestry principles	Convention on Biodiversity conservation	Convention on climate change	Convention on Certification
Low-lying coastal			Yes	Yes	
Arid and semi-arid			Yes	Yes	Yes
Suitable for reforestation		Yes			
Suitable for afforestation	Yes	Yes			
Prone to natural disasters	Yes			Yes	
Liable to drought & desertification				Yes	Yes
High urban atmospheric pollution	Yes			Yes	
Fragile ecosystems			Yes	Yes	
Forested	Yes	Yes	Yes	Yes	

Tables 3 lists the types of indicators to be monitored for agreements arising from UNCED. Note that many of the indicators involve observing things other than trees and nearly all require the measurement of change. This new direction means new information. To protect and create

more natural biological diversity for example, one needs information not only on the trees but on other flora, fauna, soils, site, and habitat as well. These kinds of things should be built into new inventories. Once the information requirements are known, the next task is to break the requirements down into data to be measured.

Table 3 - Indicators to be monitored according to documents arising from UNCED (Anonymous 1992, 1993).

Area	Agenda 21	Forestry principles	Convention on Biodiversity conservation	Convention on climate change	Convention on Certification
Biomass	Yes			Yes	
Climate	Yes			Yes	
Ecosystems & habitat		Yes	Yes		
Emission sources and removals		Yes		Yes	
Employment		Yes			
Energy	Yes				
Fodder		Yes			
Food	Yes	Yes			
Fuel		Yes			
Land Cover	Yes				
Land degradation	Yes				Yes
Land Productivity	Yes				
Land use	Yes			Yes	
Landscape diversity		Yes			
Minerals	Yes				
Medicine		Yes			
Plants & animals	Yes	Yes	Yes		
Recreation		Yes			
Shelter		Yes			
Soils	Yes				
Water and water use	Yes	Yes			
Wildlife	Yes	Yes			
Woodstocks		Yes			

4. **How often will 'they' need the information?** The answer to this question has a huge bearing on the inventory infrastructure one sets up and on the inventory design employed. Given the requirements for tracking change, one may wish to consider establishing a continuous forest inventory system using permanent sample plots.
5. **What would happen if 'they' do not have an inventory? / How good do the answers have to be?** (What is the desired sampling error and confidence level?) The answers depend on what is the impact on the resources, what is the impact on the decisions, and what is the impact on the decision-maker if there is no inventory or if the data are weak.
6. **Is this a one-shot deal or will subsequent observations need to be made over time?**
7. The big question - **How much are 'they' willing to pay or what are they willing to contribute to the effort?** In my opinion, those that are requesting the information should pay for it be it timber data, biological diversity, etc. 'Payment' may be in the form of in-kind contributions, money, personnel, equipment, office space, computer support, etc. What contributions are likely to be available also impacts the inventory design and how 'good' the information will be.
8. **Which lands shall you include?** International agreements tend to promote the increase of forest area. That implies that you will need data on areas that currently do not have trees but should have. Do you wish to include these current non-forested areas in your assessment?
9. **What do you need in the way of maps? Why? Who will use them? How?**

Page 16 - Definition of the population of interest and sampling frame

Determine if you are inventorying or monitoring the population as it exists, as it was in the past, or what you think it will be in the future. For example, here is an image of an area of dead trees in the Bahamas that were killed due to storm surges of salt water. In the past this would have qualified as forest land. Would you include this area as part of the forest population today?



Below is an image of a pine plantation in Manassas, Virginia. As it exists at the time the photo was taken, the area would not have met the definition of forest as the crown closure was not dense enough and the trees not large enough to qualify. In ten years hence, the area would qualify as forest. So, would you include this area as forest in your inventory. Four years after this image was taken, the area was paved over to make a parking lot for a local hospital.



Page 17 - Identification and specification of variables to be recorded

1. **What do you need in the way of tables? What are the column and row headings? Why? Who will use them? How?**
2. **What does one have to measure/observe to fill in the columns and rows?**

Page 36 – Field Work Planning

1. **What will the inventory cost be and do you have enough funding?** The costs depend on several things, including existing available resources. Some general resource requirements include:

- Forest survey and inventory officers
- Remote Sensing, Remote sensing/GIS officers
- Database management system and manager
- Appropriate equipment, hardware, software
 - *Per person*
 - Hard hat
 - Clinometer
 - Compass
 - Bark scribe
 - Vest
 - Increment hammer
 - Ruler
 - Aluminum tags for numbering trees
 - Stakes for marking plot center
 - Diameter tape
 - Pencils
 - Canteen
 - Hatchet
 - Insect repellent
 - *Per crew*
 - Radio/telephone
 - Data Recorder or Tatum
 - GPS

- Loggers tape
 - First aid kit
 - Truck
- Financial resources for training, field data collection
- Appropriate sampling methodology for ground data collection
- Standardized metadata, projections and work flow processes
- Administrative infrastructure for the implementation of demarcation and description of forest areas
 - **Cost of Field Work - A formula to determine the cost of a field plot:** $F = CW\{[L + (M) + D]\}$ Where
 - F = The field cost in dollars for a single plot
 - C = The size of the field crew
 - W = Hourly wage per person in dollars
 - M = The time per crew to measure each sampling unit (plot) in hours
 - L = The travel time between sampling units (plots) in hours
 - D = The daily travel time to and from the inventory unit in hours.
 - **To determine field cost to measure all plots within an inventory unit**
Multiply F X N to get the total cost of field work minus equipment, subsistence, travel and transportation expenses where:
 - N = Number of sampling units to be measure
 - The formula for determining the number of plots needed to meet a desired sampling error and a desired confidence level is as follows:
 - $N = (t^2CV) / E^2$ where n = number of plots, CV = coefficient of variation, E = sampling error (%), and t = student's 't' statistic.
 - For the Bahamas – Assuming a desired accuracy of +/- 15% at 2 standard deviations (t = 4) and a coefficient of variation of 43% (largest cv reported) –
 - $N = 4(43^2)/15^2 = 7396/225 = 32.9$ or 33 plots required for the resulting true value of the estimate to be within +/- 15%, 95% of the time.
 - Here is formula to estimate what the sampling error would be given n number of plots.
 - $E^2 = (t^2CV)/n$. Using the 43% coefficient of variation, a 't' of two; Here the estimated sampling errors for 30 and 200 plots.
 - For 30 plots
 - $E^2 = 2^2(43^2)/30 = 4 \times 1849/30 = 7396/30 = 247$; $\sqrt{E} = 16\%$
 - Thus if you establish 30 plots you can expect to be within +/- 16% of the true value 95% of the time.
 - For 200 plots
 - $E^2 = 2^2(43^2)/200 = 4 \times 1849/200 = 7396/200 = 247$; $\sqrt{E} = 6\%$
 - Thus if you establish 200 plots you can expect to be within +/- 6% of the true value 95% of the time.

Be sure you have the needed programs and software tested, up and running before you start collecting field data. This will help double check that you are collecting the needed data and ensure you can produce results in a timely manner. In one of the timber inventories that I helped with it was two years after the field work was completed that we were finally able to process the data.

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Thank you once again for the opportunity to review this document.

Cheers, Gyde.

5. **Christian Laurent, Service Public de Wallonie. Département de la Nature et des Forêt, Belgium**

- Cette version aborde-t-elle de façon adéquate tous les éléments requis pour mettre sur pied et maintenir un système national de suivi des forêts ?

Je pense que l'ensemble des éléments à prendre en compte ou à prévoir sont bien explicités. Un chronogramme schématique pourrait être ajouté, avec les étapes du processus de préparation et de réalisation. Cela compléterait les éléments repris dans le texte, de manière plus pratique.

- Quels autres aspects techniques, logistiques ou politiques devraient être abordés dans le document ?

Un encart pourrait être ajouté, présentant les différents schémas d'échantillonnage et leurs avantages et inconvénients, en matière statistique, de réalisation pratique et de coûts. Ces éléments sont diffus dans le texte et les rassembler dans un seul tableau serait utile.

- Étant donné que les directives volontaires élaborées devront être utilisées par les administrateurs des systèmes nationaux de suivi des forêts, quels sont les aspects spécifiques de la section III à améliorer pour atteindre cet objectif ?
- être abordés dans le document ?

Un encart pourrait être ajouté, présentant les différents types d'unités d'échantillonnage et leurs avantages et inconvénients, selon les grands types de forêts.

- Y a-t-il des contenus redondants qui pourraient être supprimés pour rendre le document plus concis ?

Pas de remarque à ce sujet.

6. Kuruppacharil V.Peter, World Noni Research Foundation, India

The scientific basis of a minimum 33% of land area under forest cover is not known. In the southern state of Kerala (India) an aerial survey will indicate more green cover due to plantation crops like coconut, rubber, palmyrah, cardamom, coffee, tea, cashew and cocoa. Forestry and agro-forestry are terms loosely used. Clarity for following is needed:

1. With dwindling human habitat and urbanisation, there is heavy pressure on land. Intrusion into declared forest area is rampant. Is it practical to fix a proportion as under forest cover?
2. Awareness on forests and forestry need to be a part of syllabi in primary school level.

(K V Peter)

7. Subhash Chand, ICAR, India

Thank you very much for having a broad discussion on the issues which are need of the current period. I feel monitoring of forests and allied activities a need of hours. Though we are already late nevertheless right action may balance. Therefore, I can suggest that awareness creation about the utility/importance of the forest must be foremost agenda of policy at local as well as at global level. It is because people must understand why forest are important and how one individual can contribute to conserve and protect the forest resources. Survival and existence are really becoming so difficult due to ever growing population resulting higher demand for forest products and posing threat for their degradation.

By monitoring forest will give an idea of balance and gap in demand and supply of forest goods and services. Therefore, it has to be monitored and brought to the notice to the public.

8. Chiegele Christian Akpoke, Ebonyi State Agricultural Development Programme, Nigeria

My name is Akpoke C. Christian, a practicing beekeeper working with Ebonyi State Agricultural Development Programme in Nigeria as the Subject Matter Specialist (SMS) on AGROFORESTRY.

Considering the global positive effects of honeybees on rendering effective pollination services which multiply forest plants, I write to contribute that without honeybees our forest must vanish one day.

Bees can be used to monitor and sustain national forest by fully involving real practicing experienced beekeeper in the programme or team. They are to propagate the forest trees for their good and deploy bee hives/colonies within the forest perimeters which keep away forest enemies and pollinate forest trees.

I wish to refer to a project at Kenya where the honeybees was used to keep away the almighty giant elephant away from the areas they are disturbing human existence.

For effective result in this programme, honeybees are highly needed.

NO BEES! NO FOREST!

MORE BEES AND BEEKEEPERS!

MORE SUSTAINED AND CONSERVED FORESTS!!

Thanks.

Christian (Mr Bee).

9. H. Gyde Lund, Forest Information Services, USA

I support the comments by Javier Fernandez -re financial sustainability of the inventory program especially if long term monitoring is to be involved and Christian Laurent's suggestion for more series of charts.

One way to obtain financial sustainability is to have the requirement for period assessments of the nation's forest resources is to have it built into the laws. The US has (at least I assume it still has) the 1974 Renewable Resources Planning act which required an periodic assessment (10 years) of the Nation's Forest and Range resources (see <http://www.nrs.fs.fed.us/fia/topics/rpa/>). Since it is essentially a law, the government has to fund. Given a nation's international obligations these day, UNFCCC, COB, FRA, etc. I suspect there is plenty of justification for sustainable funding of a country's forest resources.

I also suggest the incorporation of photos of various aspects of carrying out the monitoring.. something to break up the text and to make the document more eye-appealing and interesting.

10. Peter Skripchuk, National University for Water Management and Natural Resources Use, Ukraine

Dear colleagues,

In our university the methodology of environmental audit areas and agricultural land. Feature land area Polissya of Ukraine: sandy, little fertile soil. Such land subject to natural afforestation. Some plantations are aged 20 years. This is actually a new forest. Therefore, monitoring and auditing of forest and agricultural land should have common issues to study. Also studying wetlands and the impact on the natural cultivation of forests.

In the files of individual publications in Russian and Ukrainian languages.

Еколого-економічні засади лісорозведення на сільськогосподарських землях

<http://www.fao.org/fsnforum/sites/default/files/resources/%20%D0%9F.%D0%9C.%2C%20%D0%A2%D1%80%D0%BE%D1%85%D0%BB%D1%8E%D0%BA%20%D0%A2.%D0%9C.%20%202015.doc>

Варианты реформирования земельных отношений

<http://www.fao.org/fsnforum/es/sites/default/files/resources/%20%D0%9F.%D0%9C.%20%D0%A2%D1%80%D0%BE%D1%85%D0%BB%D1%8E%D0%BA%20%D0%A2.%D0%9D.%20%D1%81%D1%82%D0%B0%D1%82%D1%8C%D1%8F%20%20%D0%92%D0%B0%D1%80%D0%B8%D0%B0%D0%BD%D1%82%D1%8B%20%20%D1%80%D0%B5%D1%84%D0%BE%D1%80%D0%BC%D0%B8%D1%80%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D1%8F%20%D0%B7%D0%B5%D0%BC%D0%B5%D0%BB%D1%8C%D0%BD%D1%8B%D1%85.doc>

Методика экологического аудита трансформации сельскохозяйственных земель

<http://www.fao.org/fsnforum/sites/default/files/resources/%20%D0%9F.%D0%9C.%2C%20%D0%A2%D1%80%D0%BE%D1%85%D0%BB%D1%8E%D0%BA%20%D0%A2.%D0%9D.%20%D1%81%D1%82%D0%B0%D1%82%D1%8C%D1%8F%20%D0%A0%D0%BE%D0%B2%D0%BD%D0%BE%20%D0%A3%D0%BA%D1%80%D0%B0%D0%B8%D0%BD%D0%B0.doc>

All success.

11. Kari T. Korhonen, Luke, Finland

Excellent document, covering widely the different aspects of establishing a national forest monitoring system. Few hints to consider:

1. Chapter 3.1 deals with the mandate. Would it be necessary to discuss here, or somewhere, the different roles of implementing organizations. I mean, if one of the goals of the NFMS is to monitor quality of forest management, the NFMS should be independent from organizations responsible for forest management. Perhaps this was discussed in the earlier Chapters, I did not check.
2. Chapter 3.2 Identification of information Needs. I think that in one WFC2015 sessions, Andrew Lister pointed out that it would be useful to document INA process and the decisions made on the information content of NFMS. This would mean some kind of listing of reasons why some themes were rejected and why some themes were accepted in the NFMS information content. It was an excellent proposal, that could be added here?
3. Chapter 4.2.2 Sampling Design, Box 7. Please add a statement that there are also well established methods for estimating variance from systematic samples, reference to the work of Matern, for example.
4. Chapter 4.2.3 Sampling Design, page 24. Very well discussion about the need to consider the long term monitoring aspect when planning stratifications. Could add here some warnings about the need to consider all the key variables when planning the stratification, because a stratification that may improve estimation of one key variable may be very ineffective for another key variable?
5. Chapter 4.2.6. Here or somewhere else(4.4?) add a recommendation that data processing, calculations, should be started as soon as you have some data. This may reveal some unexpected errors in the measurement guidelines or practices.
6. Chapter 4.3.4. Would this be good place to remind about work safety? One useful tool to improve the safety of field work is mapping of risks and sharing the results of this mapping in the training.
7. Chapter 4.4.1: Add about the need to make responsibilities very clear: who is allowed to clean the data, who is responsible to back up the data etc. Or, perhaps this was explained in some other Chapter?
8. Finally, a more general comment: I think you should consider possibility to make this document more practical by showing some good practices. For example, how the efficiency of monitoring has been improved. And estimators for means and totals, and their variances in the most common sampling designs should be shown in a compact and practical manner. I think that for example the German and US NFI's have made such details available, but it would be very useful to collect this information under this document, as well.

12. Manoj Kumar Behera, NRMCI, India

Dear Colleagues,

I thank FAO for this noble initiative. The draft is very useful and informative.

Following are some of my comments;

1. Little more narration under certain sections may be helpful for easy understanding, interpretation and its uniform application. For example, under training need assessment and capacity building support, FAO can think about defining the roles of different stakeholders in this exercise as well as a standard methodology for undertaking the same.

2. Some good practices can be included under specific sections viz. institutional collaboration or inter-sectoral collaboration.
3. Possible inclusion of a set of training modules for different stakeholders.
4. Involvement of village level trained youth volunteers in the monitoring exercise.
5. Formation of a National Level Task Force (20-25 members) to execute planning & monitoring exercise. The Task Force shall be well represented by Senior Forest Officials, Policy Makers, Scientists, Subject Matter Specialists, Social Experts, Consultants and Experts from Private sector and Civil Society Organisations.
6. Adequate space for participation of Community Based Organisations (viz. Forest Rights Committees or Van Panchayats/VSS in India).

Once again thanks for this opportunity.

Best Regards,

Manoj

13. Peter John Opio, FAO, Uganda

It is encouraging the process of development of the NFMS is bottom up to;

Increase ownership/acceptance and ensure needs of stakeholders are met and that there are no questions raised later when it comes to decision making/misinterpretations and failure to collect important data and to

It is noted the development of the NFMS process is participatory, hope that takes care of countries that have devolved or decentralised forest management. And if that is the case recognises (Embedded in policy briefs) the need to build capacity of responsible persons from the lower local governments.

The NFMS informs on areas that may need development/improvement, and that this information will be documented/reported and subsequently communicated/ disseminated to stakeholders, including communities. What next after that? What are the provisions (in the draft) to capture follow up actions on the findings of the monitoring process and reporting. The future NF monitoring may build on that as a starting point.

14. Jeff Dechka, Canadian Forest Service, Canada

Hello,

Please find below, comments on the FAO Voluntary Guidelines on National Forest Monitoring provided to me by Dr. Steen Magnussen.

Best regards, Jeff.

Pretty good document. Below are some specific comments.

1. In section 4.1 the term 'landscape view' is used. Meaning what? I have an idea but don't want to just guess.
2. In the third bullet of 4.1.1 something is missing. A rewrite is in order. In the same section a rather narrow view of the role of RS is put forward (classification).

3. Box 4. There will never be a scientifically based minimum level of acceptable precision. How could there be?
4. In 4.2.1 fourth bullet. Meaning is unclear. The term 'on-the-ground information' in the 7th bullet is too vague.
5. If the population frame is determined from a map (say a forest mask) then errors in this frame must be mentioned. Some sample points may actually be outside the frame and should therefore, in theory, be withdrawn from the list of sample locations. However, over time the forest frame may change. Therefore if forests is the population of interest it is best to use 'all land' for selection of sample locations but only sample field data on forested locations. Periodic updates of the forest mask will provide important statistics on forest area. Many national inventories apply this approach to avoid otherwise serious issues of a sliding population frame.
6. Box 7 (p. 23) and Box 9. The issue of autocorrelation is only relevant for the efficiency of a sample design. This comes out at a later point. But here it may not be appreciated. Perhaps rephrase the paradigm of optimizing the within plot variability towards minimizing the among-plot variance, which, of course, is done by maximizing the within plot variance.
7. Page 23 mentioned that it is not possible to optimize the sample size for several sample sizes. I think the statements needs to be softened a bit. I can think of solutions if you don't require the same precision for all variables; and yet others based on optimization given constraints on budget and or time.
8. In the 7th bullet in 4.2.3 it may be worthwhile to mention that the fidelity of geo-referencing in RS is not perfect. In some years, and some locations it is 'user beware'.
9. In the 8th bullet in 4.2.3 Your dismissal of fixed-count sampling is too harsh. Of course, fixed-count estimators are not design-based. Steen Magnussen has developed new and approximately unbiased fixed-count estimators of stem density and is on the verge of submitting a manuscript illustrating the same desirable property for density estimators of VOL and BA.
10. What is a statistical model? A model is a model. It may be used in connection with a statistical estimation procedure. But the term is foreign to me.
11. On page 28 and forward the term 'introduces variability' is used as if variability is exchangeable for errors and even bias. A thorough revision is called for. One that eliminates the ill-defined 'variability'.
12. On page 30 the sentence 'when reporting only' needs a revision. I also found the implicit linking of errors to failures rather mysterious.
13. In 4.2.7 on the issue of QA/QC a statistical approach to quality control should be promoted rather than a rule of thumb (10% of field plots to be remeasured!). In particular a sequential QA/QC statistical analysis is efficient. Remember, a decision has to be made: accept or reject the work. So clear limits of acceptable 'errors' or 'divergence' are needed.
14. A point worth mentioning? If confidence intervals are given for a large number of inventory attributes they are merely point-wise intervals. One must recognize that the multivariate confidence level is lower. This is important because NFMS deal with many reportable attributes and when deciding on sample size the multivariate nature of the statistics is often ignored.

Jeff Dechka
Director, Forest Information / Canadian Forest Service
Natural Resources Canada / Government of Canada

15. Shaun Suitor, Department of Environment, Land, Water & Planning, Australia

Great piece of work.

One comment on the “building teams” section, we’ve found it much more efficient to employ contractor teams to measure plots and we then audit them to ensure compliance with procedure. So essentially we leave it up to the marketplace to build and maintain forest monitoring capacity (with a small amount of help from us -2 days training), instead of us having to do it “in house”. As it is inherently difficult for government organisations to build and maintain such specialised technical skills.

Also, we’ve spent the last 6 years developing an extensive suite of standard operating procedures for the Victorian Forest Monitoring Program, (~700 pages), and we update them after every field measurement season. They are available online. So, feel free to have a look and compare with yours. I’m happy to talk about these anytime. Shaun.suitor@delwp.vic.gov.au.

Link to Victorian Forest Monitoring Program:

<http://www.depi.vic.gov.au/forestry-and-land-use/forest-management/forest-sustainability/victorian-forest-monitoring-program>

Regards,

Shaun

16. Lauri Vesa, FAO, Finland

Thanks for excellent work done! The foundation elements are very well selected and presented.

Here some inputs & thoughts to be considered when further revising the paper:

1. In the field assessment, better to avoid collecting aggregated data if variables of interest can be measured by interval or ratio scale. Aggregation can be always done at the reporting stage. This is a typical case e.g. with seedling/sapling data.
2. For saving time and money, is recommended to avoid measuring too much data. For example it is waste of money to record every single tree height in savanna type if (almost) the same accuracy level (in terms of volume/biomass/carbon) can be reached through recording some well-selected height sample trees in sample plots and then using localized tree height curves in the data analysis phase.
3. In planning the data collecting protocol, it should be known how the data will be analyzed. There are cases where for example depth of litter has been recorded, but no clear idea how that data is utilized in computing carbon in litter.
4. Database: data should be preferably normalized, even though field forms are not showing normalized data structure. (Maybe too technical topic into this manual?).
5. Database: correct data hierarchy should be in place in order to utilize inheritance, for example a sample tree should inherit properties of plot section, plot, and cluster. This makes writing of data analysis scripts easier when using object-oriented language, as R.
6. Please add examples of computing variance estimators for stratified sampling (both area based, and point sampling methods).
7. Chapter 4.3.1 (manual): It is recommended to include definitions & explanations for terms and variables, e.g. what is a 'tree', 'shrub', 'forest', 'breast height', 'stump height' etc. in the national context.

8. Somewhere it could be mentioned that “Not to change field protocols during an inventory cycle”. This can cause difficulties in data analysis & reporting phase!

17. Jim Penman & Carly Green, UCL / EAS, United Kingdom

General

1 The document contains much useful material, particularly on institutional arrangements for NFMS and NFIs.

2 There are no references in the present document – are these to be added?

More specific

3 At 47 pages Section III is much longer than the previous Sections I and II (together about 12 pages). Of course, Section III was always intended to be the section with the detailed guidance but the shift to much more specific material may give difficulty in countries adopting the guidelines as a whole.

4 The language seems very prescriptive – for example there are about 85 instances where the word shall is used, often in a heading governing multiple points. Sections I and II together use shall only once. Probably shall (which carries connotations of legal text) should not be used at all in a document which is, after all, voluntary. It would be better to make recommendations. This would be more consistent with a stepwise approach as foreseen in the REDD+ COP decisions.

5 The document sometimes confuses NFMS (institutional arrangements) with NFIs (the statistical system which may be part of the NFMS). In fact the latter part of the document, although it often refers to NFMS, reads more like a manual on how to develop and implement an NFI. It would be useful to do a review of the use of terms to see which is meant.

6 Although the document says early on that it takes account of the requirements of REDD+, it really focusses only on NFI-based systems and does not mention IPCC emissions inventory guidance and guidelines at all. Use of the IPCC guidance and guidelines is requested by the COP. They allow gain-loss calculations that do not necessarily require an NFI – although they can of course use NFI data if available. The GFOI Methods and Guidance document covers the linkage between the IPCC guidelines and the REDD+ estimate in some detail and cross referencing both IPCC and the MGD could be useful as a way to avoid duplication and extensive additions.

7 Joint use of remote sensing and ground-based data are mentioned but in much less detail than NFIs. This is also covered by the MGD which provides information on the availability and application of freely available remotely sensed data.

Jim Penman (UCL/MGD Advisory Group Chair) and Carly Green (EAS/MGD Component Manager)

30th October 2015

18. Yoganath Adikari, FAO, Italy

Dear Colleagues;

I went over the document National Forest Monitoring manual under preparation and I have the following suggestions;

In the section 4.3 operational design and 4.4 reporting- I think we surely do need method that is scientifically correct, cheap and easy to use so that we get standard information from the field, analyze

them and report the results. Based on these results evidence-based decision, policy-making for sustainable forest mgt as well as awareness raising is formulated in various levels. Therefore, I suggest that we have to give some examples of the method that could be used and when time comes they could be improved... It is an open suggestion AND

In my view, the forest health is very important: a healthy forest protects soil, water, animals and also give recreational and religious benefits. On the other hand if the forest health is deteriorated, water problem will be triggered, soil will be degraded, nutrient from the forest will be deteriorated and even due to lack of forest natural disasters such as debris flows, shallow landslides and floods will be triggered... and much more. I suggest we have to accommodate eco-DRR carefully.

Hope it helps

Best regards

Yoganath Adikari (FOMD)

19. Carla Ramirez, FAO, Guatemala

Congratulations for the idea and the effort to develop this very useful document!

Please find the following comments,

1. The document is talking about forest monitoring system, but even though it is implicit (in this section) that one main approach of this document is to keep both Remote sensing monitoring and monitoring with field data. The most of the people and the information available in the Web are more focused on Remote sensing monitoring approach. So many people cannot feel identified with this document, I did not check the previous chapters if this issue is discussed, but in this section most of the discussions are focused on forest inventories, so it would be nice to make visible the linkage between both approaches and how they work together to finally evaluate forests and forest resources and services.

2. In some parts of the document the descriptions are much detailed than others, so the document rather than guidelines seems to be a protocol or manual. In some sections is too much technical, for the understanding of all the broad public, or the stakeholders that are not biometricians.

3. In all the document a relation with the NFMS for MRV requirements for REDD+ mechanism is missing.

In chapter 2.1 (Institutionalization): I suggest to include in the title: "and public financial mechanisms". The NFMS should be a mandate from the Governments to provide a public service on reliable data on forests. Lack of permanent financial mechanisms is one of the main bottlenecks to install permanently the NFMS.

4. Chapter 2.1 where say "permanently institutionalized NFMS can efficiently promote"..., the item 4 can include: "Allow governments to report in a consistent and transparent manner to international commitments.

5. Institutionalization also can address to governments to formalize the public financial and investment mechanisms. Financial sustainability is missing, and it can be a principle.

6. Chapter 2.2: National capacities should start with the institutional structure. After develop a legal framework for institutionalization, it is necessary that countries analyse and adapt the previous institutional structure at national and subnational level (the last one, when applicable). This step allows to build other aspects on country capacities as human resources and infrastructure. The document just mention about human capacities. It is necessary develop more about infrastructure, for

example appropriate equipped offices (national and sub-national), including buildings, furnishing, hardware, software, satellite imageries, measuring equipment, vehicles (cars, boats, motorcycles), etc.

7. Chapter 2.2 (capacities): I suggest to make a list of the institutional capacities divided on technical and operational management. Technical capacities: forest inventory sampling techniques (critical), remote sensing, field measurements, data processing and analysis, information-data base development, communication techniques. Operational management are necessary on planning (this is critical), human resources, administrative and logistics management.

8. Chapter 2.2 paragraph 2: Is less strong to say: The persons responsible to implement the NFMS should have the appropriate level of education to reach the necessary knowledge and experiences through specific trainings and learning-by-doing. on the field of expertise

7. Chapter 3.3. Stakeholder engagement can be supported by the concepts around the dialog mechanisms for NFP.

8. Chapter 4.1. This section is focused on methodological design. Maybe is better to write a more appropriate title.

9. Terms and definitions are very important for the field data protocol.

10. For the operation design it is important to be developed by a person that know the public administration.

11. Chapter 4.3.3 The administrative staff should understand the data collection procedures. When the funds comes from public sources there are many constraints and procedures that are not easy to manage and can evolve in high risks over the data.

12. Chapter 4.3.5 Fieldwork planning: It is needed to take into account the administrative modality to operate the monitoring system. Some countries has the possibility to contract governmental staff to operate (regular staff), other should outsourcing the field work and quality control. On the other hand, to develop whatever direct government staff, or outsourcing, the administrative modality to mobilize the public sources are very important to understand, not only the persons in charge of the NFI, but also the Ministry of Finance and financing departments in the institution in charge. This situation is a bottleneck to operate as cost-efficient, rather than the cost-efficient in the methodology design.

13. Chapter 4.4 data management and analysis: Should be discussed the institution in charge for the data analysis, in some cases the institution for data collection it should not be the same for the data analysis. For example the forestry authority can collect the data and a research institute analyse the data. The message is that the data analysis process should be institutionalized too.

14. Field work protocol should include how to re-measure the permanent plots, if it is talking about permanent forest monitoring.

15. Continue motivation for the field crew is the best practice for the quality control in measurements, because the field work is a hard work. Motivation should be part of the training programme. Also a internal check should be part of the work in the field.

16. On the other hand. Insurance for the field crews is crucial. In many countries the security of the field crews is missed as in this document. It is necessary to mention in the field protocol or develop a separate protocol for contingencies.

20. Zoltan Somogyi, Hungarian Forest Research Institute, Hungary

Attached comments in "track changes".

http://www.fao.org/fsnforum/sites/default/files/resources/2015%2009%2005%20-%20FAO%20Voluntary%20Guidleines%20NFMA%20-%20Draft%20for%20consultation_ZS.docx

21. Heino Polley Thünen, Institute of Forest Ecosystems, Germany

I suggest the following recommendation:

Automatic plausibility and completeness checks DURING THE FIELD ASSESSMENT are very important in terms of data quality. Only in the field a reliable data correction is possible. Later at the office nobody knows the real situation.

22. Jose Maria Michel, FAO, Mexico

Adjunto encontraras el documento con comentarios puntuales en algunas secciones.

http://www.fao.org/fsnforum/sites/default/files/resources/2015%2009%2005%20-%20FAO%20Voluntary%20Guidleines%20NFMA%20-%20finalfinal_2%20%281%29revJMM.docx

23. Javier Garcia Perez, FAO, Italy

Aqui mis comentarios (solo Preparacion y Disenyo estadistico he mirado).

Javier

http://www.fao.org/fsnforum/sites/default/files/resources/2015%2009%2005%20-%20FAO%20Voluntary%20Guidleines%20NFMA%20-%20Draft%20for%20consultation_JGP.docx

24. Joberto Veloso de Freitas, Serviço Florestal Brasileiro, Brazil

Dear David,

Please consider my main comments on the Voluntary Guidelines on National Forest Monitoring:

1. As general observation, the VG will help the countries to establish their systems, as well as they will serve as a reference for the increasing community interested in forest monitoring in the context of international agenda that use the information coming from NFMS (UNFCC, CBD, etc);
2. I think that term National Forest Assessment and Monitoring (NFAM system) seems to be more appropriate. Monitoring means to assess in time, being therefore just a characteristic of the system, less important that the assessment itself; Most of the NFIs are designed to be continuous forest inventories, which is the monitoring functionality of them;
3. Despite the proposal try to differentiate between NFI and by stating a definition or meaning for national forest monitoring (Section I: "...a comprehensive process that includes collection, analysis and dissemination of forest related data and the derivation of information..."), it seems that both the proposed definition and the content of the whole guidelines are quite related to national forest inventories (NFIs);

4. It is important to establish a much more clear link between NFIs and the proposed term NFMS, as for many country one can affirm they are completely different things and weak NFI processes already in place (it can happen, believe);
5. There could be a Glossary with the main terms of the “forest monitoring” at the end of the document;
6. The figure 1 (page 7) is very helpful for giving a general view of the framework in which a NFMS should be developed; It could be helpful also if similar figures were provided at some lower levels (data management, for example); The text is to dense!
7. I found almost nothing about the importance of species botanical identification in the context of the NFMS. It is important to note that species variable only matter when the species are well identified and, for tropical countries, their scientific botanical identification is crucial for the quality of information;
8. In item 2.3 (developing partnerships and collaboration) it should be helpful to have a list of relevant fields of the NFMS; and also a list of the main (item 3.2) stakeholders groups normally involved or interested in NFMS;
9. There should be guidelines on how to integrate NFMS with other agendas at national (agriculture, for example) and at international level (climate change, biodiversity, etc);
10. At the end of the guidelines there could be a framework to help countries to measure the progress towards their NFMS planning and implementation. It could be a “check list” matrix with the main content of the VG in a format that one could “check” what is already available and what is not yet;
11. I missed a section dedicated to the main results or group of results that a NFMS should provide and, more important, a possible path to link these results to police formulation or potential applications at national level;
12. In the item 4.1.4 (Review of existing information) you could provide pros and cons of using old and existing forest inventories as base for new NFMS;
13. It would be good to mention the link between NFMS and NFIS (national forest information systems), for example as one the main provider (NFMS) of forest information on the forest resources;
14. I expected to find more about the socioeconomic aspect of a NFMS, as the interviews as part of the NFI are being used by some countries and also it seems to be considered as important by FAO; There should be similar guidelines on this topic for sampling design, variables and statistical analysis.
15. The “dynamic” aspect of the NFMS was almost forgot; There could be at least a section dedicated to how to deal with the long term dimension of NFMS and with the statistical implications of calculating changes in time;
16. The use of new technologies and trends in forest monitoring could be part of the VG;
17. Despite the Remote Sensing is mentioned in the item 4.2.1 in the context of the statistical design, I think that more emphasis could be given to their use as part of the NFMS. Questions like “Is it possible to have a NFMS based only in remote sensing?” and “How remote sensing

could be one of the pillars for field work planning and to scale up ground plot data?” Are the guidelines only on the traditional ground national forest inventories?

18. When we think about national forest inventory is very clear that we should have one standard methodology for the whole country, an appropriate sampling design and one plot configuration as much as possible. However, when thinking about a NFM “system” it could be important to mention something about sub national initiatives when they are also doing forest monitoring at smaller scales. For example, permanent sample plots within Forest Management Units designed for forest dynamics and growth and yield studies (m³/ha/year) and even plots designed to monitor biodiversity. Perhaps a small topic on the possibility of including such other monitoring system as national information could be appropriate, off course without mixing data. By non-mentioning them, it seems that they are not forest monitoring, they do not exist or are useless for the NFM system, which is not true.