



Forestry Department

Food and Agriculture Organization of the United Nations

NATIONAL FOREST ASSESSMENT

WORKSHOP ON THE FAO APPROACH TO NATIONAL FOREST ASSESSMENTS AND ONGOING PROJECTS

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The National Forest Assessments Programme

Forests are crucial for the well being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources and by serving as habitats for plants and animals. Forests also furnish a wide range of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, spiritual renewal and other services.

Today, forests are under pressure from increasing demands of land-based products and services, which frequently leads to the conversion or degradation of forests into unsustainable forms of land use. When forests are lost or severely degraded, their capacity to function as regulators of the environment is also lost, increasing flood and erosion hazards, reducing soil fertility and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

In response to the growing demand for reliable information on forest and tree resources at both country and global levels, FAO initiated a programme to provide support to national forest assessments (NFA). The programme includes developing a harmonized approach to NFAs, information management and support to policy impact analysis for national level decision-making.

The purpose of the NFA initiative is to introduce countries to an alternative approach designed to generate cost-effective information on forests and trees outside forests, including all benefits, uses and users of the resources and their management. Special attention is placed on monitoring the state and changes of forests, and on their social, economic and environmental functions. Another main objective is to build national capacities and harmonize methods, forest related definitions and classification systems among countries.

The National Forest Assessments Programme is organized under the Forest Resources Division (FOR) at FAO headquarters in Rome. Contact persons are:

Mohamed Saket, Forestry Officer, Mohamed.Saket@fao.org
Dan Altrell, Forestry Officer, Dan.Altrell@fao.org
Anne Branthomme, Forestry Officer, Anne.Branthomme@fao.org

or use the e-mail address: fra@fao.org

The NFA programme originated from the Global Forest Resources Assessment (FRA) programme, an initiative that seeks to gather and examine information on global forest resources and their uses. As such, many of the original NFA documents can be found within the FRA working paper series.

DISCLAIMER

The National Forest Assessments (NFA) Working Paper Series is designed to reflect the activities and progress of the NFA Programme of FAO. Working Papers are not authoritative information sources – they *do not* reflect the official position of FAO and should not be used for official purposes. Please refer to the FAO forestry website (www.fao.org/forestry) for access to official information.

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Abbreviations

ARMM:	Autonomous Region in Muslim Mindanao
CATIE:	Centro Agronómico Tropical de Investigación y Enseñanza
C&I :	Criteria & Indicators
CIPEC:	Centre for the Study of Institutions, Population, and Environmental Change
CONAP:	Consejo Nacional de Areas Protegidas
CSD:	Commission on Sustainable Development
DENR:	Department of Environment & Natural Resources
DILG:	Department of Interior and Local Government
EEA:	European Environment Agency
FAO:	Food and Agriculture Organisation of the United Nations
FMB	Forest Management Bureau of the Philippines
FORIS:	Forestry Information System
FRA:	Forest Resources Assessment
FSIS:	Forestry Statistical Information System
ICIV:	Institut de la Carte Internationale de la Végétation, Cameroun
IFF:	Intergovernmental Forum on Forests
INAB:	Instituto Nacional de Bosques
IPF:	Intergovernmental Panel on Forests
ITTO:	International Tropical Timber Organisation
IUFRO:	International Union of Forest Research Organizations
LGU:	Local government units
MINEF:	Ministère de l'Environnement et des Forêts
NAMRIA:	National Mapping and Resource Information Authority
NCO:	National Coordination Office
NFA:	National Forest Assessment
NFI:	National Forest Inventory
NWFP:	Non wood forest products
OECD:	Organisation for Economic Co-operation and Development
PROCAFOR:	El Programa Regional Forestal para Centroamérica
RFIT:	Regional Field Inventory Teams
SLU:	Swedish University of Agricultural Sciences
TOF:	Trees Outside Forest
UNFF:	United Nations Forum on Forests
UVG:	Universidad del Valle de Guatemala
WCMC:	World Conservation Monitoring Centre

1 Introduction and background

In many countries, information on forestry resources and their uses is often incomplete or even lacking. The global Forest Resources Assessment 2000 (FRA 2000) carried out by FAO found that while many of the industrialized countries have reliable information on a wide array of forest attributes, data from the developing part of the world is often very fragmentary and insufficient for forest policy development. In those developing countries where national forest assessments have actually been carried out, only 20 were based on field sampling, while in 59 information was produced by applying remote sensing. Information gathered in these countries is mainly focused on the extent of forest area, while complete data on volume from nationwide field inventories is very rare. Other dimensions attributed by the forest resources are often not properly covered by the national forest inventories (NFI). This is also the case when it comes to trees outside forests (TOF), a resource often not accounted for in national data sets.

Efforts in national forest inventories and assessments, particularly in developing countries, seem to have decreased compared to what was done in the 1970s and early 1980s. This trend is mainly explained by scarcity of financial resources on one side and the low national capacities to plan and implement inventories on the other.

FAO has the mandate to provide assistance to countries that request forest inventory and assessments. Furthermore, it collaborates with countries in producing and providing reliable and complete data to the global Forest Resources Assessments

Intergovernmental Panel on Forests/Intergovernmental Forum on Forests (IPF/IFF) recommended that inventories should cover all forest and TOF resources, include all derived benefits, be based on a low-cost approach and lead to national capacity building and technology transfer. In response to this, the FRA programme of FAO has designed an approach to support national forest resources assessments, based on low-intensity systematic field sampling that produces information on forests and trees for use at national levels. The approach focuses on the long-term monitoring of the resource state, the way it is managed and used and on harmonizing the countries' data sets. Its objective is to help countries ensuring that national information is consistent with national needs and with reporting requirements to international processes such as FRA, UNFF, etc.

The approach was successfully tested in a pilot project in Costa Rica and improved for adoption by other countries. So far, Cameroon, Guatemala and the Philippines have launched their national forest and tree assessments by applying this approach.

The FRA programme convened a workshop in 15-17 January 2003 in Rome in which the national project coordinators from the Philippines, Guatemala and Cameroon participated along with the FRA staff. Four international scientists from the WCMC, Indiana University and University of Goettingen participated in the workshop.

2 Objectives of the workshop

The objectives of the workshop were to:

- (a) review the progress made in the national forest assessment projects in the Philippines, Cameroon and Guatemala with a view to identifying the difficulties met by the national team in implementing the survey methodology, the resources and logistics deployed so far and required to complete the remaining activities;
- (b) Examine national plans for data entry, storage and analysis, information management, and follow on actions based on the project results.
- (c) Discuss methodological issues related to the approach in terms of sampling design (data collection model, sampling intensity, plot configuration, etc), biophysical and management/uses variables of forest and tree resources, interview method and quality of generated information, capacity building for national forest resources assessment and long term monitoring, information management.

3 Methodological issues

3.1 Main characteristics of the NFA approach

For a number of motives such as easy planning and implementation in the field, data quality, cost implications, etc, systematic sampling was chosen as the most suitable technique for nationwide data collection on forest and tree resources. For the same sampling intensities, systematic sampling usually yields higher precision of estimates compared to non-stratified random sampling.

The sampling intensity for national forest assessment varies between 50 and 500 tracts (200 to 2000 plots) per country. This sampling intensity has been found optimal in order to produce national estimates of the main parameters with an acceptable sampling error (<10%), while maintaining the cost-effectiveness of the exercise. Sampling error is higher for rare population elements. Permanent field plots and interview sites are established on the ground for long-term monitoring of the resource and its use.

The approach is designed for projects to be implemented by national institutions and national personnel. Projects are founded as collaborative partnerships between the concerned governments, donors and FAO and successful implementation rests on the commitment of country institutions. In addition to the generated information, national capacity building in forest inventory and assessment is a major outcome of the project.

Broadening the knowledge on a countries' forest and tree resources requires that the assessment covers all products and services related to forests and encompasses all user groups. National assessments are designed on the basis of:

- a standard core of global biophysical and management/use variables that are adjustable to national needs;
- a standard classification system also adjustable to national requirements, and;
- common terminology and definitions.

NFAs produce considerable amount of data at different levels and for different purposes. A functional information system is fundamental to enter, store, process and manage the collected inventory data. Support to national forest inventories includes development of a national information system on forest and tree resources. The foundation for the information system will be a well-structured database, which includes interrelated tables. The system will permit storage of data from sequential surveys in order to detect and estimate changes and establish trends. It will also provide information for national and global reporting.

3.2 Reporting

A report layout was introduced to the participants of the workshop for discussion. There was a consensus that, to the extent possible, the report should cover the global variables for the Global Forest Resources Assessment (FRA) as specified by the Advisory Group for the FRA programme. The variables relate to criteria of sustainable forest management, used as a framework for country and FRA reporting. These variables are:

- Land use
- Land use change
- Ownership
- Designation
- Forest characteristics
- Forest characteristics change
- Growing stock
- Biomass
- Carbon stock
- Fires and Pests
- Species occurrence
- Forest tree species abundance
- Wood supply balance
- NWFP (non wood forest products) supply
- Socio-cultural sites
- Value of primary production of wood
- Value of primary production of NWFP
- Employment through primary activities in forests
- Illegal harvesting

It was accepted that the national reports should be produced in the official language of the country and be translated to English and French. The proposed report layout is presented in Table 1.

Table 1: Proposed report layout for national reports

<ol style="list-style-type: none">i. Location mapii. Executive summary1. Introduction2. Background: (general context of the study: Expressed Government need for NFA, FAO support to NFA, situation of the existing information on the forest and TOF resources, methodology of its production, etc)

3. Objectives of the study
4. Resources for the implementation of the NFA (Infrastructure, institutions, staff, equipment)
5. Preparations (equipment, manuals, field forms, maps, etc.)
6. Project management
7. Methodology: (sampling design, classification system, variables, training of field personnel, biophysical variables measurements, interviews on forest and tree resources management and uses, data entry and processing, reporting)
8. Fieldwork and coordination
9. Data base design, data entry and processing
10. Results
 - 10.1. Area
 - by forest types and land use classes (according to classification)
 - By per ecological zone
 - Proportions of forest area by management system
 - Proportion of forest area of each protection level
 - Proportion of forest area by ownership
 - Precision of area estimates
 - 10.2. Volume
 - Gross volume (mean per hectare and total) of each forest type
 - Commercial volume (mean per hectare and total) of each forest type
 - Commercial volume per major species (mean per hectare and total)
 - Gross volume (mean per hectare and total) of trees outside forests
 - Commercial volume (mean per hectare and total) of trees outside forests
 - Commercial volume per major species (mean per hectare and total)
 - Gross and commercial volume per ecological zone, forest management system
 - Precision of volume estimates
 - 10.3. Biomass
 - Above ground woody biomass in forests (per ha and totals)
 - Above ground woody biomass of TOF (per ha and totals)
 - Above ground woody biomass in forests and of TOF per ecological zone
 - Precision of biomass estimates
 - 10.4. Carbon stock
 - By forest type
 - In other land use classes – TOF
 - Precision of carbon storage estimates
 - 10.5. DBH distribution
 - By forest type
 - In other land use classes – TOF
 - Precision of carbon storage estimates

- 10.6. Biodiversity
- List and frequency of tree species in forest by forest type
 - List and frequency of tree species outside forest
 - Forests by fragmentation level
 - Forests by stand structure option
 - Forests by human induced disturbance level
 - Precision of estimates
- 10.7. Use of resources with highlight of productive, protective and social functions of the forests and trees
- Wood and NWFP provided by the forest (including logging, fuelwood collection, etc.)
 - Wood and NWFP provided by the trees outside forest
 - Social, economic and environmental services provided by the forest
 - Social, economic and environmental services provided by the trees outside forest
 - Users of forest and tree resources
 - Reliability of estimates of forest use attributes

11. Forest fires

12. Local population

- Trends
- Activities

13. Accessibility to tracts and plots

14. Comparison of the results of the assessment with the existing information (land use land cover areas, timber volume, state of the forest and tree resources, local population, biodiversity, etc)

15. Capacity building (staff training, institutional strengthening, etc)

16. Time and cost analysis

17. Conclusions

18. Recommendations:

- Monitoring of the resources
- Additional information needs and data collection with more intensive sampling: forest types, regions, etc.
- Actions for resources development
- International reporting

19. Bibliography

Annexes

- Forest/land use classification
- Variables assessed and definitions and codes
- Field manual
- Progress reports
- Others: Functions and models for data processing
- Summary of tract data

3.3 Presentations by participants

3.3.1 Findings of the consultancy on Field-testing and Evaluating the Interview Component of FAO's New Approach to NFAs

Krister P. Andersson, Scientist from the Centre for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University, Bloomington, IN, USA, was assigned by FAO to carry out the study 'Field-testing and Evaluating the Interview Component of FAO's Approach to National Forest Assessments' with Guatemala as case study. A 10-day visit produced a report (Andersson 2003) that reviewed the data content and format as proposed by the FRA approach. Although the NFAs still have some issues to resolve, the information that it makes available is of potentially great value both to national policy makers and to FAO. Furthermore, it finds the information much richer and more complete than the current forest assessments of most FAO member countries (both developing and developed countries). Ultimately, the usefulness of data is related to how the FRA end-users perceive its overall quality. Thus, the issue of data quality is critical for the future success of the NFA, especially as forest use varies according to local bio-physical characteristics and social, cultural and historical attributes of the user community, as well as the rules and norms observed by each user. Three methods to determine the quality of the data should be considered; namely the reliability, validity, and uncertainty of estimates. For this, the author proposed a number of recommendations as to i) define a minimum standard for interview methods; and ii) test the quality of information including test of data representativity, reliability and validity.

3.3.2 Introduction to knowledge reference for national forest assessments

Ylva Melin, from the Swedish University of Agricultural Sciences (SLU), Department of Forest Resource Management and Geomatics, delivered a presentation on Knowledge Reference for national forest assessments. This joint FAO-IUFRO initiative has the objective of improving worldwide access to information in several languages to state-of-the-art knowledge regarding a wide range of subjects with relevance to national forest assessments. The Knowledge Reference will be developed by: i) Lead authors for IUFRO network (each chapter will have one responsible author and several co-authors); ii) Representatives from countries for case studies; and iii) Institutions such as FAO, IUFRO and the Swedish University of Agricultural Sciences, Department of Forest Resource Management and Geomatics.

Publications from the Knowledge Reference project will be made through the Internet and will reside within the FAO website. It will also be part of the Forestry Information System (FORIS). The contents will be divided into chapters structured in three parts. The tentative structure of each is the following:

- **Part I: Introduction**
 - Rationale
 - Cases
- **Part II: Inventory**
 - Sampling design
 - Observation and Measurement
 - Permanent plots
 - Remote sensing
 - Implementation and Organization
- **Part III: Output**

- Information management and Data registration
- Biometry
- Scenarios and Analysis
- Policy influence

The internet publication will include a chapter on specifications comprising:

- Overview
- Lead author
- Text addressing the subject of the paper
- Annotated bibliography
- Annex: Contacts
- Annex: Proposed teaching materials
- Annex: Acronyms, terms, definitions and thesaurus

Seven persons have already shown interest in participating in the knowledge reference group. A planning meeting by lead authors is planned for March 2003 and other follow up meetings will be organized.

3.3.3 Biodiversity indicators in national forest inventories

Valerie Kapos, from the WCMC, delivered a presentation entitled: Biodiversity Indicators in National Forest Inventories. According to her, biodiversity indicators are required when:

- they are appropriate for use at the local scale, but can be readily aggregated at larger scales
- they can be generated from data collected by standard forest inventories
- they can build on international initiatives that have already developed such indicators (e.g. ITTO, Pan-European (or 'Helsinki') Process, Montreal Process, Tarapoto, Lepaterique, Near East, Dry Zone Asia and Dry Zone Africa)

The problems with the existing forest biodiversity indicators include poor definitions and difficulties in measuring, lack of relevance at national level (however not at forest management level) and, as indicated by a field evaluation of C&I undertaken by CIFOR, little relevance to forest management. There exist a number of indicator frameworks such as:

- 'Pressure-State-Response' (P-S-R) framework, developed by the OECD
- 'Driving Force - State - Response' (D-S-R) applied by the CSD (CSD 2001)
- 'Driver-Pressure-State-Impact-Response' (D-P-S-I-R) developed by EEA
- Plus others - Noss (1990), Stork *et al.* (1997)

Key biodiversity indicators include:

- Forest area by type, and successional stage relative to land area;
- Protected forest area by type, successional stage and protection category relative to total forest area;
- Degree of fragmentation of forest types -area by spatial integrity class;
- Rate of conversion of forest cover (by type) to other uses;
- Area and percentage of forests affected by anthropogenic and natural disturbance;
- Complexity and heterogeneity of forest structure, e.g. area by canopy height class, by canopy openness, dbh frequency distribution;
- Numbers of forest-dependent species;
- Conservation status of forest-dependent species

The presentation had the following conclusions:

- Future global forest assessments should incorporate a greater emphasis on biodiversity
- This could partly be achieved through use of indicators, appropriate for use at the local scale, but enabling information to be aggregated at larger scales
- Information collected at the local scale may be aggregated by summarizing data in categorical form, and presenting them in relation to forest area
- Such an approach would assist countries in contributing to C&I processes, as well as meeting their reporting obligations to international conventions
- There is a widespread need for capacity building in biodiversity assessment and analysis

3.3.4 Data entry and storage

Dan Altrell from FAO, NFA, introduced the database developed for data entry and storage.

The NFA produces considerable amount of data at different levels and for different purposes. A functional information system is fundamental to enter, store, process and manage the collected inventory data. Support to national forest inventories includes development of a national information system for forest and tree resources. The base for the information system will be a well-structured database, which will include various levels of internal relations. An undefined number of analyses can be carried out on the stored data. The system will permit storage of data from sequential surveys in order to detect and estimate changes and establish trends. The information system should therefore be a base for historic database, updated information and for changes and trend analysis. The system will enable reporting on global and national issues.

3.4 Conclusions

I. In relation to the forest and tree resources uses and management variables, information that NFA makes available, is of potentially great value both to national policy makers to FAO. It is also much richer and more complete than the current forest assessments of most FAO member countries, whether developing countries or not. It is thus recommended that:

- A minimum standard for interview and processing methods is defined;
- Interviewers are well trained in interview methods;
- Quality of information is tested and proven reliable and representative

II. In connection with biodiversity indicators, the NFA approach has the potential to provide valuable information. It is, however, recommended that:

- Future assessments incorporate a greater emphasis on biodiversity. This could be partly achieved through use of indicators, appropriate for use at the local scale, but enabling information to be aggregated at larger scales.
- Information collected at the local scale be aggregated by summarizing data in categorical form and presenting it in relation to forest area.
- Countries are enabled in contributing to C&I processes, as well as meeting their reporting obligations to international conventions.
- Capacity building in biodiversity assessment and analysis is assured by NFA projects.

III. The participants recognize the strong need for knowledge references in national forest assessments. The interest of scientists from the IUFRO network to contribute as lead authors or co-authors is encouraging. The participants in the workshop recommended that:

- case studies should include the current NFI projects;
- access is provided to resource materials on interviews

IV. In connection with follow-up activities, the participants:

- Considered that a working meeting on data analysis is necessary after completion of the ongoing projects. Such meeting should include decision makers from the countries.
- Recommended that an evaluation meeting is organized in the countries, at e.g. mid-term, to assess progress, adjust the approach where necessary and provide countries with feedback.
- Recommended that FAO considers, for new NFA projects in new countries, specific national information requirements and involvement of representatives in ongoing NFI efforts in other countries through e.g. study tours.
- Recommended the development of a manual for data processing and synthesis.

V. Meeting outputs:

- The proceedings of the meeting will be made as a working paper to be posted on NFA webpage.

4 Country projects

4.1 The Philippines

4.1.1 Background

The presently available information on extent, location, volume and condition of the Philippine forest resources was obtained in the 1980s. As a consequence, the data and information used to prepare plans and programmes on the management, development, protection and utilization of forest resources are obsolete. In addition, the information from the latest national forest inventory refers only to designated forest land, and only to the biophysical properties of the forest.

The second national forest inventory (NFI) was carried out 1979-1988, with the assistance of donor funding throughout this time. It was designed as a conventional national forest inventory, based on a large number of sample plots, backed up with full-cover aerial photo interpretation. The inventory covered the legally designated 'forest land', i.e. about 19.4% of the land area (FAO 2000). The inventory was designed mainly to support decisions related to the production of wood.

Two donor-assisted attempts have been made to update some of the national level information, using remote sensing data to map the land cover/land use for the entire country. In 1987/88, spot images were used to map the entire country, which provided more up to date land cover statistics compared to the NFI which had an average inventory about five years earlier. Unfortunately, the information was not compatible with the NFI and could not be used to establish trends. Since 1997, a project using Landsat images from recent years has produced another land cover map, presently covering about 80% of the country, mainly in the scale 1:100,000. Also this information showed to be incompatible with previous surveys, and reliable calculations of land use area changes can still not be made. Also, the precision and accuracy of area classifications is unknown for the two map sets.

Following a request by the Philippines for FAO support, a FRA expert travelled to the Philippines in 2002 to initiate a project for the pilot assessment of forest resources as part of the framework of FAO FRA Programme to support national forest resource assessments.

4.1.2 Project Design

The project adopts the systematic sampling design, using a grid of tracts that are established at each 15' longitude and 15' latitude. The coordinates of the southwest corner of the tracts correspond to the points located in the initial systematic plan.

A tract measures 1 km x 1 km. Each tract contains a group of four (4) field observation/sample plots. Each sample plot measures 20 m x 250 m. The basic lines of the sample plots constitute a square of 500 m whose center matches the center of the tract. The plots start at each corner of the 500m square. Data are collected through field works in these plots.

Three hundred and ninety five (395) tracts were initially identified to be established nationwide. It is expected that all the tracts will be visited in one year.

4.1.3 Planning

In May 2002, an FAO team of experts visited the Philippines as a follow-up to a project formulation mission. They met with the members of the FRA Steering Committee and FRA

National Coordinating Team and presented and discussed the proposed inventory design and data collection methodology as well as variables to be collected. The mission also updated Forest Management Bureau of The Philippines (FMB) on the status of the draft Letter of Agreement.

In September 2002, NCOs assisted, in collaboration with the Forestry Department of FAO, in reviewing and refining the FRA Field Manual and Field Forms. On the same occasion, NCOs conducted field-testing of the inventory sampling design and data collection methodology and determined the team composition of a field crew and the average man-days to inventory a tract.

NCOs contacts with regional authorities to introduce the FRA project:

- Memoranda to all DENR Regional Executive Directors informing them of the planned implementation of the NFA project.
- Letter to the Regional Secretary, DENR, Autonomous Region in Muslim Mindanao (ARMM) informing of the planned implementation of the FRA project.
- Letter to the Secretary of Interior and Local Government requesting to disseminate to concerned local government units (LGUs) officials the planned implementation of the NFA project, to facilitate coordination with private land owners when tracts fall in private lands.
- Disseminated to Regional Field Inventory Teams (RFITs) copies of the letter of the Director, Bureau of Local Government Supervision, DILG suggesting FMB to coordinate with concerned LGUs where the FRA project will be implemented.
- Drafted memorandum to all Regional Executive Directors requesting that RFITs be allowed to work full-time with the FRA project and be freed from other duties and responsibilities.

Preparation of field equipment, transport and information:

In September 2002 NCOs identified, in collaboration with the Forestry Department of FAO, surveying/measuring instruments needed to collect data. They drafted memorandum to all DENR Regional Executive Directors requesting to submit to FMB a list of available surveying instruments in the regions and contacted and made arrangements with identified dealers of surveying instruments.

Surveying instruments were purchased from dealers who submitted the lowest quotations and regional and provincial maps were purchased from NAMRIA.

In October 2002 NCOs prepared lists of tracts by region showing their respective location according to province, municipality and land use, and distributed to RFITs their respective surveying instruments, maps and list of tracts.

Nomination of field crew members was done already May 2002 by NCOs with drafted memorandum which was sent to all DENR Regional Executive Directors requesting to submit to FMB the names of two regional personnel with background in timber inventory.

4.1.4 Training

Training of field crews members (from 16 administrative regions) was done in October 2002 by NCOs in collaboration with the Forestry Department of FAO in the province of Laguna.

Human Resources Development Service offered technical assistance in the conduct of the NFA training. DENR field officers and the Director of Makiling Center for Mountain

Ecosystems were used to identify potential sites for field practice and for overall coordination of the training.

4.1.5 Fieldwork

Fieldwork started during November 2002. Teams constitute five to six members; two foresters and three to four locally hired labourers. Each team was accompanied by an NCO in the beginning of their work and by the end of the year, 73 tracts were accomplished, out of the 82 tracts programmed for the period. Teams who committed mistakes in filling out the Field Forms were still visited in the field and advised further.

4.1.6 Plans for data entry, processing and management

NCOs have purchased one Desktop Computer for data entry and processing work and employed on contractual basis a computer operator to manage data submitted by field team leaders. Data entry and processing work started in February 2003 with the assistance of Forestry Department of FAO.

There has also been a discussion with the Project Leader of Forestry Statistical Information System (FSIS), an ongoing project of FMB to develop information services on forest resources and products, regarding the possibilities of co-management of NFA data.

Information generated by field crews at sites, as well as aggregated findings, will be made public. FAO will assist in the organization and dissemination of information over the Internet.

4.2 Guatemala

4.2.1 Background

Guatemala, with a population of 12 millions, is located in Central America just south of Mexico and surrounded by the Pacific Ocean in the south, El Salvador, Honduras and Belize in the east and with a short strip facing the Caribbean Sea. Guatemala covers 108,889 Km² and is characterized by a diverse topography with flat lowlands in the north and in the south towards the Pacific coast, while the central-south is very mountainous leading to the country's varied climate and vegetation. About 25% of the country is covered by forest.

In November 2001, the Government of Guatemala requested the assistance of FAO to plan and implement their first national forest assessment with the objective to establish permanent sample plots systematically distributed through the whole country for the monitoring of national forest and tree resources as basis for national decision making relating to the forestry sector.

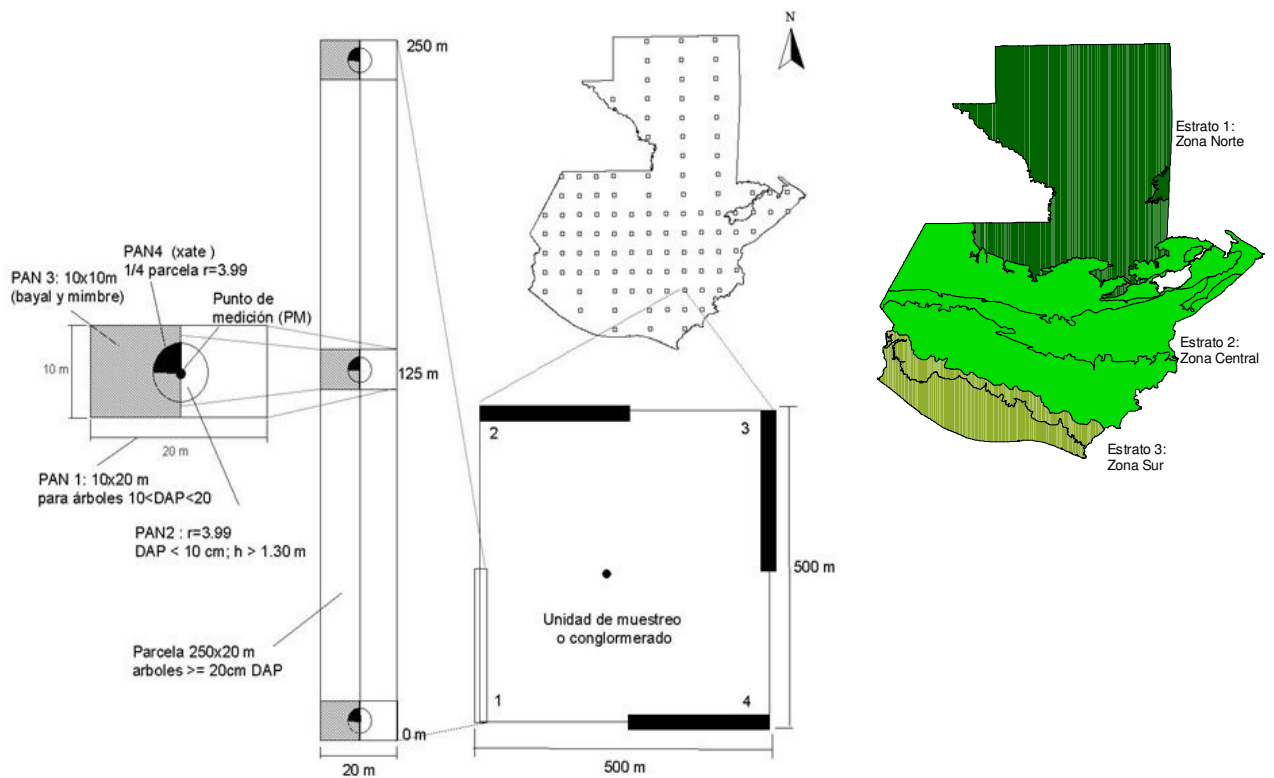


Figure 1: Tract, plot and subplot design.

4.2.2 Inventory Design

Guatemala adopted the FAO/FRA National Forest Assessment (NFA) methodology with some small modifications and additions to better meet national needs of information.

Guatemala with a very diverse topography and vegetation was divided into three strata according to national ecological zones (Figure 1). A northern stratum of relatively homogeneous lowland, a southern stratum of relatively homogeneous coastal plain and a central stratum of heterogeneous high mountain and valley areas.

108 tracts (1x1 km²) are systematically distributed at higher density in the heterogeneous central stratum and lower density in the northern and southern strata to optimize the precision in the national statistics.

In each tract, four sample plots (250x20 m²) are distributed and laid out in directions south-north, west-east, north-south and east-west according to the FAO/FRA standard NFA design (Figure 4.2.1). Some parameters are measured only in sub-plots to lower the work-load. The national design of the Guatemalan NFA includes two additional sub-plots to the FAO/FRA standard design; “PAN 3” and “PAN 4”. PAN 3 represents the left half of the sub-plot level 1 (PAN 1) and here bayal (flax, *linum usitatissimum*) and mimbre (twigs of *Salix* species used for basketry) are measured. PAN 4 represents the upper left quarter of the sub-plot level 2 (PAN 2) and here xate (leaves from *Chamaedorea* palm species) is measured.

4.2.3 Planning

- Field manual, forms, codes and Excel data base have been revised and edited
- Specific inventory methodology for coniferous forests has been elaborated. Special funds have been granted by PROCAFOR for this activity
- Objectives of forest plantations inventory have been prepared in coordination with INAB and CATIE National Office
- The NFI Project strategy document has been prepared to be presented for national forestry experts
- Preparations have been made to sign a National Inter-institutional LoA
- Preparations to finalize the field work, supervisions and field checking have been made

4.2.4 Training

The team leaders of the field crews and supervisors from INAB and CONAP and the university UVG were trained in the NFA methodology during a workshop held in Antigua in June 2002. The methodology was presented by the national NFA coordinator Carla Ramirez Zea and her assistant Rodrigo Rodas. During the workshop, two days were dedicated to field tests to practice and better understand the methodology.

During the fieldwork, regional technicians from the national forest institutions and universities have accompanied the field crews while carrying out the inventory as part of the training.

4.2.5 Workshops and seminars

- Workshop was held to introduce NFA methodology and planned activities.
- Awareness campaign was undertaken to inform forestry teachers and students in national universities.
- Seminars have been held to brief representatives from the forestry sector about the Guatemalan NFA objectives and activities.
- Fieldwork mid-term seminar was organized to discuss experiences from the fieldwork and plan the following activities.

4.2.6 Fieldwork

The fieldwork is divided amongst 6 field crews comprised of experienced technicians in forest inventory. By 15 January 2003:

- 47 sample sites have been completed (44%);
- 24 sample sites have been supervised by the Technical Unit;
- 1 sample site has been re-located and re-measured;
- 15 field reports have been reviewed

4.2.7 Plans for data entry/processing and management

- Data entry and storage: Primary inventory data from 15 sampling units are currently stored in a Microsoft Excel workbook specially developed for the Guatemalan NFA

inventory data. Later this year data will be entered in a Microsoft Access database application developed by FAO/FRA in Rome.

- Data analysis and reporting: No analysis of the inventory data has been made so far except for quality control. Data analysis will be conducted through the FAO/FRA database application and standard reports will be prepared through the same application.

4.2.8 Follow on activities

- Information management;
- Options for policy influences, additional inventories, etc.;
- Contributions to next global forest resources assessment (pilot assessments)

4.3 Cameroon

4.3.1 Background

The Republic of Cameroon, located in western Africa, is bounded on the north by Lake Chad; on the east by Chad and the Central African Republic; on the south by the Republic of the Congo, Gabon, and Equatorial Guinea; and on the west by the Bight of Biafra (an arm of the Atlantic Ocean) and Nigeria (see maps). It covers an area of 475 442 km² situated between latitudes 2° and 13° N (about 1 200 km) and longitudes 8° 30' and 16° 10' E. The altitude is for the most part between 200 and 800 m above sea-level. Cameroon has a tropical climate, humid in the south but dryer to the north (Figure 2). Rainfall ranges from about 4 000 mm at the coast to about 400 mm in the north-east. The average temperature in the south is 25° C, while on the central plateau it is 21° C and in the north 32° C.

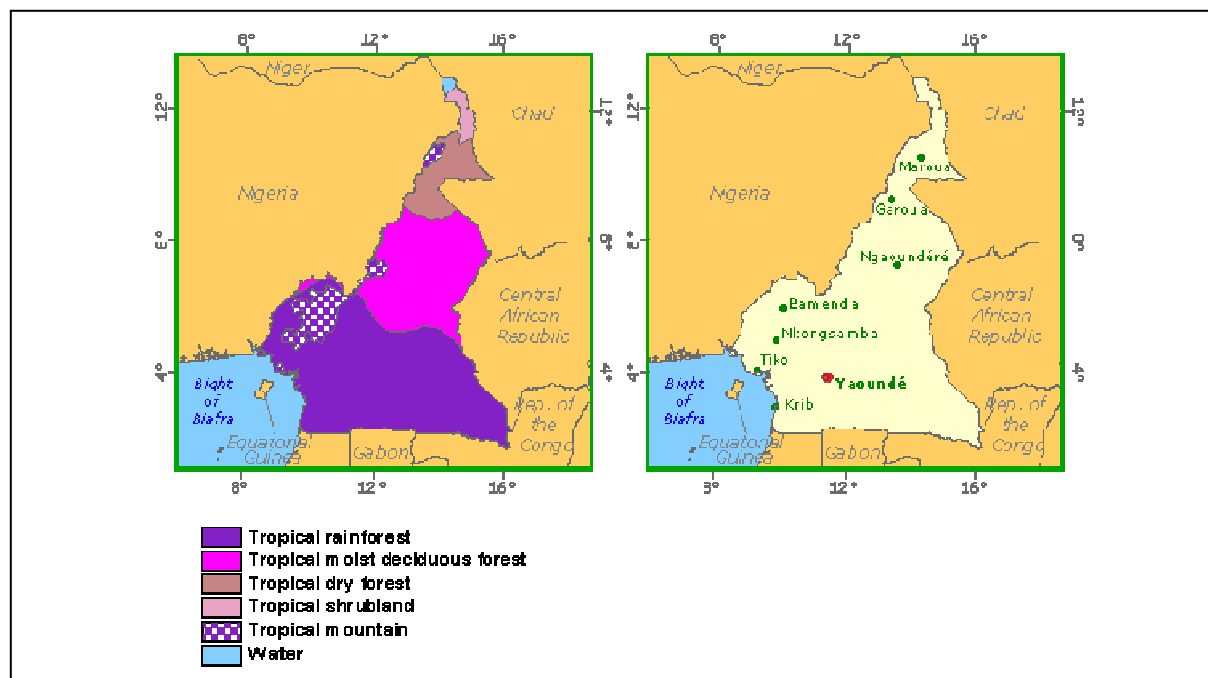


Figure 2: Maps of Cameroon and global ecological zones (Source: FAO, 2000)

Knowledge on forest resources is relatively low in Cameroon. National statistics on forest resources produced for the FRA 2000 were mostly based on national expert estimates, while actual forest inventories only cover part of the productive domain. Existing information is mostly available for the southern region, which constitutes approximately 50% of the national territory. However the data is generally obsolete and dates back to the eighties (1984-1988).

The forest inventory in the South was prepared with assistance of Canada and was based on aerial photographs and systematic field sampling. The sample design was based on measurement sites of 1 km² in which 12 plots (20 m x 250 m) were laid out in parallel strips of about 300 m distance. Along the strips plots were continuous.

Many small scale inventories for timber exploitation and forest management were carried out using different methodologies. This makes comparison and use by the forest services rather difficult. For management inventory, sampling is commonly based on 20 m x 250 m successive plots along parallel strips 2 km apart. NGOs are reported to use different designs. For exploitation purpose, the surveys are exhaustive: all trees above certain diameters at breast height are measured.

The Ministry of Environment and Forestry (MINEF), as well as the FAO project TCP/CMR/0066 entitled "*Bilan des expériences et modèles d'aménagement pour une gestion durable des forêts*" identified the urgent need of an updated and national forest inventory. The necessity of harmonizing inventory methods and country capacity building in planning and implementation of national forest resources assessment was also stressed.

In December 2001, the MINEF requested technical support from FAO to plan and finance a national forest inventory. A Letter of Agreement between FAO and the Ministry of Environment and Forestry (MINEF) was signed in July 2002, with the main following objectives:

- To plan and implement the first phase of a national forest assessment;
- To establish a monitoring system of forest and tree resources in Cameroon;
- To train the national team involved in the national forest assessment and in forest information management.

4.3.2 Inventory Design

Cameroon adopted the FAO/FRA National Forest Assessment (NFA) approach. Slight modifications, adaptations and additions were incorporated in the methodology to better serve national needs and specifications.

A systematic and stratified sampling design was adopted. Two strata North/South were defined, based on the Global Ecological Zones Map 2000 (FAO 2000) (Figure 2), and on the Phyto-geographic Map of Cameroon (Letouzey 1985). Two grids with distinct spacing were applied to select the sample locations. Sampling intensity is higher in the southern part of the country, where most of the forest resources are concentrated. Lower sampling intensity was applied in northern and mountainous parts of the country (Figure 3).

239 tracts were selected. The sampling distribution per stratum is given in the Table 2: and **Error! Reference source not found.** 3. Tract configuration follows FRA/NFA standard approach.

Table 2: Tract intensity by stratum

Stratum	Tract number	Distance between tract location (minutes)
1 (South)	167	30' (latitude) X 15' (longitude)
2 (North)	69	30' (latitude) X 30' (longitude)
TOTAL	236	

The variables inventoried are nearly the same as the ones described in the standard FRA FAO approach. In order to fulfil national needs and to fit with common national definitions and standards, a few variables were included or options modified, in particular:

- Variables on wildlife were integrated, since fauna is of major interest in Cameroon. More than a proper survey of animal population, these variables are observations on the presence of mammal species in the tract.
- Diameter below the first branch in the northern part of the country is measured, in order to establish volume functions in that stratum.
- The forest-type/land use classification was established to subdivide global classes into classes matching with national classification (based on Letouzey 1985).

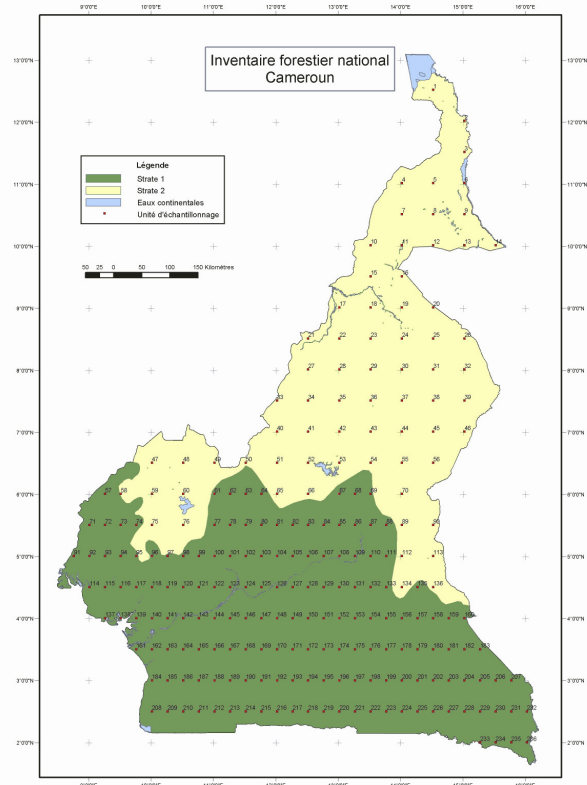


Figure 3: Sampling intensity applied in NFA in Cameroon.

4.3.3 Planning

Two FAO missions in the country were organized to assist the national team in the planning of the project.

A first FAO mission in November 2001 aimed at establishing contacts with the national forestry services and defining national priorities in the area of forest inventory; taking stock of the institutional set-up and national capacity at central and regional levels to plan and carry out forest surveys; defining a national counterpart with whom FRA would work for the implementation of an eventual national forest inventory project; and presenting and discussing with national experts the national forest inventory methodology designed by FRA.

A second FAO mission, in September and October 2002, was carried out to assist MINEF in establishing a technical unit of the project; refine the technical aspects of the project

(sampling design, fieldwork organization, data collection method, variables, budget); and to assist the technical unit in planning the fieldwork and undertaking the training.

The field manual, the field forms as well as the team composition are ready. The technical unit is preparing a folder for each tract, containing the field forms, the maps of the area and the coordinates of the starting point of the tracts. The work plan for the project was revised several times, due to many delays before starting the field activities caused mainly by heavy administrative procedure.

The members of the technical unit and a national FAO consultant for the project were designated by MINEF. Letters have also been prepared and sent to different ministries and provinces and department delegates to inform them about the NFA activities.

4.3.4 Training

The training was implemented in two phases:

- Training of the members of the technical unit on NFA methodology was carried out in October 2002 by a FAO expert. Practical exercises in the field were then carried out in one of the sample tracts close to Yaoundé.
- Training of 30 persons on NFA methodology, field measurements and interview methods was made by the technical unit members. This started at the end of December 2002 and is still ongoing. The training includes theoretical and practical activities. Team leaders and assistants to the team leaders will be selected among the trained people.

4.3.5 Fieldwork

The field work should start after the training activities, and depends on approval by the Minister of MINEF, of budget for national contribution and field personnel. Field work will be implemented progressively, beginning with the provinces close to Yaoundé.

4.3.6 Plans for data entry/processing and management

- Data entry and storage: Later this year, entry of the collected field data will be carried out through an MS Access database application developed by FAO/FRA in Rome. An FAO mission to the country is planned to assist the technical unit in installing the application and train the technicians in the data entry process.
- Data analysis and reporting: No analysis of the inventory data has been made so far. Data analysis will be conducted through the FAO/FRA database application and standard reports should be prepared through the same application.

4.3.7 Follow on activities

- Information management;
- Options for policy influences, additional inventories, etc.;
- Contributions to next global forest resources assessment (pilot assessments)

4.4 Conclusions and recommendations

I. Progress in project implementation of the first phase of the ongoing NFA projects:

- Findings:
 - Guatemala and Philippines made appropriate progress in the implementation of the first phase of their projects.
 - Cameroon had experienced considerable delays to start the field work, due to slow and heavy administrative procedure.

- Recommendations:
 - Preparations of inputs for the second phase of the projects should be initiated to avoid gap between the two phases.
 - FAO is requested to intervene with the Minister of Environment and Forests in Cameroon to speed up implementation of the NFA project.
 - The meeting on Global information framework for monitoring forest, land use and the environment could consider Cameroon as a pilot study.

II. Data entry and storage:

- Findings:
 - The database application is needed by the countries to start entry and storage of their data.
 - The application of data entry and storage designed by FRA aims at developing a standardized database that facilitates the analysis of the national data and exchange of experiences between countries.

- Recommendations:
 - The application of data entry and storage should be flexible enough to be adapted to national needs, but at the same time be useful at the global level.
 - FAO should provide the support to national staff on the use of the application for data entry and storage.

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