Forestry Department

Food and Agriculture Organization of the United Nations

National Forest Monitoring and Assessment

Proceedings from Regional Workshop:
(FAO Project GCP/GLO/194/MUL)

"Promoting and Strengthening Multi-purpose National Forest Inventory System in the Asia Pacific Region in Connection with Climate Change"

Seoul, Republic of Korea

23-25 February 2010

National Forest Monitoring and Assessment

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NFMA Working Paper No. 45 – Rome, 2010

National Forest Monitoring and Assessment

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 an activity to provide support to national forest monitoring and assessment (NFMA). The support to NFMA includes developing a harmonized approach to national forest monitoring and assessments (NFMA), information management, reporting and support to policy impact analysis for national level decision-making.

The purpose of the NFMA 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 support to National Forest Monitoring and Assessment is organized under the Forest Assessment, Management and Conservation (FOM) at FAO.

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www.fao.org/forestry/site/nfma

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23-25 Feb 2010, Seoul, Korea, FAO/KFS/KFRI

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1. Executive Summary

This regional workshop was held from 23 to 25 February 2010, at the Korea Forest Research Institute (KFRI) in Seoul, organised by FAO within the framework of its Support to National Forest Monitoring and Assessment (NFMA) programme, and hosted by the Korea Forest Service (KFS) and the Korea Forest Research Institute. The workshop aimed to: a) facilitate better understanding among the participants of the role of multipurpose National Forest Inventory (NFI) for coherent policies, strategies and integrated programs including climate change, REDD etc., b) deliberate a general action plan for promoting and strengthening the NFI activities in this region, and; c) identify the funding needs for NFI implementation in partner countries for consideration by donors. The event targeted, in particular, the directors responsible for NFI and REDD activities in the Asia-Pacific Region, experts on Climate Change, REDD and NFI. 13 countries participated.

The workshop included presentations on: a) international processes and national policies related to climate change and REDD; b) the status of actual NFI policies designed to mitigate climate change by participating countries, and; c) the methodological background and actual NFI programmes. The workshop stimulated discussions among participants through plenary and working groups sessions to produce recommendations on a strategy and an immediate action plan for NFI implementation in this region. The workshop was also comprised of a field demonstration of the Korean NFI field measurements at their permanent sample plots.

All the Asia-Pacific country representatives stressed that multipurpose NFI systems are essential for integrated and comprehensive national policy-making processes and also for reporting to international processes, including reporting on carbon emissions from deforestation and forest degradation. Currently, most Asia-Pacific countries are using defaults factors of GPG of IPCC for carbon estimates and biomass and the participating countries stated that they are lacking technical skills, knowledge and capacities in all dimensions of Forest Greenhouse Gas (GHG) reporting. They expressed their goal to report at higher tier levels (2-3) as soon as possible, but they pointed out that they lack resources for NFI implementation, as a result of weak political will and support.

In order to strengthen the institutional capacities related to GHG reporting, all participating countries suggested a phased programme to develop and sustain their national institutionalized NFI systems with an annual, regular financial support of about one million dollars per country. The meeting stressed the importance that such support be provided to all partner countries as soon as possible and that a sustained flow of resources, technologies and methodologies be ensured for timely and quality implementation of regular and periodic NFIs.

The participating countries expressed the difficulty in satisfying increasing demands for forest information and the challenges in conforming to a variety of suggested methodologies by different donors and conventions, given their very limited institutional capacities. The workshop therefore resolved that a working group for NFI, under the Asia-Pacific Forestry Commission, be established to coordinate, in particular, with donors and conventions to support the development of a harmonised, common and basic framework at both the regional and international level for the development and implementation of NFI systems. The workshop resolved that FAO should take the lead on the establishment of such a working group on NFI, based on its rich experience of more than six decades of supporting countries in developing their NFI/NFMA.

2. Introduction

The land area of Asia and the Pacific region occupies about 19% of the world. In addition, forests and other wooded land together cover about one third of Asia and the Pacific region. Excluding the Russian Federation, the forest area in 2005 was estimated at 734 million hectares, accounting for about 19% of global forest area. The region as a whole experienced a net increase in forest area of about 633,000 ha annually during 2000-2005 due largely to an increase of more than 4 million ha per year in China.

However, most other countries experienced a net loss. In particular, Southeast Asia experienced the largest decline in forest areas, with an annual net loss of forests of more than 2.8 million ha per year. The greatest forest loss occurred in Indonesia, almost 1.9 million ha per year, followed by Myanmar, Cambodia, the Philippines, Malaysia, PNG and DPR Korea.

During the first 5 years of the 21st century, several countries lost forests at rates exceeding 1.5% per year (Indonesia, Cambodia, Philippines, DPR Korea, Pakistan, Solomon Islands, Sri Lanka), which are among the highest rates of loss in the world. The net loss of forest area actually accelerated in the Southeast Asia region.

We can think about the possible strategies to reduce deforestation and degradation in developing countries as follows.

- Strengthening forest policies
- Providing adequate financial resources
- Supporting institutional and technical capacity-building
- Strengthening the information and databases on forest and tree resources etc.

What is common to all these strategies? It may be the need for better and regular information both for developing strategies, planning, implementation and monitoring. Therefore, National Forest Inventory (NFI) is one of the ways to satisfy this information need.

The importance of NFI has gained widespread attention in the international forest community. In December 2007, UNFCCC COP-13 in Bali confirmed their commitment to address the global climate challenge through the *Bali Action Plan* and the *Bali Road Map* for an agreement to be completed at UNFCCC COP-15. One of the important outcomes from Copenhagen COP 15 last year is the decision on methodological outcomes for REDD+. Parties have to use most recent IPCC guidance and guidelines for estimating forest-related GHG emissions. All countries in a position to do so are encouraged to support and strengthen the capacities of developing countries in collecting, accessing and interpreting data and in using the IPCC guidelines.

In response to the COP-13 decision, requests from countries, and encouragement from donors, FAO, UNDP and UNEP have developed a collaborative REDD programme in which forest monitoring and assessment are major activities.

Until now, steady progress has been made in strengthening the capability of countries to carry out the NFI, but it has been hindered by a shortage of resources. The estimated cost of carrying out a one-time national forest inventory varies from US$500,000 to US$3 million, depending on the country.

The Regional Workshop "*Promoting and Strengthening Multi-purpose National Forest Inventory System in the Asia Pacific Region in Connection with Climate Change*" was planned to review the current situation in deforestation and degradation, and status of NFI policy to mitigate climate change in Asia and the Pacific region, and then discuss the future strategy for the NFI implementation in this region.

This workshop was held from 23 to 25 February 2010 in Seoul, hosted by the Korea Forest Service (KFS) and Korea Forest Research Institute (KFRI), Republic of Korea and was organized by FAO in collaboration with related international organizations (UNFCCC, IUFRO, ITTO, IPCC), and funded by the FAO Project GCP/GLO/194/MUL (baby 3), kindly supported by the Government of Korea.

The main objectives of the workshop were: a) to create consensus around NFI as the main tool for providing the basic information for national policy-making system and for reporting to the international processes including on carbon emissions from deforestation and degradation and; b) to propose a common strategy for supporting the earliest implementation of NFI systems in the partner countries with emphasis on the mobilization of financial resources for this program. The three main parties of the strategy on NFI in the Asia Pacific region were the participating countries, represented donors and FAO.

The event targeted, in particular, the directors responsible for NFI and REDD activities in the Asia-Pacific Region, experts on Climate Change, REDD and NFI, as well as the major international organisations and donor representatives. Thirteen Asia-Pacific countries were represented at the workshop: China, India, Laos, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Solomon Islands, Thailand and Vietnam. The international donor community was represented by JICA (Japan) and KOICA (Republic of Korea), and international organizations were represented by ITTO.
Also, key note speakers were participated, including the Director of French National Forest Inventory and a representative of the US Forest Service.

3. Synopsis of Workshop Sessions

3.1. Opening Session

Dr. Junghwan Park, Director, Research Cooperation Division in the KFRI, opened and chaired the opening session of the Workshop.

Mr. Jose Antonio Prado, Director, Forest Assessment, Management and Conservation Division, FAO, welcomed all participants and reminded them that forests are today in the very center of the international discussion on climate change. He stressed that countries participating in COP 15 of the UN Convention on Climate Change in Copenhagen recognized the crucial role of forests in addressing climate change and made a decision on methodological guidance for REDD+ making a call not only to identify the main causes of deforestation and forest degradation, but also to establish national monitoring systems. He introduced UN-REDD program to support countries in their preparations for the mechanisms that are being discussed under the UNFCCC. Finally, he mentioned that in this context, FAO is also strengthening and modernizing its traditional National
Forest Monitoring and Assessment program to respond the IPCC requirements for REDD+.

Mr. Snail Lee, Deputy Minister, Korea Forest Service, expressed his sincere appreciation to all distinguished participants for attending the meeting. He highlighted that "forest sector stands nearly 18% out of the global greenhouse emissions according to the IPCC 4TH report and this trend tells us that which direction the forest sector is to set up and enforce the policy implication for stabilization of climate system." He also introduced that Mr. Ban, Gig-Moon, the UN secretary emphasized the climate change is impossible to be coped without the global forest conservation at the inaugural meeting of UN REDD Program in September 2008. Finally, he hoped that we would come to conclusion in drawing the basic set-out plan for the forest sector in the Asia Pacific region where deforestation and forest degradation is severe in order to practically perform the leading role that coped with climate change of the earth through the workshop.

Prof. Donkoo Lee, President of IUFRO, warmly welcomed everyone to the workshop and stressed that we must evaluate the ongoing effects and implications of climate change on forests and tailor our research, policies. and practices accordingly in order to plan for and manage healthy and productive forests. He also mentioned that in relation with this, National Forest Inventory System is one of the strategies that will provide relevant information for creating and implementing national policy associated to climate change, and through this, we can determine the level of capacity building that needs to be improved in one country. Finally, he hoped that this workshop would serve as a successful venue for the active for the active exchange of scientific and technical information among counties in the region and would help seek for better partnerships and collaboration.

Mr. Hyungkwang Kim, Senior Forestry Officer, Forest Assessment, Management and Conservation Division, FAO, introduced the objectives and tentative program of the workshop as well as the administrative arrangements for all participants. He also presented invited experts, and the representatives from JICA, ITTO and partner countries to all participants. Finally, he encouraged all attendants' active participation during the whole workshop period.

3.2. Session 1 : Climate Change and REDD

Climate Change and REDD+

Mr. Jose Antonio Prado presented "Overview of the REDD+". He stressed that the IPCC estimated that more than 17.4 % of greenhouse gas emissions come from the forestry sector, mainly from deforestation and forest degradation. The emissions from DD are higher than those from Agriculture and Transport. Keeping forests intact and well managed is considered a rapid and cost effective way to reduce emissions. He also introduced that REDD(+) is proposed as an instrument under UNFCCC to provide financial incentives to developing countries to reduce greenhouse gas emissions from forests and increase greenhouse gas removals from the atmosphere through reduction of deforestation and forest degradation (REDD), and conservation, sustainable management of forests and enhancement of forest carbon stocks that correspond to the "plus" component. He briefed background of REDD+, outcomes of COP15 and significant issues to notes.

Climate Change Policy of Korean Government

Mr. Seoungjoo Shin, briefed the Green Growth policy of Korean Government (Creating Opportunities through Green Growth). He introduced the task of Presidential Committee on Green Growth; the importance of green growth policy in Korean government (Green Growth, Turning Crises into Opportunities); real actions of those policies (Legal framework, Green budget, 5-year national green growth strategic plan); and National Strategy for Geen Growth (Low carbon society, Climate change adaptation actions, Fostering green industries and green forest policy). He also mentioned recent progress in Korea (Setting National Mid-term Reductions Goal by 2020 – Cutting GHG Emissions by 30%, Launch of East Asia Climate Partnership program). Finally, he concluded Challenges ahead (Public and corporate support, Emission trading & carbon tax).

UN-REDD Program

Mr. Jose Antonio Prado mentioned the UN Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) was established in 2008 by FAO, UNDP and UNEP within the framework of ONE-UN in response to the Bali Action Plan 2007. He presented the Objective of this program; the Key Principles (coordinate response, contribution to UNFCCC process, country-driven REDD programs, and MRV- Measurement, Reporting & Verification); and Funding & Governance (MDTF: $75m, Donors: Norway, Spain, Denmark), Policy board: 3 times a year, approve resources allocation). He also introduced two levels support of this program: first, international level (develop concepts & methodologies in MRV, build consensus about the importance of REDD in post 2012 agreement): second, national level (Provide technical support to develop the National Joint Programme and the national MRV system). He briefed REDD monitoring, principles for MRV work and REDD+ in a UNFCCC/IPCC context. Finally, he concluded the UN-REDD quick start countries.

Climate Change Policy of Korea Forest Service

Mr. Youngkyoon Yoon introduced the strategies of Korea Forest Service to address Climate Change. He mentioned an outline of Korean Forest and Forest Policy Implementation (1^{st}~4^{th} National Forests Plan). He also introduced the Climate Change Response in the Forest Sector followed by a comprehensive plan for combating climate change of South Korean Government on a voluntary basis (G7 Strategies in forest sector: Green up, cycle, trading, care, governance, inventory, partnership).

Discussion

- Forests are major carbon sinks and REDD+ is a proposed instrument to provide financial incentives to developing countries to reduce carbon emissions from deforestation and degradation of forests (D&D)
- Multipurpose NFIs are needed for integrated and comprehensive national policy processes
- Monitoring of forestry resources in a MRV system should be based on Multi-source NFI using both remote sensing techniques and field based data collection (measurements, observations and interviews with users of forestry resources)
- REDD incentives require MRV systems to derive verifiable evidence for carbon accounting and in order to formulate policies to achieve REDD. MRV systems must also address the underlying drivers of D&D
- FAO is responsible for MRV (NFIs) within the UN-REDD programme
- Different country situations will require different actions for REDD, and these need to be identified as soon as possible in order not to lose momentum, as there now are many potential funding options and opportunities for NFIs to be expected (COP15). REDD readiness is necessary to be able to absorb the financial openings, as funding might be response driven
- The REDD process is comprising of multiple stakeholders and is attracting many actors, why coordination of efforts along with a participatory process is central, as is transparency during the whole process. It is important to collaborate and create partnerships to share knowledge and to build on existing experiences
- REDD is a complex process and a stepwise implementation is recommended
- An IPCC guideline is to be followed for GHG reporting. However, Ref. levels and parameter inclusion for MRV are still not defined
- The REDD instrument is likely to include SFM and conservation along with decreased D&D
- A low carbon society should be based on “green” growth using both Regulations and Incentives as policy tools (Korean initiative)

Workshop on Promoting National Forest Inventory System
in the Asia Pacific Region in Connection with Climate Change

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3.3. Session 2-1 : National Forest Inventory Program in connection with climate change

Why is NFI important to mitigate climate change?

Mr. Claude Vidal briefed the use of French NFI data to simulate the impacts of climate change on French forest productivity, to develop models for potential area distribution of French tree species, and to study the long-term changes of French forest vegetation. He specifically explained the conclusions of long-term simulation of forest potential production (intensive management scenario and the most fertile sites are the most sensitive to climate change, positive response to the climate change, broadleaves take more advantage of climate change than conifers).

FAO NFMA program and approach
- Evolution of FAO NFMA

Mr. Dan Altrell introduced the FAO NFMA Objective (Strengthen national capacities for long term forest monitoring and assessment), Main consideration (Connect NFI to National Policy Processes), Working areas (Development of cost effective and pragmatic NFMA methods and tools, Technical support to countries' NFI), NFMA Evolution Process, and the present state of NFMA / ILUA Country projects.

FAO NFMA program and approach
- FAO - Finnish program and support in the Asia countries

Mr. Mikko Leppanen presented the FAO-Finnish program (Innovation in FAO NFMA- support to Asian countries). He mentioned the background (4 year program for FAO HQ and 5 pilot countries through innovative methods, tools and technology), resources (US$ 20million), methodological development (REDD MRV, NFMA, National Forest Information Systems), and support to NAFORMA. He also introduced the sampling design for NAFORMA in Tanzania.

FAO NFMA program and approach
- Methodology and Cost Analysis of FAO NFMA

Ms. Anne Branthomme outlined the FAO NFMA Methodology and Cost analysis. First, she mentioned technical and methodological developing activities (core guiding principles, an evolving process to meet changing needs toward broader and more integrated concept, methodological overview- field survey and remote sensing, production of guidelines and training materials, production of databases and web-based dissemination, ILUA). Second, she also explained the analysis of NFMA cost and time (NFMA actual or estimated budget /country, breakdown of costs per selected activity, breakdown of time per activity).

Discussion

- Feasible timeframe of Tanzania project concerned about complex nature of REDD+ and limited budgets were discussed. (4~5 years)
- Estimating belowground biomass requires more research to develop appropriate models in view of diverse tree species.
- The role of Lidar technologies for multi-resource inventory would be a useful as an additional tool, though it would cost high. Its methods will need to be tested for statistically reliable data.

- The analyzed unit cost of NFMA projects included all survey components from planning to reporting, though its amount varies among countries. Most of the costs occurred during access and preparations in the field.
- Given the cost USD 5 million for one country, inventory cost is too high. (marginal)
- It was suggested that website data could be helpful for further information and e-consultation would be useful on creating information.
- It was mentioned that FAO publications were available at its website, including data and studies on NFI and climate change.

3.4. Session 2-2 : National Forest Inventory program in connection with climate change

Long history - USA NFI program

Mr. John Coulston briefed the United States NFI Program. First, he introduced the Overview of the US Forest Service Forest Inventory and Analysis (FIA) program (Basic sampling scheme, Variables collected, Use of remotely sensed data, Forest survey design tools). He explained a history of FIA since 1928 (9 National Assessment of Forests; 1953, 1963, 1970, 1977, 1987, 1992, 1997, 2002, 2007) Second, he mentioned an Use of Forest Inventory and Analysis data for planning and policy (US Greenhouse Gas Inventory, Forecasting).

Strengthening MAR : FAO - Japan program

Pacific Mr. Masahiro Otsuka introduced an Outcomes and perspectives of the MAR-SFM Project. He briefed project outline (Period: May 2006 – December 2010, Funded by Government of Japan, Asia- region, Objective: support harmonized forest monitoring, assessment and reporting (MAR), Global activities: guidelines/frameworks, National activities: networks, consultations, training, pilot testing), activities (regional, subregional, national), products of 2009. Finally, he explained Considerations/Lessons (project scope, budget size, flexibility in activities).

New emerging sector : Korea NFI program

Mr. Sungho Kim presented experiences of Korea National Forest Inventory. He introduced the outline of National Forest Plan, Fore4sts of Korea and History of Korean NFI. He specifically mentioned the 5th NFI (2006~2010) which is big turning point moving from periodic to annual Inventory System (core challenges, sampling design; 4000 plots, ground plot configuration, plot measurements & variables, forest type maps). Finally, he concluded with NFI results & issues (Cost-effective sampling design, Quality Assurance/Quality Control (QA/QC), Database management and analysis system, Human resources training).

IPCC Good Practice Guideline for LULUCF and Carbon estimations in Korea NFI program

Mr. Kyunghwak Lee outlined IPCC GPG for LULUCF and Carbon estimations in Korea. First, he mentioned GHG Inventory under UNFCCC (Under the KP- GHG Measuring & Reporting, In Post-2012 Climate Regime- MRV GHG inventory). Second, he mentioned IPCC GPG for LULUCF (Definition, Contents: 6 land use categories, 5 carbon pools, 3 tiers for activity data & emission factors, Approaches for estimating land-use area and area changes, Cross-Cutting Issues). Third, he introduced GHG Inventory System in Korea (Carbon Flux in Forests (2005) based on 1996 IPCC Guideline- LUCF in Korea: Net sinks, The GHG inventory system consists of 4 parts including activity data, emission/removal factors, and verification, Development of emission/removal factors (12 major tree species, 150 plots, & 5 carbon pools), Challenging Issues).

Introduction to ITTO REDDES program

Mr. Hwanok Ma briefed ITTO REDDES program. He mentioned 10 Demonstration Projects of ITTO REDDES program (2009: 3.9million USD), ITTO Thematic Programme on REDDES, A Public-Private Partnership to promote REDD, DONORS to ITTO, and Carbon financing.

Discussion

- It was discussed why the results of inventories in South Korea produce very different figures: e.g. the two official figures on the mean volumes have 20% gap. There are difficulties in calculating the inventory results of the 4000 plots
- Uncertainty levels of inventories especially in the developing countries and UNFCCC reporting requirements/acceptable error levels were discussed, emphasising the difficulties and expectations on realistic target levels.
- Satellite image resolution requirements are country specific. In USFS Landsat is appropriate, but in a country like South Korea, higher resolution is needed where there are many very land cover types and forest classes and the land use patterns are very detailed.
- USFS FIA has produced many interesting analysis on e.g. development of growing stock according to IPCC scenarios, which could be applicable in other countries, too
- Landsat TM images are used in the USA FIA system to provide local level estimated with K-NN methodology, it is a good example on integration of RS to field inventories.
- Comparison was made to FAO FRA reporting every 5th year, difficulties in providing reliable data for FRA and on the other hand reliable information from national forest inventories
- USFS has developed many tools and methods for NFI, which could be utilised in developing countries. E.g. tool for inventory design.
- Korea is changing the inventory system into a panel approach which will help in providing annual updated reporting on GHG
- GHG reporting is a very challenging task, if the changes between categories are measured it means 6 x 6 classes.
- It was discussed on uncertainties of different pools of the GHG inventories, better to concentrate on essential i.e. above ground biomass, of which the change monitoring is more applicable.
- More emphasis must be put on Quality Assurance & Quality Control systems in order to produce reliable data.

3.5. Session 3-1: Idealism or Reality? – A Status of NFI policy to mitigate climate change in partner countries

Current situation of Deforestation in the Asia Pacific region

Mr. Hyungkwang Kim presented the current situation of deforestation in the Asia Pacific region. First, he mentioned an outline of the world's forests and annual net change in forest area by continent between 1990 and 2005. The African forest land was decreasing the fastest in the world (2000~2005: -0.62%). Next, he introduced a deforestation situation of the Asia–Pacific region. The Asian forest land was increasing from 2000 to 2005 (0.18%), however, Southeast Asian forest was rapidly decreasing during the same period (-1.0%). Especially, during the first 5 years of the 21C, several countries lost more than 1.5% annually; it is the highest rate in the world. Therefore, he stressed we need a long-term strategy to prevent the deforestation in this region.

Country Presentations

Participants from 6 partner countries reported "A Status of NFI policy to mitigate climate change" in their countries. Each presentation consisted of 3 parts which were Current Situation of Deforestation and Degradation, Strategy to reduce Deforestation and Degradation, Brief on National Forest Inventory, and Suggestions for promoting and strengthening NFI System.
The following was the title and order of presentation.
NFI experiences in Philippines
Availability of financial resources for NFI in Malaysia
Importance of NFI in the policy-making system of Myanmar
Reporting systems in Nepal
NFI and Forest management in Thailand
Government organization for NFI in Pakistan

Discussion

- Forest budget differs greatly from each country in terms of forest land size.
- Measuring trees in high mountain areas (Nepal). Need for permanent plot for assessing changes. Need to revise the sampling design to make in representative. Divided to ecological units. Need to concentrate where they are the forests.
- Forest area in some countries is a big difference between official statistics and this presentation.
- It was discussed internationally accepted sample density design.

3.6. Session 3-2: Idealism or Reality? – A Status of NFI policy to mitigate climate change in partner countries

Review of NFI in Asia and Pacific region in context of UNFCCC

Mr. Kailash Govil presented Emerging Dimensions of Demand and Supply of Information from National Forest Inventories in context of Climate Change and UNFCCC. First, he mentioned Emerging Scenario and Key Messages on forest information. Second, he explained Copenhagen 2009 Accord including MRV and New timber procurement standard. Third, he mentioned Estimating Carbon Stock Changes. He stressed only 13 countries of the world used the Tier 3 method, but not completely on all pools. Fourth, he introduced Variablity in Sampling Design in Asian NFI.

Country Presentations

Participants from 7 partner countries reported "A Status of NFI policy to mitigate climate change" in their countries. Each presentation consisted of 3 parts which were Current Situation of Deforestation and Degradation, Strategy to reduce Deforestation and Degradation, Brief on National Forest Inventory, and Suggestions for promoting and strengthening NFI System.
The following was the title and order of presentation.

Quality control of NFI in China
Extent of technical expertise in Mongolia
Relationship between National development and NFI in Laos
Strategy for NFI in Vietnam
Integration of NFI and MRV in PNG
Necessity of NFI in Solomon Islands
Carbon estimations in India.

Discussion

- Increasing information demand from national as well as international society
- Timber procurement procedures changed to include social criteria
- Lack of forest budget, especially for NFI
- Need to strengthen national forestry policies
- How to increase tier level (from tier 1 to tier 3) in NFIs?
- Information generation systems: different solutions for different levels- local, regional, national
- Precision requirements not specified internationally -
- Important to invest in QC/QA to minimize bias -at all levels, for all systems, etc.
- Need to generate guidelines on NFI QC/QA
- Whips and carrots: Legal measures and payments for environmental services
- Country objectives: Multipurpose – Narrow
- Country constraints: Lack of capacities- financial, human, knowledge, political priorities
- Cost sharing –sector collaboration
- Definition of inside and outside forest
- Precision of sampling
- How to correct errors in data
- Need for research
- Need for long term planning and training
- Combining production, protection and social benefits
- MRV –mitigation measures –

3.7. Session 4 : Working group sessions

A long-term strategy for NFI activities in the Asia Pacific region

Mr. Hyungkwang Kim presented a proposal for a long-term strategy for NFI activities in the Asia Pacific region. This was a follow-up for the previous presentation (Session 3-1: Current situation of Deforestation in Asia Pacific region). First, he mentioned requirements to reduce deforestation and degradation in this region. Next, he briefed the criteria for priority country selection and the results of criteria application. The list of tentatively selected priority countries and the size of their required funds were as follows.
The first priority countries: Myanmar (US$ 2.5million), Cambodia (US$ 2million)
The second priority countries: Mongolia (US$ 1.5million, Philippines (US$ 1.5million)
The third priority country: North Korea (US$ 1.5million)
The fourth priority countries: Bhutan(US$0.5million), Solomon Islands(US$0.5million)
Finally, he suggested the necessity for the creation of ***Regional multipurpose NFI project (Total budget: US$ 10million, Duration: 5 years, Countries: 7).***

East Asia Climate Partnership Program of Korean Government

Ms. Hyoeun Kim introduced East Asia Climate Partnership Program of Korean government. First, she mentioned the goal of this program which is to create win-win synergy between the climate and the economy in East Asia by exploring Low Carbon Green Growth paradigm. Second, She explained Background (Korea announced a plan to launch East Asia Climate Partnership ($200 million for five years) to this region of dynamic economic growth. Third, she briefed 1st East Asia Climate Forum (May 29, 2009) and Implementation mechanism (process and institutions).

Discussion

- Is East Asia Climate Partnership Program supporting only limited on SFM or on all forestry issues? - Depends on the contents of the projects
- Collaboration with other international organization. Focus only on East Asia region or also on other region - The funding is limited so Korea not considering to go out of the Asia Pacific region. Korea working with international organizations. KOICA is the main channel.
- Procedure for submitting proposal? - Through Korean embassy
- Timetable? - every year circulating request form to developing countries before March and April. Decision in October and November
- Number and amount of the countries are not limited but it is being taken into account.
- KOICA prefer bilateral not multilateral. Forestry sector is small part - Hope that cooperation will be expanded with international organization. Forestry is an area that can produce a good result comparing to investment, so Korea need to support more. Korea Forest Service needs to be more involved in the process.
- Closer cooperation between KOICA and FAO is needed in the future.

Guide for the Working group discussion

Mr. Dan Altrell and Ms. Anne Branthomme briefed ToRs (Terms of Reference) for this Working group sessions. First, all participants were distributed between the 2 Working Groups.

Working Group1 was composed of 6 country representatives (Myanmar, Thailand, Malaysia, Pakistan and Philippines), 2 experts (Mr. Vidal, Mr. Coulston) and 2 FAO staffs (Mr. Altrell, Mr. Otsuka). Working Group 2 was composed of 7 country representatives (China, Vietnam, Laos, Mongolia, PNG, Solomon Islands and India), 1 Donor (JICA) and 2 FAO staffs (Ms. Branthomme, Mr. Kim).

Second, they explained discussion topics of each Working Group session.
The main topic of Session 1 was "Priorities for and requirements from the NFI in connection with climate change" and ***another of Session 2 was "What should the role of three main actors (countries, FAO, donors) be for NFI activation in connection with climate change?"***. Each working group discussed both of those topics.

Working Group discussion

First, Participants of each working group selected their Chair (Group1: Mr. Tosporn Vacharangkura- Thailand, Group2: Mr. Shiv Raj Singh- India) and Rapporteur (Group1: Mr. Pem Narayan Kandel- Nepal, Group2: Ms. Ruth Turia- PNG).

Second, they discussed following specific topics of session 1.

1. What is the NFI status of each country related to climate change reporting or equivalent (tier level I, II, III)?
2. What is the target of each country's climate change reporting (tier level I, II, III)?
3. Which are each country's objectives for NFI improvements?
4. Which are the main gaps and constraints to reach target tier level/ objectives?

Third, they discussed Specific topics of working group session 2 were as follows.

1. Which are the recommendations for Actions to be taken / Recommendations?
2. Which Actor(s) are recommended as Main Responsible for each recommended Action
3. What is the estimated Timeframe for each recommended Action?
4. What is the estimated Cost for each recommended Action?
5. Other key conclusions / Recommendations

Fourth, during the discussion, they expressed the following opinions relating to the target of each country's climate change reporting (tier level 1, 2, 3)

- Target must be to reach up gradually
- Compatible with international demand and national need/capacity
- Institutional building processes
- Take time, fund and capacity to generate data.
- Need National priority and support from the international communities (donors).
- Setting time line is important?
- Phase wise approach (immediate and long term).

3.8. Session 5 : Next steps for the NFI in the Asia Pacific

Working Group discussion results

Working Group1

Mr. Pem Narayan Kandel presented results of WG 1 discussion.

First, he mentioned NFI status of each country related to climate change reporting. He introduced that WG members reviewed and found that among 6 WG countries, 3 were Tier level 1 and the rest were Tier level 2 (Their target was Tier 2 or 3.)

Second, he explained each country's objectives for NFI improvements. The order of priorities were Consolidated national policies, Sustainable use of forestry resources, Enhanced protection of forestry resources, Improved livelihoods, Food security, Forestry research, and Climate change mitigation (carbon market).

Third, he briefed the main gaps and constraints to reach target Tier level/objectives. The order of priorities was Technical capacities & methodologies, Institutional capacities / legal framework, Financial capacities, Political priorities and will, and Human resources.

Fourth, he mentioned the recommendations for Actions to be taken as follows.
1. In terms of Technical capacities & methodologies aspects, the order of priorities were Developing methodological framework (formulating, testing adopting), Trained the personnel and retained, Networking, Partnership among the stakeholder within and outside the countries.
2. In terms of Institutional capacities / legal framework, and Financial capacities aspects, the order of priorities were Prioritizing and allocating more Fund, Institutionalization the whole functions needed for NFI, and Developing Partnership to increase the national capacity on NFI.
3. In terms of Political priorities and will, it was Lobbying.
4. In terms of Human resources, it was Collaboration with Academic and research institutions.

Fifth, he listed main responsible actors for each recommended action as follows. FAO, ITTO, JICA, USAID, FINNIDA, DFID, SIDA, AUSAID, KOICA, GTZ, French, EU, UNF, UNEP, UNDP, GTF, WB, ADB, and National government.

Sixth, he explained the estimated Timeframe and Cost for each recommended Action for each country as follows.
1. Philippines : 2, 5, 10 years (2, 5, 5 million USD)
2. Myanmar : 2, 5, 10 years (2, 3, 5 million USD)
3. Thailand : 2, 5, 10 years (1, 5, 7 million USD)
4. Nepal : 2, 5, 10 years (2, 6, 7 million USD)
5. Malaysia : 2, 5, 10 years (2, 5, 5 million USD)
6. Pakistan : 2, 5, 10 years (1, 3, 5 million USD)

Working Group 2

Ms. Ruth Turia- PNG presented results of WG 2 discussion.

First, she mentioned NFI status of each country related to climate change reporting. She introduced that WG members reviewed and found that among 7 WG countries, 6 were Tier level 1 and the rest was Tier level 2 (Their target was Tier 3.)

Second, she explained each country's objectives for NFI improvements. The order of priorities were Sustainable use of forestry resources, Improved livelihoods, Consolidated national policies, Forestry research, Biomass and Carbon stock, Forest Conservation, and Ecological security.

Third, she briefed the main gaps and constraints to reach target Tier level/objectives. The order of priorities was Technical capacities & methodologies, Institutional capacities / legal framework, Financial capacities, Human resources, Political priorities and will, and Land Tenure (Solomon Islands & PNG).

Fourth, she mentioned the recommendations for Actions to be taken as follows.

1. Training with specific skills (RS/GIS/NFTRI)
2. Collaborate with other national and international agencies
3. Recruitment of qualified personnel
4. Appropriate and sufficient budget (national/external)
5. Conduct necessary research to establish REL/RL and improve methodologies
6. Develop appropriate policies to enhance effective utilization of the forest resources (e.g., Land tenure and mitigation/adaptation actions to address climate change)
7. Build up national capacity
8. Build up institutional capacity (e.g. review and amend legislation to take on board issues relating to climate change)
9. Develop common guidelines on monitoring & reporting REDD, especially for degradation

Fifth, she listed main responsible actors for each recommended action as follows. National Government. FAO, Other international agencies, National organizations, and other donor agencies.

Sixth, he explained the estimated Timeframe and Cost for each recommended Action for each country as follows.

1. Mongolia : 10 years (5 million USD)
2. Solomon Islands : 5 years (2 million USD)
3. Laos : 5~10 years (1 million USD)
4. Vietnam : 5 years (20 million USD: Govt, 2 million USD: Intern'l Organization)
5. PNG : 5~10 years (10 million USD)
6. India : 5 years (National Budget, 0.5 million USD)
7. China : 5~10 years (5 million USD)

General Open Discussion

- WG conclusions gave some good insight.
- Precise moment to increase the focus and attention on forest.
- More opportunities now than in the past.
- Potential area for further collaboration.
- Suggestion for establishment a working group for NFI under RFC –AP to activate development and implementation of NFI at regional and international level.
- No time to discuss the use of south-south collaboration.
- Some countries are more advanced and the main responsible actors, also could be the neighboring countries.
- Transfer of technology between countries in the region.
- WG2 came from going from a tier 1 to tier 3 within a 5 years timeframe. How duable this would be? - depend on country specific. Some want to go from 1 to 2 and other from 2 to 3.
- How food security is related to NFI? - Indirect beneficiary of better information is better policy, better livelihood and better food security.

A summary of the Working Group findings can be found in Annex 5.11.1

Workshop Conclusions and Recommendations

A draft of the Workshop Conclusions/Recommendations were presented, reviewed by all participants and endorsed by the meeting. (see section 4).

Closure of the Workshop

In his closing remarks, Mr. Jose Antonio Prado stressed the importance of identifying gaps and needs for NFI and the establishment of WG to streamline methods and be a platform for discussions within the region. Finally, he expressed the sincere thanks to all participants and declared the Regional Workshop closed.

3.9. Session 6 : Field trip - Visit to the Sample Plot of Korean NFI

To make a practical connection to national forest inventories the workshop offered a field trip. Representatives of Korea Forest Research Institute, led by Mr. Sungho Kim, accompanied the workshop participants to the forests near Korea National Arboretum, where they demonstrated how sample plots within the Korean NFI are identified and established in the field, and how the typical field measurement and observations are carried out. The demonstrations raised much curiosity among the participants and triggered many questions to learn more about the Korean methods for field data collection. Mr. Sungho Kim explained the theory behind the measurements and happily attended any question from the participants.

After the field demonstrations the participants were guided through the exhibition halls of Korea National Arboretum (KNA) and were shown the Korean diversity in nature, culture and craftsmanship. KNA has combined a mix of expositions and interactive presentations to attract the eyes and minds of the visitors, and by doing so they have succeeded to create a pedagogic centre for spreading the knowledge on their national heritage to both international and domestic visitors at all ages.

4. Conclusions and Recommendations

- All participating Asian and Pacific countries stressed that Multipurpose National Forest Inventory systems are essential for integrated and comprehensive national policy-making process and for reporting to the international processes including on carbon emissions from deforestation and forest degradation.

- Most of the countries are using defaults factors of GPG of IPCC for estimating biomass and carbon and most report at Tier 1 level.

- Most of the countries lack technical skills, knowledge and capacities in all dimensions of Forest - GHG reporting specially at higher tier levels.

- Most of the countries felt that this is because of the lack of resources for NFI which is manifestation of weak political will and support.

- Most countries expressed their goal to report at tier 3 level as early as possible.

- They suggested a phased programme (2 year (coterminous with 2012), 5 year and 10 year) to develop and sustain their national institutionalised NFI systems with an average annual regular financial support of about 1 million dollars.

- Therefore, the workshop resolved that institutional strengthening and capacity building should provided to all countries as early as possible with an average annual regular financial support of about one million dollars per country.

- Most of the countries felt that satisfying different demands of forest information and suggested variant of methodologies by different donors and conventions over the years has gone beyond their traditional capacities and is putting lot of strain on their limited resources.

- The workshop therefore resolved for establishment of a working group for NFI under Asia-Pacific Forestry Commission (APFC) to coordinate in particular with donors and conventions or the purposes of development of harmonised common basic framework at regional and international level for development and implementation of NFI as well as reporting on forest including conventions. Two tiered approach (international and regional)

- The workshop also felt this was also necessary to ensure sustained flow of resources and technologies and methodologies to the countries for timely and quality implementation of regular and periodic NFIs.

- The workshop also recommended that universities, research institutions and alike should be also part of such working group.

- The modern tools of electronic networking and e-consultations should be promoted to achieve the objective.
- FAO should take the lead on establishment of such a working group based on its rich experience of more than six decades of supporting countries to develop their NFI/NFMA.

- The Director, French National Forest Inventory and representative of US Forest Service and JICA supported establishment of such working group.

5. Appendices

5.1. Workshop Agenda

5.2. Participants list

5.3. Terms of Reference for Moderators and Rapporteurs of Plenary Sessions

5.4. Terms of Reference for Working Group Sessions

5.5. Presentation materials of Opening session

5.6. Presentation materials of Session 1
- Climate Change and REDD

5.7. Presentation materials of Session 2
- National Forest Inventory program in connection with climate change

5.8. Presentation materials of Session 3
- Idealism or Reality? – A Status of NFI policy to mitigate climate change in partner countries

5.9. Country presentation materials of Session 3
- Philippines, Malaysia, Myanmar, Nepal, Thailand, Pakistan, China, Mongolia, Laos, Vietnam, PNG, Solomon Islands

5.10. Presentation materials of Session 4
- Working groups session

5.11. Presentation materials of Session 5
- Next steps for the NFI in the Asia Pacific Region

5.12. Field Trip Information

(Appendix5.1)

Workshop Agenda

TUESDAY, 23 February

08:00 - 09:00 Registration

Opening session (09:00 - 10:20)
Moderator: Mr. Jung-Hwan Park (Director of Research Cooperation Division, KFRI)

09:00 - 09:10 Opening address by FAO *(Director of Forest Assessment, Management and Conservation Division, Mr. Jose Antonio Prado)*
09:10 - 09:20 Welcome address by the hosting government *(Vice Minister of Korea Forest Service, Mr. Sangkil Lee)*
09:20 - 09:30 Congratulatory speech by IUFRO *(President of IUFRO, Professor Donkoo Lee)*

09:30 - 09:40 Group Photo
09:40 - 10:00 Refreshments *(coffee/tea break)*

10:00 - 10:20 Introduction of the Workshop *(FAO, Mr. Hyungkwang Kim)*

Session 1 : Climate Change and REDD (10:20 - 12:10)
Moderator : Mr. Claude Vidal (Director of France National Forest Inventory)
Rapporteur : Mr. Dan Altrell (FAO), Ms. Eun-Kyung Kim (KFRI)

10:20 - 10:40 Climate Change and REDD+ *(FAO, Mr. Jose Antonio Prado)*
10:40 - 11:00 Climate Change Policy of Korean Government *(Presidential Committee on Green Growth, Mr. Seongjoo Shin, Director of Climate Change Policy Team)*
11:00 - 11:20 UN-REDD Program *(FAO, Mr. Jose Antonio Prado)*
11:20 - 11:40 Climate Change Policy of Korea Forest Service *(Korea Forest Service, Mr. Youngkyoon Yoon, Director General of Forest Resources Policy Bureau)*

11:40 - 12:10 Discussion

12:10 - 13:40 Lunch *(KFRI Cafeteria)*

Session 2-1 : National Forest Inventory Program in connection with climate change (13:40 - 16:00)
Moderator : Mr. Jose Antonio Prado (FAO)
Rapporteur : Mr. Masahiro Otsuka (FAO), Ms. Min-Joo Kim (KFRI)

13:40 - 14:10 Why is NFI important to mitigate climate change? *(France National Forest Inventory, Mr. Claude Vidal)*
14:10 - 15:10 FAO NFMA program and approach
- Evolution of FAO NFMA *(FAO, Mr. Dan Altrell)*

- FAO - Finnish program and support in the Asia countries
  (FAO, Mr. Mikko Leppanen)
- *Methodology and Cost Analysis of FAO NFMA (FAO, Ms. Anne Branthomme)*

15:10 - 15:40 Discussion

15:40 - 16:00 Refreshments *(coffee/tea break)*

Session 2-2 : National Forest Inventory program in connection with climate change (16:00 - 18:10)
Moderator: Professor Woo-Kyun Lee (Korea University)
Rapporteur: Mr. Mikko Leppanen (FAO), Ms. Eun-Kyung Kim (KFRI)

16:00 - 16:20 Long history - USA NFI program *(USDA Forest Service, Mr. John Coulston)*
16:20 - 16:40 Strengthening MAR : FAO - Japan program *(FAO Regional Office for Asia and the Pacific, Mr. Masahiro Otsuka)*
16:40 - 17:00 New emerging sector : Korea NFI program *(KFRI, Mr. Sungho Kim)*
17:00 - 17:30 IPCC Good Practice Guideline for LULUCF and Carbon estimations in Korea NFI program *(KFRI, Mr. Kyunghwak Lee)*
17:30 - 17:40 Introduction to ITTO REDDES program *(ITTO, Mr. Hwanok Ma)*

17:40 - 18:10 Discussion

18:30 - 21:00 Welcome dinner

WEDNESDAY, 24 February

Session 3-1: Idealism or Reality? – A Status of NFI policy to mitigate climate change in partner countries (08:00 - 10:20)
Moderator: Mr. John Coulston (USDA Forest Service)
Rapporteur: Ms. Anne Branthomme (FAO), Ms. Min-Joo Kim (KFRI)

08:00 - 08:10 Current situation of Deforestation in the Asia Pacific region
(FAO, Mr. Hyungkwang Kim)

08:10 - 08:20 NFI experiences in Philippines
08:20 - 08:30 Availability of financial resources for NFI in Malaysia
08:30 - 08:40 Importance of NFI in the policy-making system of Myanmar
08:40 - 08:50 Reporting systems in Nepal
08:50 - 09:00 NFI and Forest management in Thailand
09:10 - 09:20 Government organization for NFI in Pakistan

09:20 - 10:00 Discussion

10:00 - 10:20 Refreshments *(coffee/tea break)*

Session 3-2: Idealism or Reality? – A Status of NFI policy to mitigate climate change in partner countries (10:20 - 12:30)

Moderator: Mr. Hiroki Miyazono
Rapporteur: Mr. Dan Altrell (FAO), Ms. Eun-Kyung Kim (KFRI)

10:20 - 10:40 Review of NFI in Asia and Pacific region in context of UNFCCC
(FAO Retiree, Mr. Kailash Govil)

10:40 - 10:50 Quality control of NFI in China
10:50 - 11:00 Extent of technical expertise in Mongolia
11:00 - 11:10 Relationship between National development and NFI in Laos
11:20 - 11:30 Strategy for NFI in Vietnam
11:30 - 11:40 Integration of NFI and MRV in PNG
11:40 - 11:50 Necessity of NFI in Solomon Islands
11:50 - 12:00 Carbon estimations in India

12:00 - 12:30 Discussion

12:30 - 14:00 Lunch *(KFRI Cafeteria)*

Session 4 : Working group session (14:00 - 18:30)
Moderator: Professor Joon Heo (Yonsei University)
Rapporteur: Ms. Anne Branthomme (FAO), Ms. Min-Joo Kim (KFRI)

14:00 - 14:20 A long-term strategy for NFI activities in the Asia Pacific region
(FAO, Mr. Hyungkwang Kim)
14:20 - 14:40 East Asia Climate Partnership Program of Korean Government
(Ministry of Foreign Affairs and Trade, Ms. Hyoeun Kim, Leader of Climate Change Team)

14:40 - 15:00 Guide for the Working group discussion
(FAO, Mr. Dan Altrell and Ms. Anne Branthomme)

15:00 - 18:30 Working group discussion
(15:00 - 16:30) - Priorities for and requirements from the NFI in connection with climate change
(16:30 - 18:30) - What should the role of three main actors (countries, FAO, donors) be for NFI activation in connection with climate change ?

THURSDAY, 25 February

Session 5 : Next steps for the NFI in the Asia Pacific Region (08:00 - 12:00)
Moderator: Mr. Jose Antonio Prado (FAO)
Rapporteur: Mr. Kailash Govil, Ms. Eun-Kyung Kim (KFRI)

08:00 - 09:00 Conclusion of Working group discussion (Working group 1, 2)
09:00 - 09:10 Presentation of discussion results (Working group 1)
09:10 - 09:20 Presentation of discussion results (Working group 2)

09:20 - 10:30 General Open Discussion

10:30 - 11:00 Refreshments *(coffee/tea break)*

11:00 - 11:40 Conclusions/Recommendations

11:40 - 12:00 Closing of the Workshop

12:00 - 13:00 Lunch *(KFRI Cafeteria)*

Session 6 : Field trip - Visit to the Sample Plot of Korean NFI (13:00 - 18:00)
Guided by Mr. Sung-Ho Kim (Director of Forest Resources Information Division, KFRI)

13:00 - 14:00 Transfer (KFRI to Korea National Arboretum)

14:00 - 16:00 NFI plot measurement demonstration

16:00 - 17:00 Visit to the Korea National Arboretum

17:00 - 18:00 Transfer (Korea National Arboretum to Hotel)

(Appendix 5.2)

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(Appendix 5.3)

Terms of Reference

for Moderators and Rapporteurs of Plenary Sessions

Before the Session

Moderators, Rapporteurs and Invited speakers should ensure that they:

1) Are familiar with the speakers, their bio data and their names.
2) Meet before the session to define the plan or strategy they will use to run the session, ensuring an interesting exchange of information with the active participation of the audience.
3) Identify suitable, to-the-point questions targeted to the speakers, in case no questions come from the audience.

During the Session

A) Moderators

When introducing the author of the invited position paper, please:

1) Indicate his/her name, nationality, title or specialization, title of the presentation and allocated time
2) Monitor the time of the presentation, informing the speaker, if necessary, of the time left or of the need to conclude his/her presentation
3) Give the floor to the audience for questions, remarks, comments, etc. avoiding unnecessary discussion, long monologues, etc.
4) Provide time to the speakers to reply or comment on questions and issues raised by the audience – if necessary, re-group questions and redirect them to the speakers eliciting the most important issues, should time not be enough
5) Present a summary of the discussion, highlighting any conclusions and recommendations, if any (these should be included in a Summary Report, see below)
6) Thank the speakers and the audience for their participation and inform them that the Moderator and Rapporteur will prepare a short Summary Report of the session which they will submit to the FAO Secretariat for the preparation of the report of the workshop proceedings.
7) Close the Session when concluded and announce any event which might take place thereafter.

B) Rapporteurs

1) Take note on the main findings, conclusions and recommendations of each presentation.

2) Support the Moderator registering those of the audience who are requesting the floor to speak.

3) Take note of those questions/remarks from the floor which could be of interest for consideration in the session Summary Report, as well as of the replies from the speakers.

After the Session

Moderators and Rapporteurs shall ensure that they:

8) Jointly prepare a short summary report (max. 400 words) indicating name of the speakers, title of presentation, number of interveners from the audience, main findings, conclusions and recommendations of the Session.

9) Submit the Summary Report of the Session to the FAO Secretariat within two hours after the end of the Session. For those sessions ending late in the afternoon the report should be delivered before 10:00 am of the following morning.

Terms of Reference
for Chairs of Working Groups Sessions

Chairs will introduce the session and topics, manage the time accordingly to address all questions, guide discussions and summarize conclusions.

Specifically the Chairs will:

- Introduce themselves and the Rapporteur
- Introduce the topic and duration of the Session
- Encourage a round of introductions at the beginning of the Working group Sessions
- Outline the scope of topic to be discussed and related questions to be addressed
- Remind those in the working group, wherever possible, to relate to the topic of the session
- Remind the participants that the objective of each session is to consider each country's needs and how to advice on best way forward to improved NFI activation
- Stimulate discussions on conclusions and recommendations based upon time remaining
- Sum up with concluding highlights

Terms of Reference
for Rapporteurs of Working Groups Sessions

Rapporteurs will prepare notes and summarize each participant's contribution to the working groups sessions according the table specified in the Working Groups Terms and Definitions (ToRs), and present them in the following plenary session.

The outputs from the working groups will assist in preparing a report on the proceedings of the workshop and serve to stimulate investments in national forest assessments and monitoring.

Specifically, the Rapporteur is to prepare the electronic summary tables according to Annexes 1 and 2 of WG ToRs, specifying:

- Details of Working Group (WG) Participants (Annex 1)
- Status of NFIs and objectives, recommendation and action plan, and a summary of regional main specificities and characteristics (Annex 2)
- Take note of key Statements and Recommendations from the sessions
- Issues/Constraints raised

The Rapporteurs will verify the WG summary tables of conclusions in collaboration with the Chair of the WG sessions and present them in the plenary session after the working group sessions. The Rapporteur will also provide WG summary tables in electronic format to the FAO Secretariat as soon as possible after the presentation.

(Appendix 5.4)

Terms of Reference for Working Group Sessions

Introduction of Working Group Sessions

During the three days of the Workshop on "Promoting and Strengthening Multi-purpose National Forest Inventory System in the Asia Pacific Region in Connection with Climate Change", the work will be carried out in Plenary Sessions with selected presentations and discussions, and in Working Groups (WGs). The Plenary sessions will provide an introduction of the main objectives of the workshop and during Working Group Sessions the country representatives will articulate the status, ambitions and objectives of their national forest inventories (NFI), and together with representatives from donor society and implementation agencies advice on actions to be taken towards enhanced NFIs in the Asia-Pacific Region. The program of the workshop includes two Working Group Sessions.

- ***Priorities for and requirements from the NFI in connection with climate change***
- ***What should the role of three main actors (countries, FAO, donors) be for NFI activation in connection with climate change?***

This document provides an outline of the core topics that will be addressed during the Working Groups. As an invited country representative, donor representative or expert, feel free to join the one of the two WG that best suits you, the one in which you will be able to give the most contribution based on your knowledge and experience. However, in order to have a balance among Working Groups, FAO may propose that some experts move to a different WG if needed.

Please note that the WG's Chairs and Rapporteurs will be selected among the WG participants in the start of the WG sessions and remain the same throughout the WG sessions.

The NFMA team is available to clarify any aspect and assist you at anytime. We hope the workshop will be an enjoyable and fruitful experience for all of you.

ToRs WG Session 1:
Priorities for and requirements from the NIX in connection with climate change

Wednesday 24 February 15:00 – 16:30

Topics

1. What is the NFI status of each country related to climate change reporting or equivalent (tier level I, II, III)?
2. What is the target of each country's climate change reporting (tier level I, II, III)?
3. Which are each country's objectives for NFI improvements? Consider objectives such as:
    - Food security
    - Improved livelihoods
    - Consolidated national policies
    - Enhanced protection of forestry resources
    - Sustainable use of forestry resources
    - Development of forest industries
    - Forestry research
    - Others.
4. Which are the main gaps and constraints to reach target tier level/ objectives? Consider aspects such as:
    - Political priorities and will
    - Human resources;
    - Institutional capacities / legal framework ;
    - Financial capacities;
    - Technical capacities & methodologies;
    - Other gaps and constraints.
5. Summarize the above for the Asia Pacific Region

ToRs WG Session 2:
What should the role of three main actors (countries, FAO, donors) be for NFI activation in connection with climate change?

Wednesday 24 February 16:30 – 18:00

Topics

1. Which are the recommendations for Actions to be taken / Recommendations?
2. Which Actor(s) are recommended as Main Responsible for each recommended Action? Consider actors such as:
    - International organisations and NGOs, in particular FAO;
    - National institutions, organisations and NGOs
    - Donors
3. What is the estimated Timeframe for each recommended Action?
4. What is the estimated Cost for each recommended Action?
5. Other key conclusions / Recommendations
6. Summarize the above for the Asia Pacific Regio

NFMA team:
Working group 1: D. Altrell , M.Otsuka
Working group 2: A. Branthomme, H.K. Kim

Working Group No: ____

Annex 1

List of participants to the WG				
#	Name	Country/Organisation	Chair (X)	Rapporteur (X)
1				
2				
3				
4				
5				
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20				

Working Group No: ☐

Annex 2

Countries / Region	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timeframe	Costs estimates (if any) USD	Notes
Countries	*For each country in the working group compile the following*				*Actions to be taken and recommendations should be related to the identified gaps & constraints*				
Asia Pacific region	*Summary of regional main specificities and characteristics*								
Asia Pacific region				* Political priorities:					
				* Institutional/ Legal framework:					
				* Financial:					
				* Technical capacities and methodologies:					
				* Human resources					
				* Other constraints					

Notes:

Notes:

5.5 Presentation Materials of Opening Session

(Appendix 5.5.1)

Opening Address by FAO

Mr. Jose Antonio Prado
Director
Forest Assessment, Management and Conservation Division
FAO of the UN,

Mr LEE Sang-Gil, Vice Minister of Korea Forest Service, Professor LEE Don Koo, President of the International Union of Forest Research Organizations (IUFRO), Dr CHOI Wan Yong, Director General of Korea Forest Research Institute, Dr Claude Vidal, Director of France National Inventory, Dr John Coulston, USDA Forest Service, Mr Hiroki Miyazono, Japanese International Cooperation Agency and distinguished and honourable participants, ladies and gentlemen, it is an honour and privilege for me to welcome you all to this workshop *"Promoting and Strengthening a Muti-purpose National Forest Inventory System in the Asia Pacific Region in Connection with Climate Change"*, organized by FAO and hosted by the Korea Forest Service and the Korea Forest Research Institute.

Ladies and gentlemen,
As we all know, forests are today in the very centre of the international discussion on climate change, on the one hand as one of the most important sources of carbon emissions, with more than 17% of the total global anthropogenic greenhouse gas emissions, and on the other hand, through conservation, sustainable management and restoration, as the most rapid and cost effective way to reduce carbon emissions.
Recently, countries participating in COP 15 of the UN Convention on Climate Change in Copenhagen recognized the crucial role of forests in addressing climate change and made a decision on methodological guidance for REDD$_{+,}$ recognizing the importance of the reduction of emissions for deforestation and forest degradation, as well as the conservation and enhancement of carbon stocks and making a call to countries not only to identify the main causes of deforestation and forest degradation, but also to establish national monitoring systems using remote sensing combined with ground based forest inventory approaches. The COP also called the countries to support and strengthen the capacities of developing countries in collecting, accessing and interpreting forest related data.
Additionally, both developed and developing countries agreed that greenhouse gas reductions should be subject to international monitoring and verification.

Under these circumstances, the importance of national forest inventories is receiving widespread attention in the international forestry community.

FAO, with a long history supporting countries in improving their national inventory capacity, is responding to these requirements.

FAO, UNDP and UNEP have created the UN-REDD programme to support countries in their preparations for the mechanisms that are being discussed under the UNFCCC. Nine pilot countries are now recipients of financial and technical support by the UN-REDD programme with a view to establishing sound, national REDD platforms.

In this context, FAO is also strengthening and modernizing its traditional National Forest Monitoring and Assessment programme, in order to respond to the need for broader and more detailed information about forest ecosystems, and also to fully align the programme with the IPCC requirements for REDD+.

In the light of this, the importance of National Forest Inventory in relation to climate change has gained widespread attention in the international forest community.

It is in this framework that we gather here today, to review the situation of the countries in the region as concerns their national forests assessments and to look forward strategically.
The workshop has two objectives: first, to generate a common understanding about the need for NFI for national policy-making systems and for reporting to the international processes; second, to propose a common strategy on how to move forwards, both from the methodological point of view and as regards financial resource mobilization.

Ladies and gentlemen,
I would like to thank the Korea Forest Service not only for supporting this workshop but also for its important support to the National Forest Monitoring and Assessment Programme of FAO. I should also like to thank the Korean Forest Research Institute for preparing this valuable workshop. I am deeply grateful too to Korean participants from the University and related organizations and all those others who have contributed to making this workshop possible and successful.

I welcome you all once again and hope that your three days here in Seoul will be a valuable opportunity to think about the importance of forests in relation to climate change and the significant role that forest professionals can play. We are here to provide important knowledge and the opportunity for sharing of experience.

I wish you a very successful workshop.
Thank you.

(Appendix 5.5.2)

Welcome address by the Hosting Government

Lee Sang Kil,
Deputy Minister, Korea Forest Service

Good Morning Ladies and Gentlemen.
I'm honored to give a welcoming speech today at this significant workshop on "Promoting and Strengthening Multi-purpose National Forest Inventory System in the Asia Pacific Region in Connection with Climate Change"

First of all, I would like to extend my sincere appreciation to all distinguished participants for attending this workshop,
especially, to Mr. Jose Antonio Prado from FAO, Lee Don Koo, president of the International Union of Forestry Research Organizations, an official from National Forest Inventory System of Asia Pacific region, three experts in climate change and National Forest Inventory System respectively from the United States, France, and India, as well as two officials from JICA(Japan International Cooperation Agency) and ITTO(International Tropical Timber Organization).
I also would like to express my special thanks to several officials from Green Growth Committee, Ministry of Foreign Affairs and Trade and KOICA(Korea International Cooperation Agency) for gracing this workshop today with your presence even during your busy schedules.
Special appreciations to the officials of not only FAO(Food and Agriculture Organization of the United Nations) but also National Forest Research Institute are given for your service and time for the preparatory work.
Ladies and gentlemen,
As many of you know, climate change due to the global warming has been progressing rapidly. Climate change issues which are linked directly with the mankind's survival have emerged as the most important global agenda, and the effort by international societies has been more active with focusing on the UNFCCC.

According to the IPCC 4th report, forest sector stands nearly 18% out of the global greenhouse gas emissions. Most of them are arouse due to deforestation and forest degradation. Having said that, this trend tells us that which direction the forest sector is to set and enforce the policy implication for stabilization of climate system by means of coping with climate change.

Mr. Ban Gi Moon, the UN Secretary emphasized that the climate change is impossible to be coped without the global forest conservation at the inaugural meeting of UN REDD Programme in September 2008. Also, Dr. Gro Harlem Brundtland who has become famous by her report about the sustainable development,「Our common future」, emphasized that the destiny of earth and forest is completely up to the decisive action implementation at the 19th FAO Committee on Forestry in March 2009.

At Copenhagen climate change conference being held last year, the Parties agreed on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including REDD-plus to enable the mobilization of financial resources from

developed countries. So, it is expected that the forest sector will be considered as a core element influencing the design of the Post 2012 Climate Change Regime.
Considering this global trend, there will be an introduction about the related activities of FAO and the UN-REDD programme that is promoted, domestic and overseas Multi-purpose National Forest Inventory System coping with climate change, topic presentation by each country from Asia Pacific region and in-depth discussion during the workshop hosted by Korea Forest Service and FAO.

I hope that we would come to conclusion in drawing the basic set-out plan for the forest sector in Asia Pacific region where deforestation and forest degradation is severe in order to practically perform the leading role that cope with climate change of the earth through the workshop.

Today, I am grateful to host the workshop with all experts in the fields of national forest inventory system and climate change.
Your valuable suggestions will be extensively helpful in deciding future climate change policies and directions in the forest sector.

At last but not least, I would like to extend my sincere appreciation to all distinguished foreign and Korean participants for attending the workshop today once again.
And I desire everyone for your health and good luck on everything you are doing and planning for in the future.

Thank you.

(Appendix 5.5.3)

Congratulatory *speech by IUFRO*

Prof. Don K. Lee
President of IUFRO

Dr. Kwangsoo Chung, Minister of the Korea Forest Service; Mr. Jose Antonio Prado, Director of Forest Management Division, FAO;

Distinguished guests and participants from the Asia Pacific Region, ladies and gentlemen, good morning!

First of all, I would like to congratulate FAO for organizing and sponsoring this Workshop in Seoul, Korea as well as the Korea Forest Service for hosting this activity in collaboration with related international organizations, such as UNFCCC, UNFF, UNDP, UNEP, World Bank, GEF, UNCCD, UNCBD, ITTO, IPCC, and of course IUFRO.

It is indeed a great honor to welcome you all to this "Workshop on Promoting and Strengthening Multi-Purpose National Forest Inventory (NFI) System in the Asia Pacific Region, in Connection with Climate Change." I believe that this Workshop is very significant in determining the best strategies for reducing deforestation and degradation, especially in the Asia Pacific.

The relationship between forests and climate is, needless to say, a complex one. We know that climate has a profound impact on the way forests grow, function, regenerate, and interact with the natural world around them. It is fair to say that this complex relationship between forests and climate has never been as well recognized and studied as it is today.

Since the release of the IPCC's Fourth Assessment Report there has been increased certainty that climate change is an inevitable consequence of past and present human activities. Although mitigating and adaptation for climate change have received a great deal of media and scientific attention these days, it is still important that we further investigate the capabilities of forests as carbon storage units and determine the amount of GHGs that trees can uptake and absorb.

Acknowledging that forests play a large role in the influence of our society – whether that is through economic or social means – it is clear that the impact of climate change on forests will directly influence society. It is now up to us to determine how best to minimize and mitigate the impacts of climate change on forests, and consequently, society. We must evaluate the ongoing effects and implications of climate change on forests and tailor our research, policies, and practices accordingly in order to plan for and manage healthy and productive forests. It is critical that the importance of forests in mitigating climate change be recognized and acknowledged at the national, regional and global level.

In relation with this, National Forest Inventory System one of the strategies that will provide relevant information for creating and implementing national policy associated to climate change. Through this, we can also determine the level of capacity building that needs to be

improved in one country. These and all others are the reasons why you are here in this Workshop, to better understand NFI, to improve its activities and to identify funding needs for its implementation.

Today's Workshop will focus on the current state of knowledge and understanding on climate change and REDD. The importance of NFI in dealing with climate change and its status in terms of policy will be examined, and the long-term or future strategy for NFI activities in Asia and the Pacific region will be discussed.

I, as the IUFRO President, sincerely hope that this Workshop will serve as a successful venue for the active exchange of scientific and technical information among countries in the region and will help seek for better partnerships and collaborations. I am very certain that this event will provide a meaningful chance for all the participants to identify new approaches and strategies to address climate change. Special thank is given to Dr. Hyung Kwang Kim for his endless efforts and contributions for
great success of this important workshop.

With this end, please allow me to take this opportunity to invite you all to participate in the 23rd IUFRO World Congress to be held this year on the 23rd-28th of August in Seoul, Korea. I hope you could be part of this significant event in forestry.

I wish you all great success in this Workshop and a pleasant stay in Seoul!

Thank you very much!

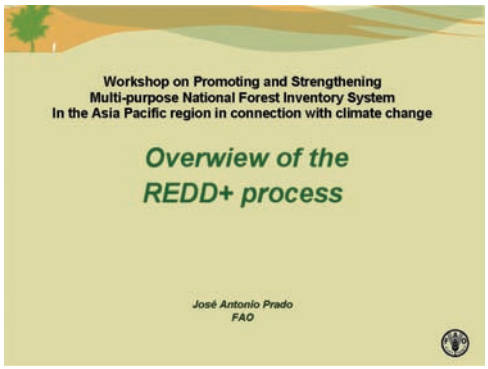
Don K. Lee
IUFRO President

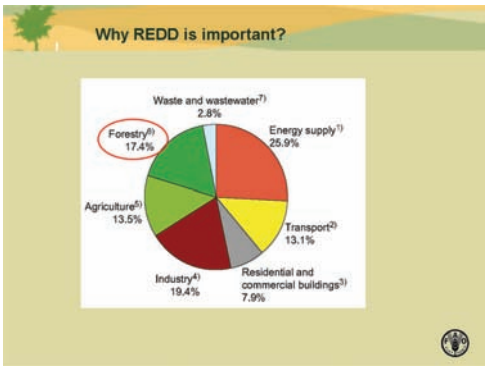
5.6 Presentation Materials of Session 1

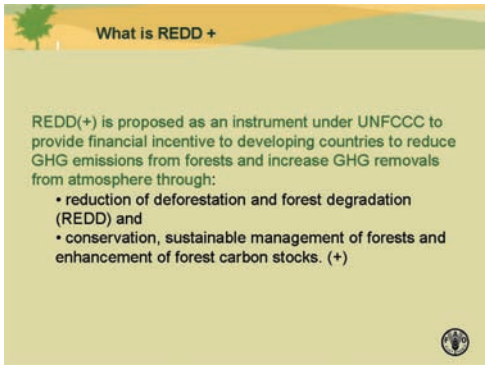
(Appendix 5.6.1)

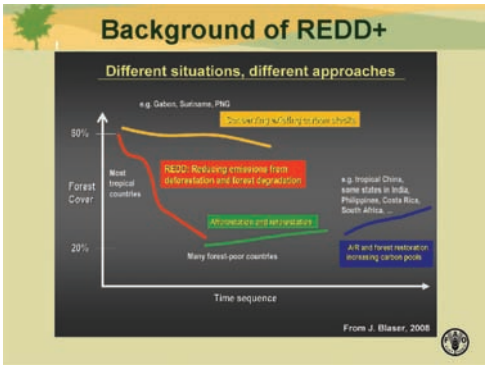
Climate Change and REDD+

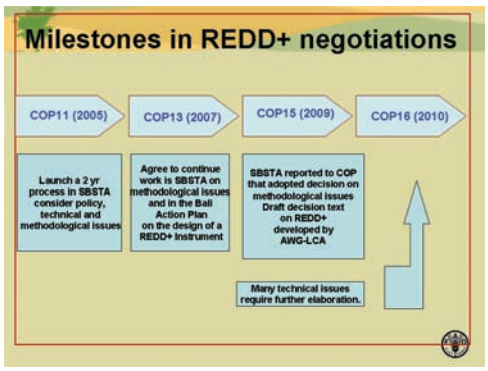
Mr. Jose Antonio Prado
FAO

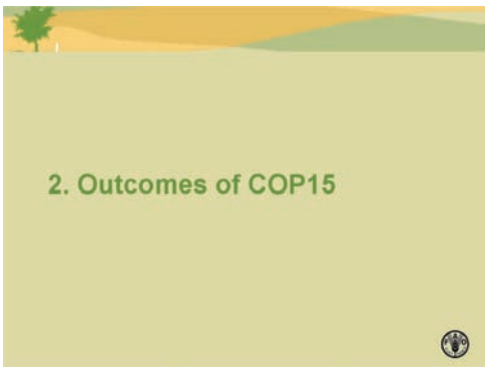




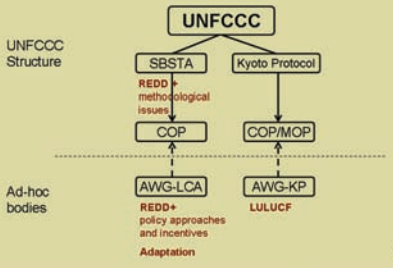








Structure of UNFCCC



Overall outcomes of COP15

- Deep divides between and within groups
- AWG-LCA & AWG-KP unable to conclude their work. Their terms were extended.
- Efforts to salvage outcome with political text resulted in the Copenhagen Accord
- Copenhagen Accord was "noted", thus has not legal standing.
- Good progress made on forest issues, in particular on REDD+

Copenhagen Accord

Although not adopted, the Copenhagen Accord indicates a commitment for action and aspirations for a negotiation outcome.

- Need to stay within a 2° C temperature increase recognized
- In 2015, assess the Copenhagen Accord and consider 1.5° C limit
- However, no goal of aggregate emission reduction commitments made
- Funding pledged: $30 b for 2010-2012 and up to $100 b/yr from 2020
- Decide to establish Copenhagen Green Climate Fund
- "We recognize the crucial role of REDD .. and agree on .. the immediate establishment of a mechanism including REDD-plus, to enable the mobilization of financial resources from developed countries."

COP decision on REDD +

Decision on "Methodological guidance for REDD+

- Sets the scope for REDD+
- Parties asked to id drivers of D&D
- Parties to use most recent IPCC guidance and guidelines for estimating forest-related GHG emissions
- Parties to establish national monitoring systems
- Other Parties to support capacity strengthening in developing countries
- Further work needed to be undertaken by IPCC (reference levels) and on engagement of indigenous peoples and local communities in monitoring and reporting

REDD+ under AWG-LCA

Parties considered a draft text for a decision on REDD+ covering core elements for implementing REDD+ activities, including:

- **Objectives, scope and guiding principles** (e.g. *country-driven, promotes co-benefits and biodiversity, actions consistent with conservation of natural forests, involvement of indigenous peoples and local communities, transparent forest governance*)
- **Means of implementation** (*financing options for readiness and full implementation – funds, markets only, combination of markets and funds*)
- **Measurement, Reporting and Verification** (MRV) of actions and support (*e.g. establishing reference emission levels, national monitoring systems, use of IPCC guidelines, parameters to be MRV-ed*)
- **Institutional arrangements** (*as part of broader financial framework, REDD+ under guidance of the COP, existing channels of finance*)

3. Significant issues to note

Significant issues to note

- Political visibility for forests is at all-time high
- Focus on adaptation and mitigation is more balanced
- REDD+ funding could increase dramatically on short term
- Greater need to increase technical and absorptive capacity of developing countries
- REDD+ has attracted many interest groups, leading to increasingly complex demands and controversy
- Calls for improved REDD+ coordination

Future benchmarks

SBSTA/AWG meeting: Bonn, 31 May-11 June 2010

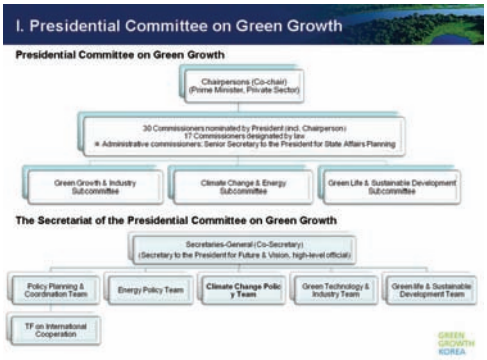
COP16: Mexico, 29 November - 10 December 2010

COP17: South Africa, 28 November-9 December 2011

(Appendix 5.6.2)

Climate Change Policy of Korean Government

Mr. Seongjoo Shin
Presidential Committee on Green Growth



III. Turning Grand Vision into Real Actions

[Framework Act on Low Carbon Green Growth]

Composition

- 7 chapters and 65 articles
- a Framework Act – it has priority over all relevant laws regarding Green Growth

Key provisions

1) legal ground for the Presidential Committee on Green Growth and mandates the committee to develop a national strategy for Green Growth.
2) mandates the government to foster and support green economy, green industry, and the transformation of conventional industry.
3) foster financing for green technology R&D and green investment, as well as, mandates to promote environment friendly tax reform.
4) mandates government to set concrete targets for GHG emission reduction, energy saving, energy security, and renewable energy supply.
5) mandates for mandatory reporting of GHG emission for businesses. Provides the legal framework to introduce cap & trade system in Korea.
6) articles on environment-friendly land use, green building, low carbon transportation, green consumption and production, and other issues related to sustainable development.

[Green New Deal]

Background & Key projects

- Green New Deal announced on Jan. 2009 - 9 key projects and supporting projects
- focused on job creation as well as building the foundation for low carbon economy transition

Budget (trillion KRW, %)

Category	Total	'09	'10~'11	'12~'13	Rate of Increase
total sum	107.4	17.5	48.3	41.6	10.2
•Adaptation to climate change & energy independence	56.9	8.6	29.2	19.2	14.0
• Creating new engines for economic growth	28.6	4.8	10.7	13.1	9.4
• Improvement in quality of life and enhanced international standing	27.9	5.2	10.5	12.2	3.6

IV. National Strategy for Green Growth & 5-yr Plan

Key Framework

Vision — A Model Green Nation - through creating virtuous harmony of environment & economy

Objectives

- Increasing Energy Security & Climate Adaptation
- New Engine for Growth
- Enhanced Quality of Life & Int'l Leadership

10 Key Agenda

- Increasing Energy Security & Climate Adaptation
  - • Build Low Carbon Society
  - •Enhance Energy Security
  - •Strengthening Climate Change Adaptation Actions
- New Engine for Growth
  - • Develop Green Technology
  - • Foster Green Industry
  - •Greenovate Industrial structure
  - •Lay Foundation for Green Economy
- Enhanced Quality of Life & Int'l Leadership
  - • Green Transportation & Land Management
  - • Green Life Revolution
  - •Global Green Leader

IV. National Strategy for Green Growth & 5-yr Plan

Policy Tools

Public sector's own investment on Infrastructure and R&D technology

- • Infrastructure: improving mass-transit system, water quality, green-home project,etc.
- • R&D in low emission vehicles

Regulation along with Incentives

- • RPS (Renewable energy Portfolio Standard)
- • Eco-friendly Tax System

Moral Suasion

- • Carbon point, carbon cash-back

1. Low Carbon Society

Strategies

- • National GHG info Management System
  - set emissions reduction goal
  - enhance carbon visibility
- • Encourage Carbon-3R Activities
- • Forestation for Carbon reduction

Indicative target

Carbon-3R Rates

('50) ---- 19.8%
('20) ---- 17.6%
('09) ---- 17%

2. Energy Security

Strategies

- Energy Conserving Society
- Expand Clean Energy Development & Deployment
- Expand Safe Nuclear Energy
- Expand off-shore Energy Source Development

Indicative target

Enhance Energy Independence

('50) 100%
('20) 50%
('09) 32%

3. Strengthen Climate Change Adaptation Actions

Strategies

- Improve climate monitoring capability & early warning system
- Establish adaptation policy for six major areas
  - Health Risks / Food Security / Water resources / Forest / Sea-shore / Disaster

Indicative target

National Forest Resources

('50) 1.43billionm³
('20) 1.09billionm³
('09) 0.95billionm³

4. Develop Green Tech

Strategies

- Strategic Promotion of Green tech innovation
- Strategic Investment in Green R&D
- Core Green technologies
  - LED, CCS, Clean Cars, Renewables

Indicative target

Invest in Green tech R&D

('50) 30%
('20) 25%
('09) 16%

5. Fostering Green Industries

Strategies

- Resource-circulating economy & society
- Green conversion of industries
- Foster green SMEs
- Build green clusters

Indicative target

Export in Green Products

('50) 35%
('20) 22%
('09) 10%

6. 'Greenovate' Industrial Structure

Strategies

- Foster high tech fusion industry
- High value added service industry

Indicative target

Export in IT fusion industry

$349billion ('50)
$144billion ('20)
$ 75.5billion ('09)

Export in contents

$50billion
$10billion
$5.8billion

7. Build Green Economy Basis

Strategies

- Invigorate Carbon Market
  - Cap & trade, Emissions related business
- Green Financial Infrastructure
  - Sustainable banking, Green fund
- Eco-tax
- Create green jobs

Indicative target

Domestic Carbon Market

('50) 5 trillion won
('20) 2 trillion won
('09) Getting ready

8. Green Land·Transportation

Strategies

- Expansion of Green Home & Green Buildings
- Green cities
- Expand Eco space
- Green Public Transportation bicycles & Promote Green Cars

Indicative target

- UN Green Model Cities: 10 ('50) / 5 ('20) / 0 ('09)
- Proportion of railway transportation: 30% ('50) / 26% ('20) / 18% ('09)

9. Green Life Revolution

Strategies

- Introduce Eco-point system & expand Carbon labeling
- Promote green consumption & green lifestyle
- Promote green growth education & public awareness

Indicative target

- Carbon label certified products: 4,000 items ('50) / 1,000 items ('20) / 50 items ('09)

10. Global Green Leader

Strategies

- Enhance int'l cooperation for green growth and climate action
- Increase Green ODA & support developing countries
- Build Green Hub Korea

Indicative target

- Green ODA: 40% ('50) / 30% ('20) / 14% ('09)
- EPI: 8th / 20th / 51st

Key Strategies in Forest policy

Build Society that Circulates and Absorbs Carbon

Expansion of Carbon Sink

- Promote afforestation of unused land, plant more trees in forests
- Develop and diffuse tree species with much carbon absorption capacity

Development of Bio-circulation forest

- Create bio-circulation forests with fast-growing and productive trees (e.g. tulip trees)

Expansion of production and use of wood

- Create carbon-circulation system by expanding use of wood pallets

Key Strategies in Forest policy

Sustainable Management of Forests

Establish conservation basis for forest ecosystem and flora & fauna

- Establish long-term forest ecosystem monitoring system and analysis system
- Manage forest ecosystem

Upgrade Infrastructure and system for addressing forest disasters

- prevent and extinguish forest fires
- Advance management of regions with landslide risks

V. Recent Progress in Korea

Mid-term Reduction Target

Analytic Framework

Systematic Approach by Research Team, Review Committee and Public Hearing

V. Recent Progress in Korea

Mid-term Reduction Target

Setting National Mid-term Reduction Goal(2009.11.17)

Decision Made on Mid-Term GHG Reductions Goal by 2020 at the Cabinet Meeting: To Cut GHG Emissions by 30% from BAU

Cabinet Meeting

Decision Made for the Bigger National Interest (Historic Cabinet Meeting)

Removing Trade Barriers, Enhancing Energy Security : Preoccupying Global Green Markets

Transformation to Green Lifestyle with Concerted Efforts Among Citizens, Firms and Governments

Creating More Conducive Atmosphere for all Countries' Active Participation

Unilateral and Voluntary Goal

- Announcement of Unilateral and Voluntary Mitigation Goals to Share the Global Mitigation Efforts
  - Proactive Participation in Global Efforts Against Climate Change as an Early Mover
  - Implementation of the Goals Independent of the Outcome of COP 15 in Copenhagen
- Goal Set at Maximum Level of GHG Mitigation Potential of Korea
  - Core Quantitative Target for Low Carbon Green Growth
  - Accelerating Transition to Low Carbon Green Growth Economy with Implementation of Ambitious Goal

GREEN GROWTH KOREA

V. Recent Progress in Korea

East Asia Climate Partnership

Background & Goal

- Korea announced a plan to launch East Asia Climate Partnership to help developing countries in East Asia combat climate change
- To create win-win synergy between the climate and the economy in East Asia
  - By exploring **Low Carbon Green Growth** paradigm
  - By promoting regional adaptation & response to adverse impacts of climate change

Implementation

- Focus on Cooperation – energy efficiency, clean& renewable energy, sustainable water & Forest management
- Implementing Institutions – KOICA in consultation with East Asian Countries and Int'l organizations

1st East Asia Climate Forum

- High-level economy climate forum participated by ministerial-level officials from 5 East Asian countries and high-level representatives of ADB, UNEP, ESCAP and green experts from US, UK, and Japan
- Adopted ***Seoul Initiative for Low Carbon Green Growth in East Asia***

GREEN GROWTH KOREA

VI. Challenges Ahead

Continued support from the public

- the key to success of Green Growth

Support from business community

- meeting its needs to adapt & change
- setting a price on target
  : emission trading & carbon tax

GREEN GROWTH KOREA

(Appendix 5.6.3)

UN-REDD Program

Mr. Jose Antonio Prado
FAO

UN-REDD
PROGRAMME

Workshop on Promoting and Strengthening
Multi-purpose National Forest Inventory System
in the Asia Pacific region in connection with climate change

Overview of the UN-REDD Programme

The UN-REDD Programme

- The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
- Established in 2008 by the FAO, UNDP and UNEP
- A response to Bali Action Plan call for REDD instrument in post-2012 climate change agreement

UN-REDD PROGRAMME

UN-REDD Programme Objective

To help developing countries to be ready to reduce emissions from deforestation and forest degradation in an equitable, effective and efficient way.

UN-REDD PROGRAMME

The UN-REDD Key Principles...

- Coordinated response(Delivering as One)
- Contribution to UNFCCC process
- Country-driven REDD Programmes
- Institution Strengthening, Capacity Building and Local Action
- Stakeholders' participation
- Measurement, Reporting & Verification

UN-REDD PROGRAMME

The UN-REDD Programme Funding & Governance

- MDTF: US$75 million
- Donor countries:
  - Norway
  - Spain
  - Denmark
- Policy Board
  - Countries, donors, IPs, organizations
  - Meets 3 times per year
  - Approves resources allocation
  - New countries

UN-REDD PROGRAMME

The UN-REDD Programme Two Levels of Support :

INTERNATIONAL

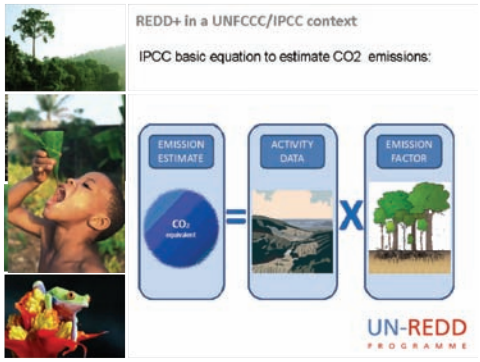
- Facilitate convening and knowledge management and exchange
- Develop concepts and methodologies in MRV .
- To build awareness and consensus about the importance of REDD in post-2012 agreement
- Develop concepts on benefit distribution.
- Focus on capacity building
- Promote collaboration with other initiatives especially FCPF

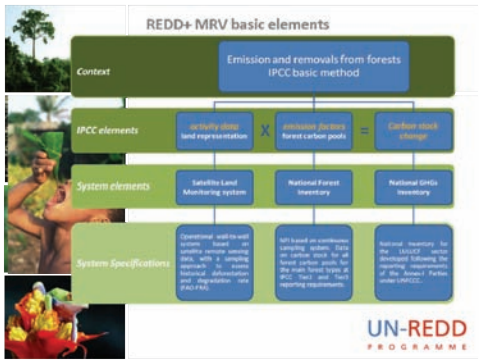
UN-REDD PROGRAMME

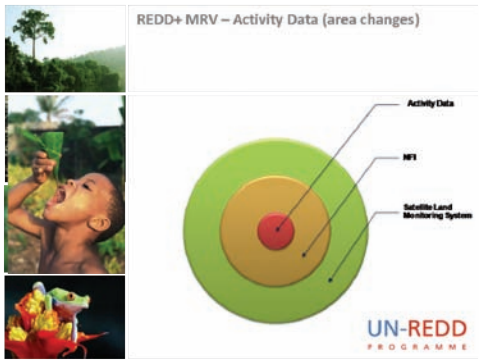
The UN-REDD Programme
Two Levels of Support :
NATIONAL
•Promote country-led REDD initiatives in close collaboration with national and international initiatives
•Country ownership and Indigenous Peoples & Civil Society involvement.
•Provide technical support to develop national REDD strategies
•Provide funding and technical support to develop the National Joint Programme
•Provide funding and technical advice for NJP implementation
•`Provide funding and tech. support to develop a national MRV system
UN-REDD
PROGRAMME

REDD Monitoring
Key Considerations
MR
UN-REDD
PROGRAMME

Some principles for the MRV work
Meet MRV needs for Carbon...
Not rocket science..
..but requires methodological considerations and more precise data
.. but not only Carbon (safegards)
REDD implementation requires broader information on natural resources, their uses and users , drivers of deforestation and change, governance, transparency, gender indigenous rights, policy options
Capacity and participation
Long-term Institutional Effort
Stakeholder engagement
Other Success Factors
Integration with existing monitoring systems
Consider monitoring needs beyond REDD
Robustness
Transparency
UN-REDD
PROGRAMME


REDD+ in a UNFCCC/IPCC context
IPCC basic equation to estimate CO2 emissions:
EMISSION ESTIMATE
ACTIVITY DATA
EMISSION FACTOR
UN-REDD
PROGRAMME


REDD+ MRV basic elements
Context
Emission and removals from forests IPCC basic method
IPCC elements
System elements
System Specifications
UN-REDD
PROGRAMME


REDD+ MRV – Activity Data (area changes)
Activity Data
NFI
Satellite Land Monitoring System
UN-REDD
PROGRAMME

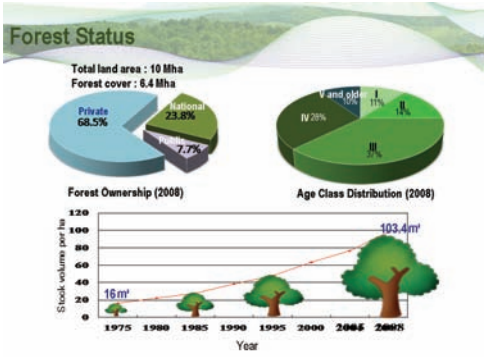
The UN-REDD Programme
Quick start countries
Africa: DR Congo, Tanzania, Zambia
Asia & Pacific: Indonesia, PNG, Vietnam
L. America : Bolivia, Panama, Paraguay
UN-REDD
PROGRAMME

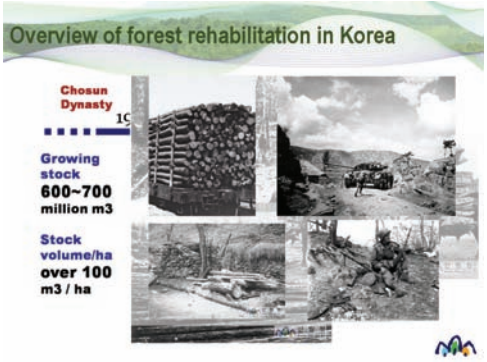
The UN-REDD programme is
open to other countries
UN-REDD
PROGRAMME

(Appendix 5.6.4)

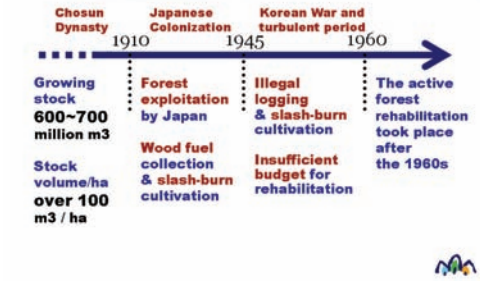
Climate Change Policy of Korea Forest Service

Mr. Youngkyoon Yoon
Korea Forest Service





Overview of forest rehabilitation in Korea



Degraded forests

Opening of the Korea Forest Service in 1967

Gupabal, Seoul in the 1950s

1st and 2nd National Forest Plans (1973~1987)

『Forest Rehabilitation Project』

Successful Rehabilitation
- Successful rehabilitation in 2.1 million ha of degraded forests

Planting Campaign
- Planting Campaign in March and April

Fuel Forests
- Creation of fuel forests for rural and mountain villagers

3rd National Forest Plan (1988~1997)

『Develop forests as commercial resources』

Plantation and Tending
- Creating 0.32 million ha of commercial plantations
- Tending 3.03 million ha of forests

Infrastructure
- Forest road construction, mechanized forestry system, and education and training programs for regional foresters

3rd National Forest Plan (1988~1997)

『Develop forests as commercial resources』

Mountain villages
- Comprehensive mountain villages development project

Overseas plantation
- Overseas plantation project

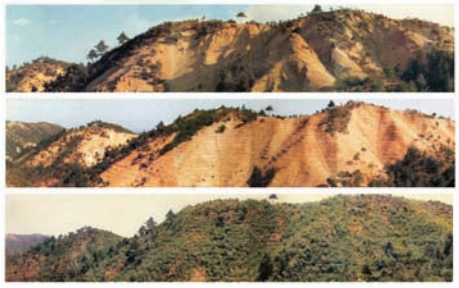
Non-marketable services
- Creation of recreational forests
- Wildlife protection

4th National Forest Plan (1998~2007)

『Pursue Sustainable Forest Management』

- Introduction of SFM as principle
- More focus on economic values
  → Promoting multi-valued aspects of forest : ecosystem, environment, recreation, urban forests, economy, etc.
- Government-led forest management
  → Privately oriented activities
- Legal and institutional regulations for the SFM system

Before / After



Now

Worldwide Recognition

FAO Unasylva (1981)

- The Republic of Korea embarked on a four-fold programme in 1973… The programme succeeded beyond expectations.

Lester Brown (2008)

- S.Korea is a reforestation model for the world. We can reforest the earth.

Achim Steiner (2008)

- Highly praised the successful rehabilitation in Korea (Executive Director of UNEP, 10th Ramsar Convention)

III. Climate Change Response in Forestry Sector

Background

- The central government established the Comprehensive Plan on Combating Climate Change (September, 2008)
- The Korea Forest Service developed the Forestry Strategies for Coping with Climate Change (December, 2008)

Strategies in forestry sector(G7)

1. Green UP	Expand forest sink
2. Green Cycle	Promote the use of sustainable forest biomass
3. Green Trading	Establish a framework for forest carbon trading
4. Green Care	Climate change adaptation
5. Green Governance	Establish climate change governance
6. Green Inventory	Greenhouse gas inventory in the forestry sector
7. Green Partnership	Establish regional partnership in East Asia

G1. Expansion of forest carbon sink

- Improvement of forest management through forest tending projects
  - 5-year Forest Greening Project (2009~2013, 1.25 Mha)
- Development of new species for forests with low carbon sink capacity
  - Regida pine, old growth forests
- Forest planting in fallow land
  - 2,000ha of fallow land planted every year and the expansion of urban forests

G2. Use of sustainable forest biomass

- Promotion of biomass use
  - Increase the number of pellet mills (40 mills by 2013)
  - Promote the use of pellet boilers (37,000 units installed by 2013)
- Promotion of wood use
  - Develop and promote Korean-style wood housing, using environmentally sound construction materials
  - Introduce a certification scheme for wood products, public campaigns to promote wood utilization

Forest Carbon Cycle Town (G2 Cont'd)

- Model for low-carbon society
  - Secure wood sources from the "bio-cycle" forest in vicinity of the town
  - Produce and supply pellets and electricity from the harvested wood to establish an independent energy source
  - Maintain carbon balance through wood housing
  - Create 40 forest carbon cycle towns by 2013

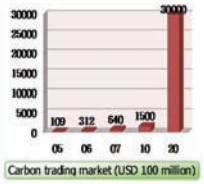
The Carbon Cycle

BedZED in UK

Biomass town in Japan

G3. Framework for forest carbon trading

- Domestic A/R CDM pilot projects('09~'12)
  - Development of PDD(Project Design Document)
  - Registration at UN(CDM Executive Board)
- Pilot projects of Carbon offset



Carbon trading market (USD 100 million)

G4. Climate change adaptation

- Mitigating fragile forest ecosystem
  - Long-term monitoring ⇒ predict changes
  - Species conservation projects according to each climatic zone
- Minimizing the reduction in productivity
  - Securing seed sources of warm-temperate species
  - Management of existing high-income products
- Preventing and mitigating forest disasters
  - Reducing forest fires, land slides, pests and diseases

G5. Climate change governance

- Strengthening partnerships between the Korea Forest Service and local governments
  - Joint implementation of regional projects (Green Partnership)
  - Leadership programs on climate change for local government heads
- Carbon Neutral Program
  - The offsetting of carbon-emissions by building carbon balance forests through the involvement of the general public and the private sector

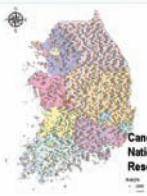
Estimate carbon emissions

Provide opportunities for counter reduction/ offset

Maintain carbon balance by tree planting

G6. GHG inventory in the forestry sector

- Establishment of LULUCF inventory in preparation for potential reduction commitments in the future
  - DB on forest resources, forest management and land-use change
  - Carbon uptake factor of each species and GHG inventory



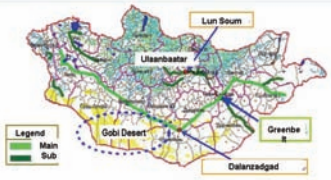
Candidate Sites for National Forest Resources Survey

G7. Establish regional partnership in East Asia

- Forestry bilateral cooperation with 11 countries

Greenbelt Plantation Project

- To mitigate and combat desertification and DSS through the Greenbelt Plantation Program in Mongolia
  - Duration & Budget : 2007~2016, 9.5M USD
  - 3,000ha plantation, Dalanzadgad, Lun Soum

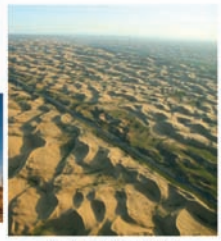


Plantation Project in Kubuchi Desert

- Kubuchi Desert is located in inner Mongolia
- Korean NGO 『Future Forest』 is implementing a plantation project with Chinese Government

Poplar trees planted.

After the roots have been settled. Ecosystem begins to restore.



Arial View of the Plantation: Plantation on the sides of the road.

Tsunami attack in Aceh, Indonesia

- Ecosystem restoration through the rehabilitation of the mangrove forest damaged by tsunami, 2005~2008, 1.8M USD

Tsunami attack in Aceh, Indonesia (cont'd)

Mangrove Information Center, established on April 15, 2008

Planting mangrove

Joint Research on A/R CDM and REDD Pilot Project in Indonesia

- Period : 2008 ~ 2012 (5years)
- Location : Indonesia
- Activities
  - Collecting and sharing information on carbon sink related activities in the forestry sector through A/R CDM and REDD

Potential site for A/R CDM
- Small scale A/R CDM pilot project

Forest Rehabilitation of Arid Region in Central Myanmar

- Period : 2008~2010 (Third phase)
- Location: Mandelei Province, Myanmar
- Budget: 1.5M USD
- Activities:
  - Forest rehabilitation (150ha) and post management
  - Office building construction

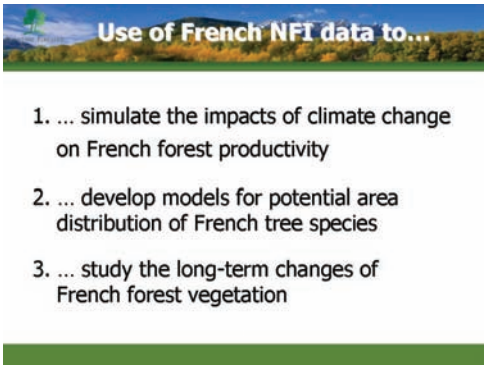
Thank you.

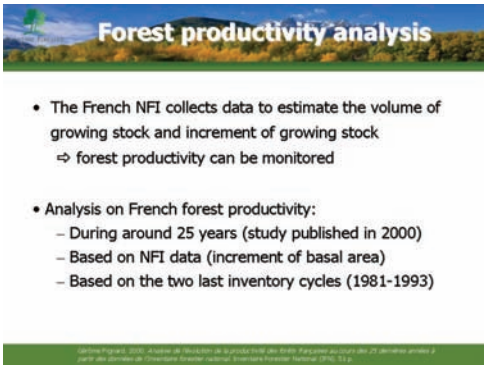
5.7 Presentation Materials of Session 2

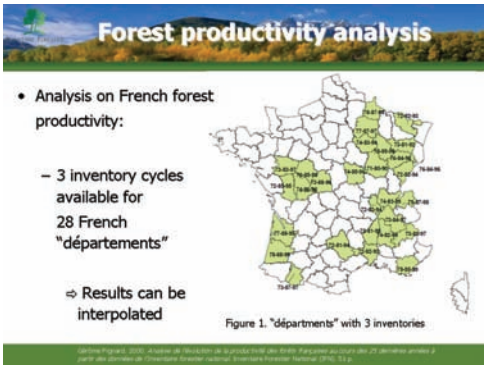
(Appendix 5.7.1)

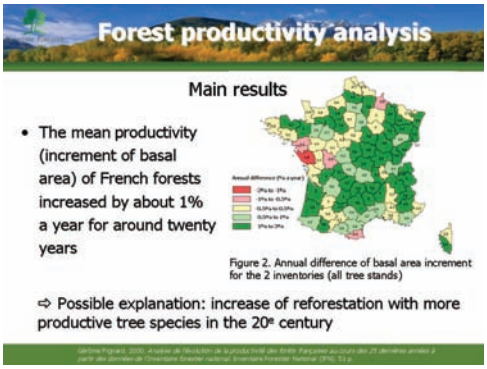
Why is NFI important to mitigate climate change?

Mr. Claude Vidal
France National Forest Inventory









Forest productivity analysis

Results by tree species

- Conifers have more increased than broadleaves

  ⇨ Possible explanation: productivity varies during stand life. The maximum value depends of tree species and fertility:

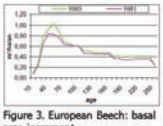


Figure 3. European Beech: basal area increment

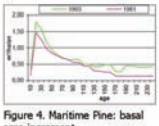


Figure 4. Maritime Pine: basal area increment

⇨Phenomenon reduced by correlation with the age effect

Forest productivity analysis

Results by tree species

- Even with age correction Maritime Pine (*Pinus pinaster*) and European Silver Fir (*Abies alba*) have a rate of 2% a year

  ⇨Maritime Pine: due to silvicultural intensification

  ⇨European Silver Fir: just after a regression period. Possible explanation: hard weather conditions (drought in 1976)

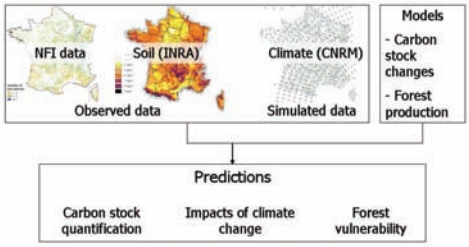
Forest productivity analysis

Results by tree species

Analysis of the 3 inventory cycles, difference in productivity (increment of basal area) for the past 20 to 25 years:

- Maritime Pine: 1.6 à 2 % a year
- European Silver Fir, Norway Spruce (Picea abies), Coast Douglas-fir (Pseudotsuga menziesii): 1 à 1.3 % a year
- Sessile Oak (Quercus petraea), Pedunculate Oak (Quercus robur), European Beech (Fagus sylvatica): 0.7 à 0.8 % a year
- Scots Pine (*Pinus sylvestris):* 0.4 à 0.6 % a year

CARBOFOR Project



Forest productivity simulation

Hypotheses

- Climate scenario: rise in temperatures for all seasons and rise in winter rainfall. High decrease of soil water availability, except in winter

- Phenology model: on average in a century bud break comes early. Decrease of frost hazard. Significant regional differences

Forest productivity simulation

General conclusions

- Long-term simulation of forest potential production:

  ⇨ Intensive management scenario and the most fertile sites are the most sensitive to climate change

  ⇨ Positive response to the climate scenario

  ⇨ Broadleaves take more advantage of climate change than conifers. Possible explanation: increase in their vegetation season

Forest productivity simulation

Analysis of regional effects

⇨ Positive effects in the North part of France (soil moisture regime less affected by climate change).

⇨ Positive effects decrease from East to West. Negative productivity anomaly in the West side.

⇨ In the South of France the drought effect is more important than the effect of CO2 and the increase of the growth season

Forest productivity simulation

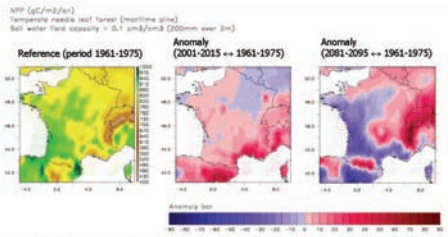


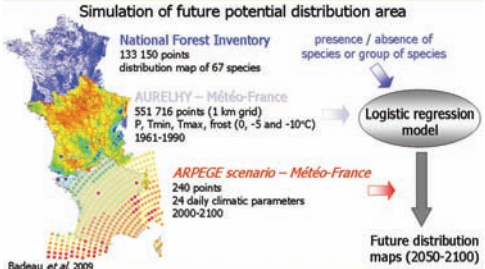
Figure 5. Net primary production of Maritime Pine with available water capacity = 200mm

Use of French NFI data to...

2. ... develop models for potential area distribution of French tree species

Future tree species distribution

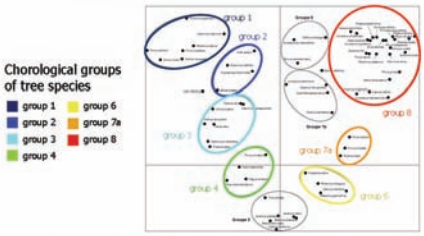
Simulation of future potential distribution area



Badeau *et al.* 2009

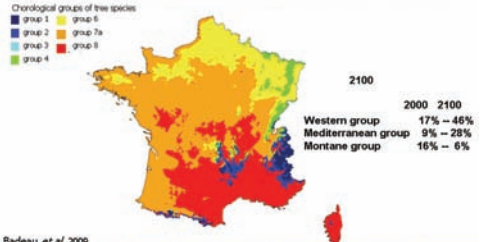
Future tree species distribution

Climate characteristics and presence of species



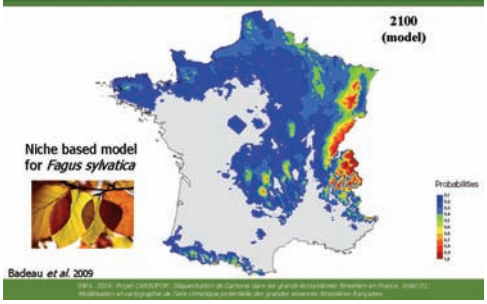
Future tree species distribution

Model of main biogeographical regions based on NFI data



Badeau *et al.* 2009

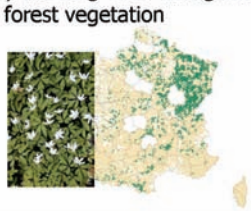
Future tree species distribution



Badeau *et al.* 2009

Use of French NFI data to...

3. ... study the long-term changes of French forest vegetation



Modifications of forest vegetation

- The NFI collects systematically ecological data since 1992 (since 1985 in North East of France)
- Study carried out in the "Ardennes primaire" forest region because 2 inventory cycles are available: 1987 and 1998
- Aim of the study: to confirm the previous observations = eutrophication and acidification of herbaceous plants in the Northe East of France

Modifications of forest vegetation

Results

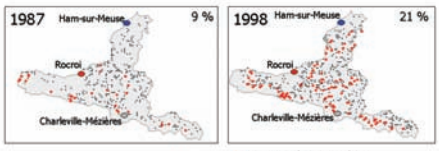
• Table 1. Number of tree species from March to August

	Number of species by plot	Number of plots	Total number of species
1987	9.8	319	126
1998	12.3	273	163

• Species frequency: between the two inventory cycles changes in species frequency range from -5% to +19%.
Increase in species which colonize forest cuts (*Rubus fruticosus*) and sub-Atlantic species (*Ilex aquifolium*)
Decrease in old forest species (*Viola reichenbachiana*)

Modifications of forest vegetation

Ilex aquifolium expansion in northeastern France



• Presence of *Ilex aquifolium*
• NFI plots with ecological data

Dupouey et al., 2001

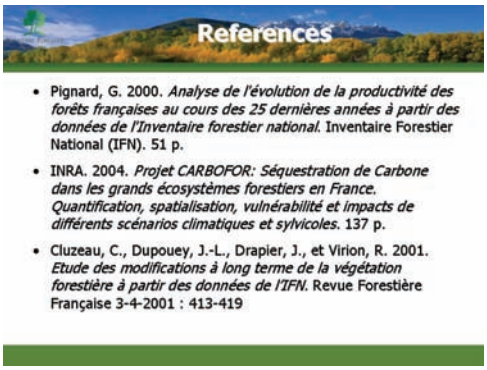
Modifications of forest vegetation

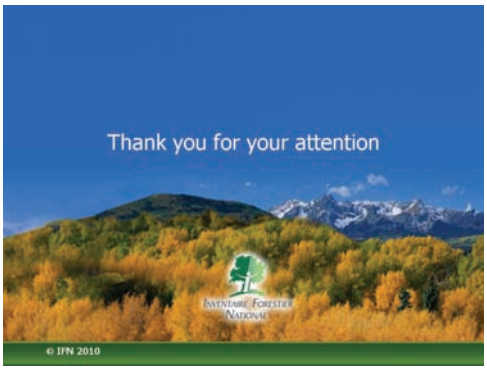
Ilex aquifolium expansion in northeastern France

Mean temperature of the coldest month

	1978/1987	1989/1998
Charleville-Mézières	-0,1°C	+2,1°C
Rocroi	-1,8°C	+0,6°C
Ham-sur-Meuse	-0,4°C	+1,8°C

Dupouey et al., 2001


References
• Pignard, G. 2000. *Analyse de l'évolution de la productivité des forêts françaises au cours des 25 dernières années à partir des données de l'Inventaire forestier national.* Inventaire Forestier National (IFN). 51 p.
• INRA. 2004. *Projet CARBOFOR: Séquestration de Carbone dans les grands écosystèmes forestiers en France. Quantification, spatialisation, vulnérabilité et impacts de différents scénarios climatiques et sylvicoles.* 137 p.
• Cluzeau, C., Dupouey, J.-L., Drapier, J., et Virion, R. 2001. *Etude des modifications à long terme de la végétation forestière à partir des données de l'IFN.* Revue Forestière Française 3-4-2001 : 413-419


Thank you for your attention
INVENTAIRE FORESTIER NATIONAL
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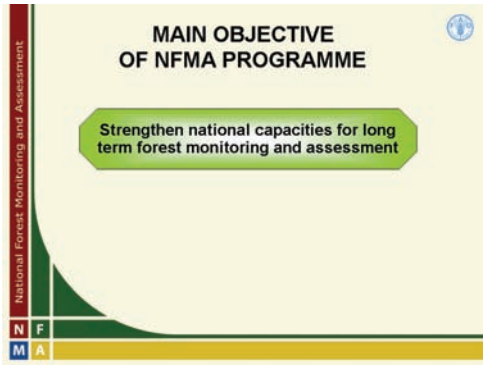
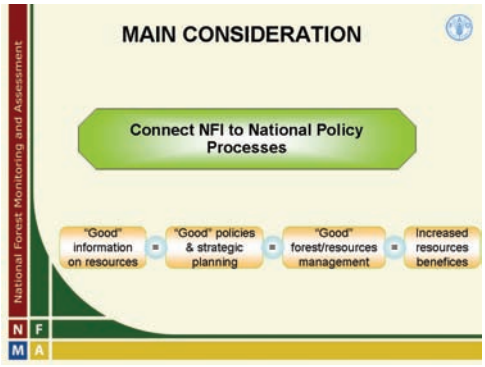
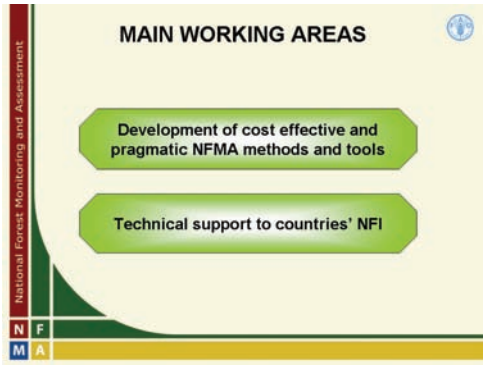
(Appendix 5.7.2)

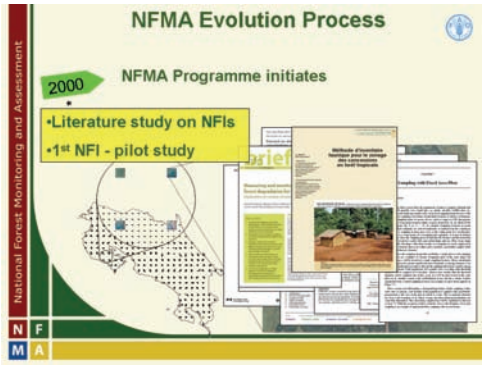
Evolution of FAO NFMA

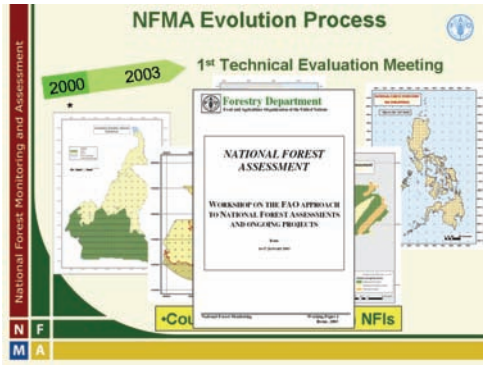
Mr. Dan Altrell
FAO

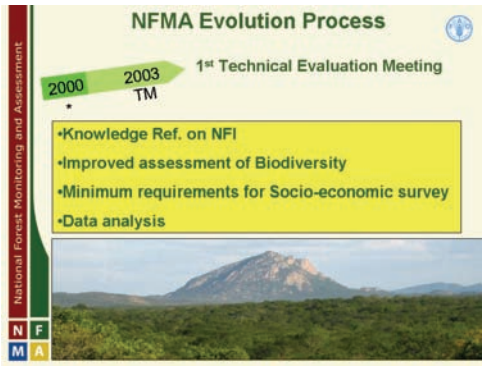


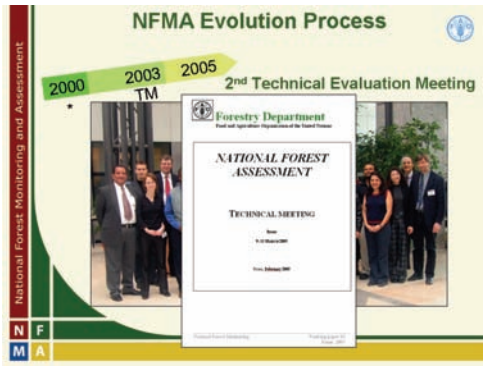


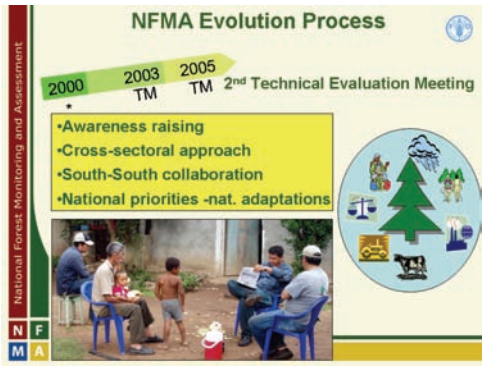


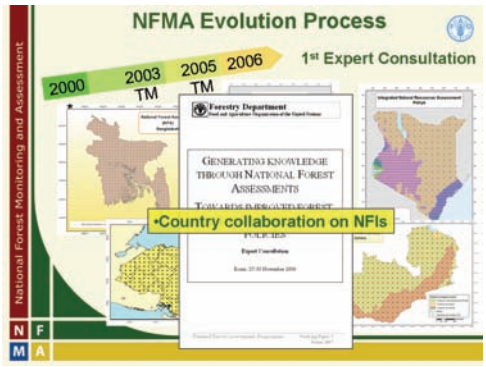




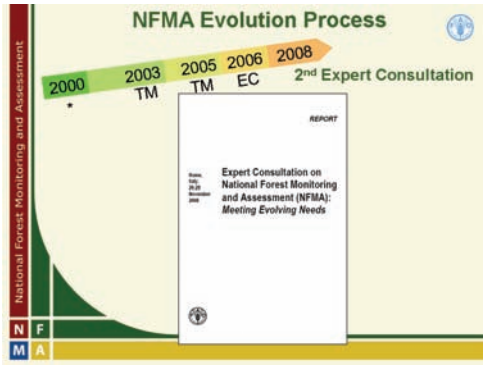

NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
1st Technical Evaluation Meeting
•Knowledge Ref. on NFI
•Improved assessment of Biodiversity
•Minimum requirements for Socio-economic survey
•Data analysis
N F
M A

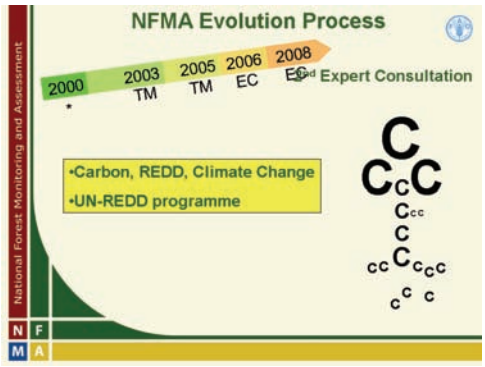

NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
2005
2nd Technical Evaluation Meeting
Forestry Department
NATIONAL FOREST ASSESSMENT
TECHNICAL MEETING
N F
M A

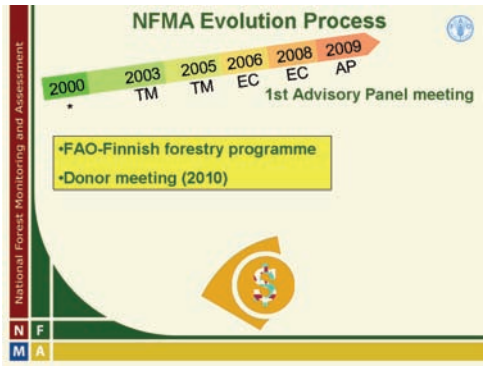

NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
2005
TM
2nd Technical Evaluation Meeting
•Awareness raising
•Cross-sectoral approach
•South-South collaboration
•National priorities -nat. adaptations
N F
M A

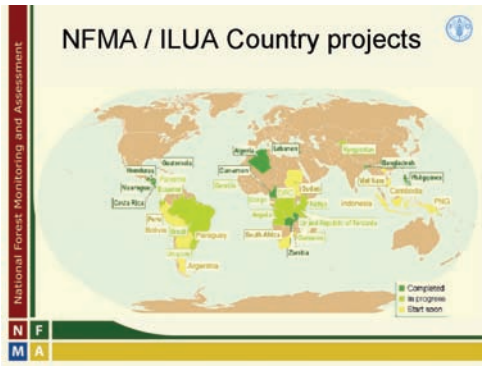

NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
2005
TM
2006
1st Expert Consultation
Forestry Department
GENERATING KNOWLEDGE THROUGH NATIONAL FOREST ASSESSMENTS
•Country collaboration on NFIs
N F
M A

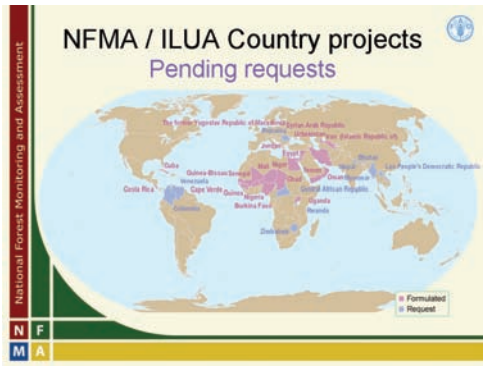
NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
2005
TM
2006
EC
1st Expert Consultation
•Support to NFI Experts Networks
N F
M A


NFMA Evolution Process
National Forest Monitoring and Assessment
2000
2003
TM
2005
TM
2006
EC
2008
2nd Expert Consultation
REPORT
Expert Consultation on National Forest Monitoring and Assessment (NFMA): Meeting Evolving Needs
N F
M A


National Forest Monitoring and Assessment
NFMA Evolution Process
2000
2003 TM
2005 TM
2006 EC
2008 EC
Expert Consultation
•Carbon, REDD, Climate Change
•UN-REDD programme
N F
M A


National Forest Monitoring and Assessment
NFMA Evolution Process
2000
2003 TM
2005 TM
2006 EC
2008 EC
2009 AP
1st Advisory Panel meeting
•FAO-Finnish forestry programme
•Donor meeting (2010)
N F
M A


National Forest Monitoring and Assessment
NFMA / ILUA Country projects
Completed
In progress
Start soon
N F
M A


National Forest Monitoring and Assessment
NFMA / ILUA Country projects
Pending requests
Formulated
Request
N F
M A

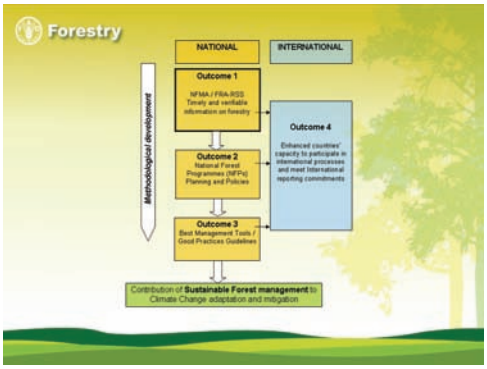
National Forest Monitoring and Assessment
Further information on NFMA
http://www.fao.org/forestry/site/nfma
National Forest Monitoring and Assessments - NFMA
N F
M A

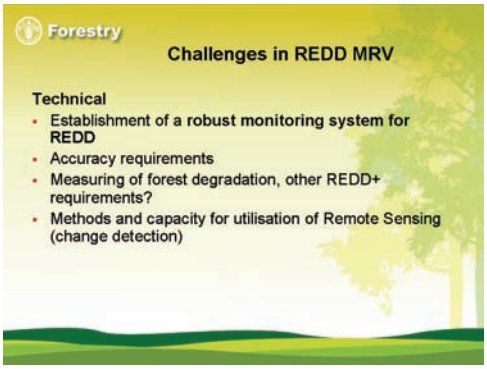
National Forest Monitoring and Assessment
Thanks!
N F
M A

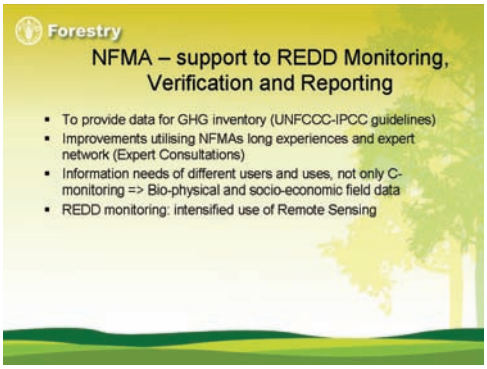
(Appendix 5.7.3)

FAO - Finnish program & support in the Asia countries

Mr. Mikko Leppanen
FAO



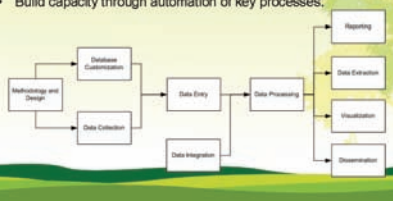




Forestry

National Forest Information Systems

- Assist countries to manage and analyse own data
- Country needs and constraints paramount
- Build on experience of best-of-class systems
- Cooperation partner: Google
- Build capacity through automation of key processes:



Forestry

Support to NAFORMA (Tanzania)

On-going Expert support to NAFORMA:

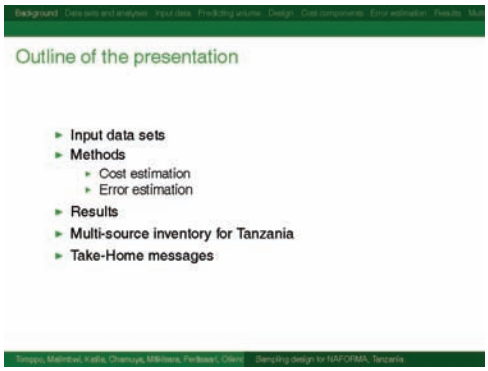
- Planning and design of the inventory
- Tailoring and improvement bio-physical and socio-economic methodology
- Training of the office and the field staff
- Technical support in mapping, RS, data analysis, data collection etc.
- Quality control system

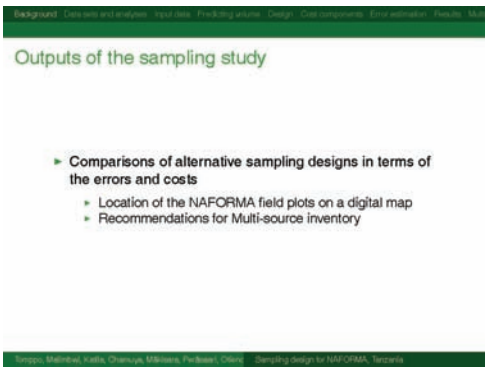
Later:

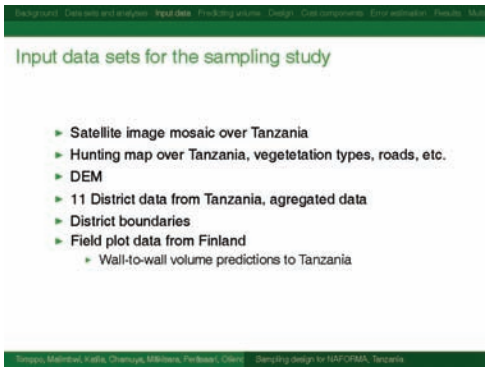
- field data collection, data analysis – multisource inventory (RS, Lidar), information system development and reporting
- Support to NFP? Forest legislation?
- SFM good practice guidelines: Fire management, plantations

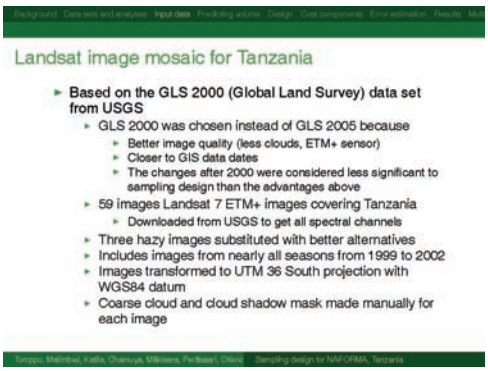
Sampling design for NAFORMA, Tanzania.

Mr. Mikko Leppanen
FAO

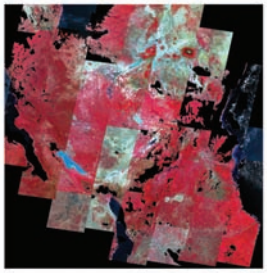




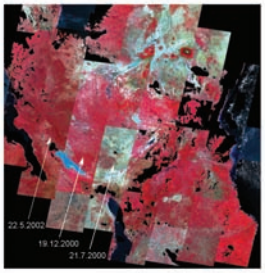




Mosaic of Landsat Images (Top Of Atmosphere)



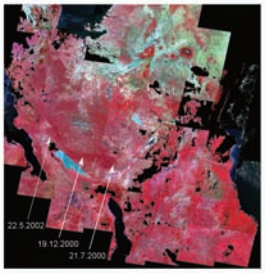
Mosaic of Landsat Images (Top Of Atmosphere)



Atmospheric correction of the images

- MODIS MOD 09 product used as reference
  - Surface reflectance computed from images during eight days
  - MODIS Aqua composite from 26.2.-5.3.2003 was used
    - The least cloudy alternative
  - Similar correction was done for the Finnish images using MODIS Aqua composite from 4.7.-8.7.2002
  - A transformation from the digital numbers of each Landsat image to the MODIS image was determined for Landsat channels 1 - 6
    - The mean and standard deviation were matched taking into account the different resolutions of the materials
  - The correction does force the image spectral measurements from the different imaging conditions and phenological state to same numeric scale
    - Not physically correct but usable
- The final mosaic size 41800 columns by 43044 rows (21 gigabyte image)

Mosaic of Atmospherically Corrected Landsat Images



Predicting volume of growing stock

Non-linear robust model for volume

- The parameters were estimated using Finnish data, top of atmosphere reflectance, with atmosphere calibration, and non-linear estimation
- The final model after the calibration with the 11 District data is, see the next slide

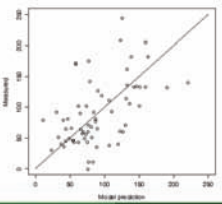
$$vol = c * exp(a + b_1 * band_3/band_2 + b_2 * band_7/band_5) + \epsilon$$

where c=1.2146, a=15.943, b_1=-29.3802 and b_2=3.2762

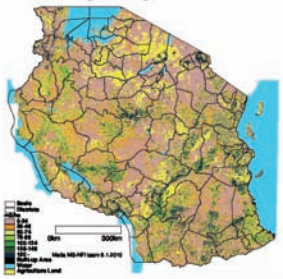
- The model explained 75 % of the volume variation
- Other variables, such as brightness, greenness, wetness, were also tested

Volume calibration

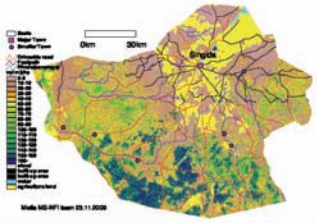
- The volumes were calibrated using 11 District data and a linear calibration
- The fit after calibration



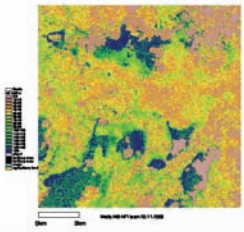
Predicted volume of growing stock



Predicted volume of growing stock, Singida District

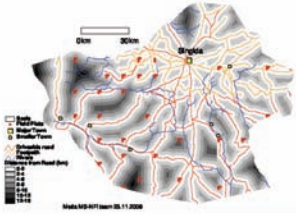


Predicted volume of growing stock, 10 km × 10 km

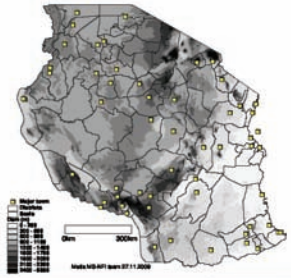


Re-classified vegetation types based on Hunting map, Singida District

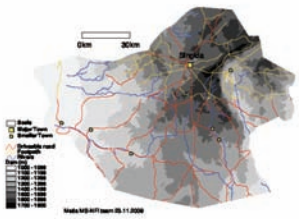
Input data, distance to the nearest road, Singida District



Input data, DEM



Input data, DEM, Singida District

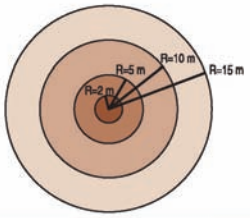


Elements of a design

- Sample plot size and shape
- Spatial layout of the plots
  - Detached plots / plot clusters
  - Distances between the plots
  - Distances between possible clusters
- The solution is far from trivial and depends also on the parameter in question, area estimate, volume estimate, estimate of rare events
- Practical things must be taken into considerations, cost, the measurement unit should be a work-load of one day for a field crew

Field plot

A concentric field plot in cluster designs, max radius 15 m was selected on the basis of the earlier local tests



Species name and dbh of all measured trees will be recorded in each plot in the following manner

1) Within 2 m radius: all trees with dbh > 0 cm will be recorded
2) Within 5 m radius; all trees with dbh > 5 cm will be recorded
3) Within 10 m radius; all trees with dbh > 10 cm will be recorded
4) Within 15 m radius; all trees with dbh > 20 cm will be recorded

Variogram and semivariance, tools to assess plot distances

Variogram of a process Z, e.g., mean volume of the growing stock

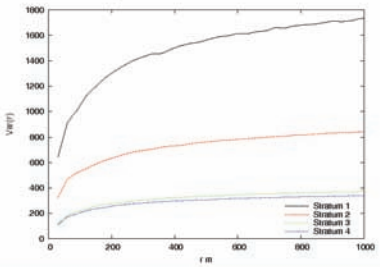
$$2\gamma(x,y) = E\left(|Z(x) - Z(y)|^2\right)$$

$\gamma(x,y)$ is called semivariogram.

A robust estimate for semivariance

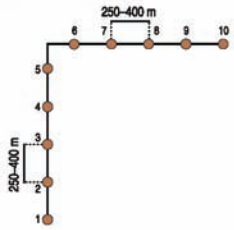
$$\hat{\gamma}(r) = \frac{(1/N(r)\sum_{S(r)}|y_i - y_j|^{1/2})^4}{0.914 + 0.988/N(r)}$$

Semivariances of predicted volume in strata 1-4

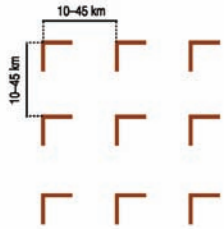


A field plot cluster, with plot distances to be tested

A distance of 250 metres was confirmed with sampling studies



Field plot clusters with basic starting distances



Summary of components considered in time calculations

- Driving to a cluster from the lodgement (50 min)
- Walking in the field (with GPS) to a cluster and along the cluster, walking speed depending on the Hunting map vegetation class
- Measurement of a plot, estimated time per plot according to Hunting map vegetation class
- Daily pause: lunch break and 'other actions' on field (60 min)

Walking distance and time, cont

Figure 3. The minimum Euclidean distance (910 m) from the road to the closest field plot of a NFI cluster. The mean volume of growing stock of multi-source NFI.

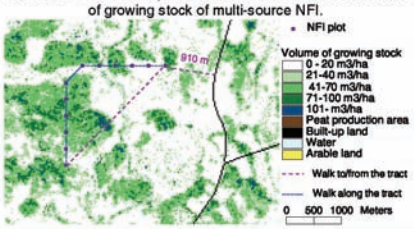


Table 4. For systematic cluster samples of L-shape, following walking speed assumptions and average plot measurement times were used, broken down to 'Hunting map' vegetation classes.

VEGCODE		Pre-strat	VEGNBR DESCRIPTION / vegtype	walk speed, min/km.	plot meas min
Fn	10	1	Natural Forest	60	40
Fm	11	1	Mangrove Forest	40	40
Fp	12	1	Plantation Forest	20	40
Wu	23	2	Woodland (unspecified density)	30	30
Wc	20	1	Closed Woodland	30	30
Wo	21	2	Open Woodland	30	30
WSc	22	3	Woodland with Scattered Cropland	30	30
Bu	30	3	Bushland (Unspecified Density)	30	25
Bd	31	3	Dense Bushland	30	25
Bo	32	4	Open Bushland	15	25
BSc	33	4	Bushland with Scattered cropland	30	25
B(et)	34	5	Bushland with Emergent Trees	30	25
Bt	35	3	Thicket	40	40
Bt(et)	36	3	Thicket with Emergent Trees	40	40
Gw	40	4	Wooded Grassland	15	25
Gb	41	5	Bushed Grassland	30	25
Go	42	6	Open Grassland	15	15
GSc	43	6	Grassland with Scattered cropland	25	15
Gws	50	5	Wooded Grassland (Seasonally inundated)	25	25
Gbs	51	5	Bushland Grassland (Seasonally inundated)	25	25
Gos	52	6	Open Grassland (Seasonally inundated)	25	15
Cm	60	3	Mixed Cropping	25	20
Ctc	61	2	Cultivation with Tree crops	25	20
Ctc(st)	62	2	Cultivation with Tree crops (with shade trees)	25	20
Cbc	63	5	Cultivation with Bushy Crops	25	20
Chc	64	6	Cultivation with Herbaceous crops	25	15
BSL	70	6	Bare Soil	30	10
SC	71	6	Salt and Crusts	40	10
RO	72	6	Rock Outcrops	40	10
ICE	73	6	Ice cap - snow	200	10
Ocean	91	7	Ocean	200	0
IW	90	7	Inland Water	200	0
S/M	54	5	Swamp/Marsh (Permanent)	100	15
Ua	80	6	Urban Areas including air fields	10	10

Steps taken in determining error estimates

- Select a set of potential sampling designs
- For each design, simulate a large number of samples, e.g., 1000, with different starting points on the volume and land cover map
- Calculate estimates from each sample
- Calculate the standard deviation of the estimates, it can be considered as a sampling error

The parameters for which the errors were studied

a) Area of land classes (ha), grouped Hunting map strata 1-3 ('forest') 1-6 (wooded land)
b) Mean tree stem volume of growing stock (m^3/ha), Hunting strata 1-3 and 1-6
c) Total volume of growing stock (m^3), Hunting strata 1-3 and 1-6

Examples of possible alternative sampling designs

1. NFMA design, a NFMA tract distance in both latitude and longitude is one degree, and its desified versions
2. Systematic cluster designs with a plot distance of 250 m apart from each other (no stratification)
3. Stratified cluster designs, the clusters distances and the number of the plots per cluster vary by strata

Double sampling for stratification

- The selected statistical framework was Double sampling for stratification, see, e.g., Cochran (1977)
- A dense grid of clusters were overlaid over Tanzania using equal distances of 5 km x 5 km between the clusters
- Cluster level mean volumes were calculated per land
- Cluster level costs (times) were calculated
- The clusters were classified into classes for the second phase sample
- The second phase is a sub-sample of the first phase sample and will be measured in the field
- Several class numbers and class intervals were tested
  - In the selected classification, 4 volume classes and 3 cost classes were used
    - The volume intervals were determined using 'optimal classification' by Neyman, see Cochran (1977)

Double sampling for stratification, cont

- The sampling intensities in different strata were selected using optimal allocation and are proportional to the the quantity (Cochran, 1977)
  - $$s^t/\sqrt{c}$$

  where
  s is within stratum standard deviation of the mean volume of the growing stock on land on a cluster
  c is the average costs (measurement) time of a cluster
  t an exponent to be determined to control the effect of the s on the strata weights (intensities)
- The densities were adjusted to different total cost levels, and are presented here for 1, 2.5 and 4 million US dollars
- The final estimates are based on measured variables from the second phase sample and area estimates of the strata based on the first phase sample

Table 5. The stratification used for first phase clusters, the number of clusters in the 1st phase sample and the sampling densities ("thinning") used in the second phase

Stratum	Measurement time of a cluster min	Mean volume on land m^3/ha	Median slope of plots °	1st phase clusters	Sampling density for 2nd phase
1.	0-<480	0-27	0-10	3080	12
2.	0-<480	27<-61	0-10	626	10
3.	0-<480	61<-118	0-10	254	8
4.	0-<480	>118	0-10	83	2
5.	480-<960	0-27	0-10	8852	13
6.	480-<960	27<-61	0-10	7282	12
7.	480-<960	61<-118	0-10	4149	9
8.	480-<960	>118	0-10	896	4
9.	960-	0-27	0-10	2252	20
10.	960-	27<-61	0-10	2766	17
11.	960-	61<-118	0-10	2033	13
12.	960-	>118	0-10	673	5
13.	0-<960	0-61	10<-20	741	7
14.	0-<960	>61	10<-20	738	4
15.	960-	0-61	10<-20	165	13
16.	960-	>61	10<-20	598	5
17.	0-	0-118	>20	243	6
18.	0-	>118	>20	94	4

Double sampling for stratification, cont

- The cluster sizes and the rough land area estimates by strata are
  - strata 1-12, 10 plots, land area 83 mill. ha
  - strata 13-16, 8 plots, land area 4.6 mill. ha
  - strata 17-18 6 plots, land area 0.5 mill. ha
- The error estimates and plot numbers are presented for three levels of total costs, as given above, 1, 2.5 and 4 million US Dollars
  - The rough areas of 1-6 and 1-3 classes are 77.4 and 49.8 million hectares and the volumes 4 and 3 billion m^3
- The result are presented also for Singida District
  - The rough areas of 1-6 and 1-3 classes are 1.9 and 1.2 million hectares and the volumes 102 and 74 million m^3

The number of the plots on land, on wooded land, on 'forest land', total costs and variation of coefficients (cv) (100*error/estimate) for four different designs for entire Tanzania.

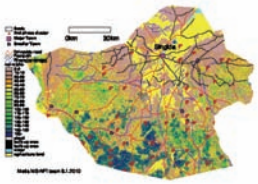
	1 Mill. USD	2.5 Mill. USD	4 Mill. USD
Plots on land	13 011	32 551	52 536
Plots on 1-6	11 635	29 086	47 133
Plots on 1-3	7 806	19 472	31 704
Crew days	2 517	6 259	10 189
Costs (USD)	1,006,648	2,503,600	4,075,421
CV			
-Area 1-6	0.77	0.44	0.33
-Area 1-3	1.88	1.16	0.81
-Mean vol 1-6	0.99	0.60	0.48
-Mean vol 1-3	1.54	0.85	0.69
-Total vol 1-6	0.81	0.53	0.42
-Total vol 1-3	1.81	1.12	0.86

The number of the plots on land, on wooded land, on 'forest land', total costs and variation of coefficients (cv) (100*error/estimate) for four different designs for Singida. The designs correspond about 2 and 2.5 mill. USD for entire Tanzania.

	1 Mill. USD	2.5 Mill. USD	4 Mill. USD
Plots on land	228	544	887
Plots on 1-6	204	484	795
Plots on 1-3	139	334	561
Crew days	50	107	169
Costs (USD)	19,928	42,677	67,630
CV			
-Area 1-6	8.61	4.33	3.29
-Area 1-3	17.86	9.78	7.80
-Mean vol 1-6	7.88	4.75	3.86
-Mean vol 1-3	13.65	6.94	5.47
-Total vol 1-6	8.32	4.33	3.87
-Total vol 1-3	15.08	9.78	5.92

The location of the plots in a stratified design, 33471 plots, about 3500 clusters

The location of the plots in a stratified design, Singida District

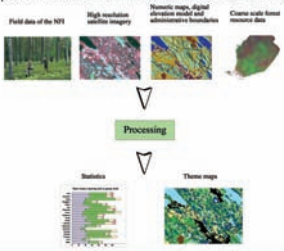


Multi-source NAFORMA for Tanzania

- The objectives
  - To be able to calculate forest resource information for smaller than what is possible using field data only, i.e., District level
    - All parameters are needed, statistics, wall-to-wall maps
  - To make the NAFORMA more cost-efficient
- **The feasibility of different remote material should be thoroughly investigated keeping in mind the needs, forest management, REDD/MRV, etc.**
  - In addition to medium resolution space-borne optical data RS data and LiDAR, high or very high resolution RS space-borne optical data could be competitive

The multi-source NAFORMA, cont

Output: small area estimates and wall-to-wall maps



Take-Home messages and conclusions

1. The data and methods for preparing a sampling design for Tanzania
2. Plan the forest inventory and monitoring system thoroughly, including the roles of field data and remote sensing data as well as field sampling design
3. Tailor the system for local conditions
4. Use internationally accepted, unique definitions to make the estimates comparable between countries
5. With a thorough and tailored planning, you can get much more detailed and accurate information, and with reduced costs compared to the situation without planning

Take-Home messages and conclusions, cont

6. A statistically sound method to allocate more measurements for areas with a high volume variation and low measurement cost and vice-versa
7. The combination of field data and remote sensing data is always efficient - field data ARE ALWAYS MANDATORY
8. With a thorough planning, you can, and YOU MUST GET, 'many birds by one stone', examples are
   - information for forestry
   - information for REDD/MRV purposes
   - information for international reporting
   - This is always necessary, even more when the resource are limited

A few References

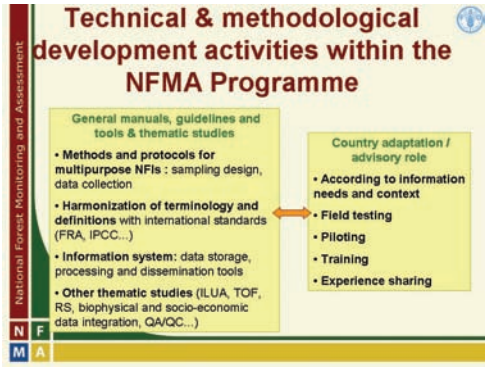
- Tomppo, E., Gschwantner, Th., Lawrence, M., McRoberts, R.E. (Eds.) National Forest Inventories - Pathways for Common Reporting. 1st Edition., 2010, XXVI, 612 p. 10 illus. in color., Hardcover. Springer. ISBN: 978-90-481-3232-4
  - Includes National Forest Inventories for over 40 countries, covering more than 2.4 billion of the forests of the Globe. (All major forest countries, Brazil, Canada, China, Russia, USA, etc, plus about 30 European countries
  - The roles of NFIs in GHG reporting is described for each country
- Tomppo, E., Haakana, M., Katila, M. & Peräsaari, J. 2008. Multi-source national forest inventory - Methods and applications. Managing Forest Ecosystems 18. Springer. 374 p.

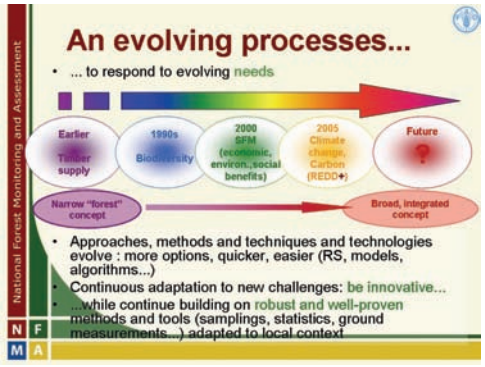
We sincerely thank the Organisers and Audience!

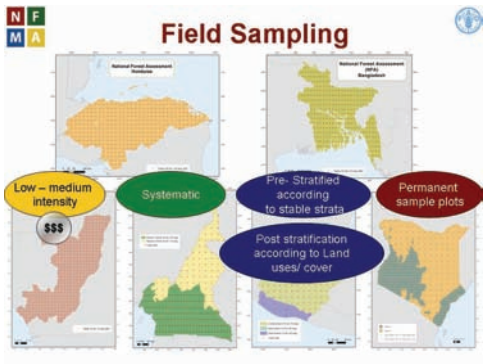
(Appendix 5.7.4)

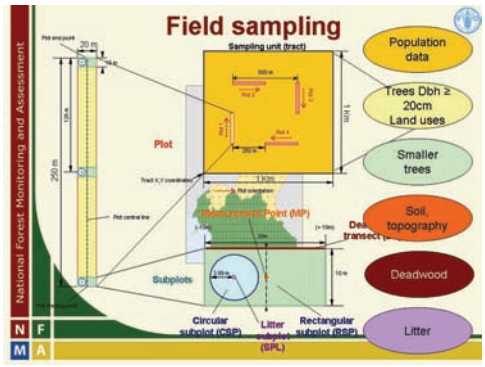
FAO - Methodology and Cost Analysis of FAO NFMA

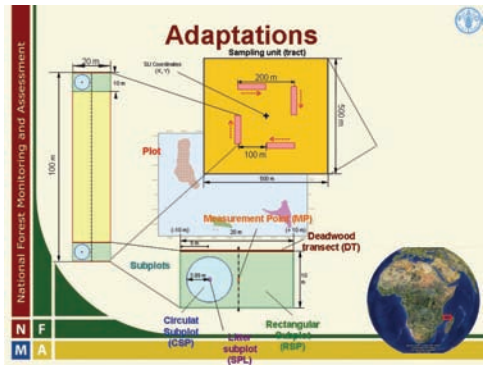
Ms. Anne Branthomme
FAO

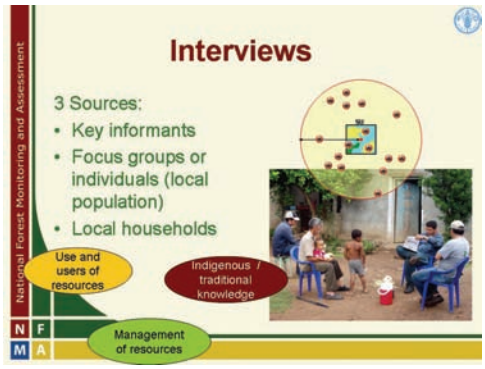


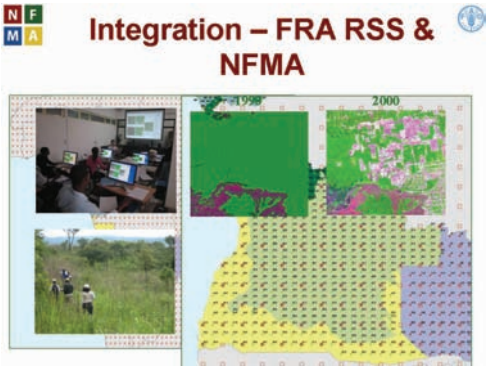


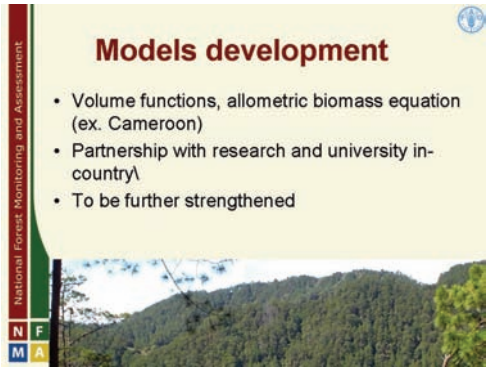

Field Sampling
Low – medium intensity
$$$
Systematic
Pre- Stratified according to stable strata
Permanent sample plots
Post stratification according to Land uses/ cover


Field sampling
National Forest Monitoring and Assessment
Sampling unit (tract)
Plot
Subplots
Population data
Trees Dbh ≥ 20cm Land uses
Smaller trees
Soil, topography
Deadwood
Litter
Circular subplot (CSP)
Rectangular subplot (RSP)


Adaptations
National Forest Monitoring and Assessment
Sampling unit (tract)
Plot
Subplots
Deadwood transect (DT)
Circular subplot (CSP)
Rectangular subplot (RSP)


Interviews
National Forest Monitoring and Assessment
3 Sources:
• Key informants
• Focus groups or individuals (local population)
• Local households
Use and users of resources
Indigenous / traditional knowledge
Management of resources

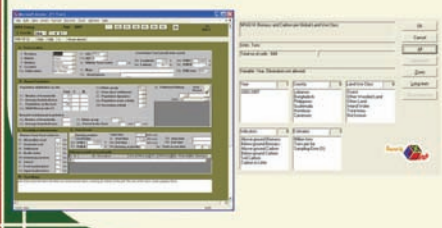

Integration – FRA RSS & NFMA
1998
2000


Models development
National Forest Monitoring and Assessment
• Volume functions, allometric biomass equation (ex. Cameroon)
• Partnership with research and university in-country\
• To be further strengthened

Products: Guidelines and training material

Products: Country reports on NFMA findings, policy analysis

Products: databases and web-based dissemination

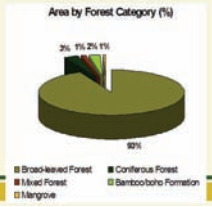


Data addressing all the 7 thematic elements of SFM

- Extent of forest resources
- Biological diversity
- Forest heath and vitality
- Productive function of forest resources
- Protective functions of forest resources
- Socio-economic functions
- (Legal, policy and institutional framework)

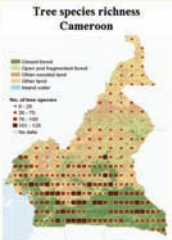
Data on extent of forest resources

- Area of forest
- Forest area change



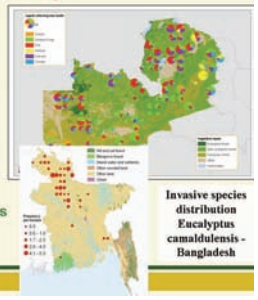
Data on biological diversity

- Number and types of tree species
- Forest structure
- Observations on fauna and flora
- Threatened species / IUCN Red list



Data on forest health and vitality

- Invasive species
- Crown / tree condition
- Causative agents
- Environmental problems (severity, trends)
- Fire disturbances (area, type)
- Human disturbances
- Insect pests and diseases



Invasive species distribution Eucalyptus camaldulensis - Bangladesh

National Forest Monitoring and Assessment

N F
M A

Data on the productive functions of forest resources

- Commercial timber volume
- Harvested products
- Tree species providing products
- NWFP
- End-use of the product
- Demand and supply trends
- Period and frequency of harvesting

National Forest Monitoring and Assessment

N F
M A

Data on the protective functions of forest resources

- Assessment of forest areas designated for protective purposes
- Environmental services provided by forests and TOF (water conservation...)
- Correlation with data on the occurrence of environmental problems (erosion, floods...)

National Forest Monitoring and Assessment

N F
M A

Data on social-economic functions

- Contribution of forest to livelihood
- User rights / conflicts
- Gender
- Ownership / land & forest management
- Cultural, spiritual and recreational value

National Forest Monitoring and Assessment

N F
M A

Data on legal framework

- Awareness and compliance of forest legislation
- Awareness of forest incentives

National Forest Monitoring and Assessment

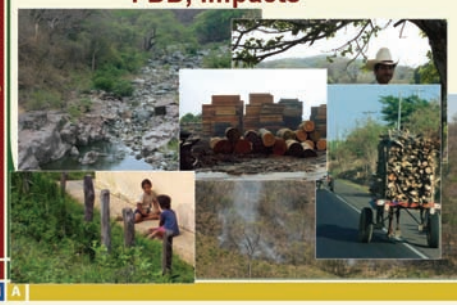
N F
M A

Data on Carbon

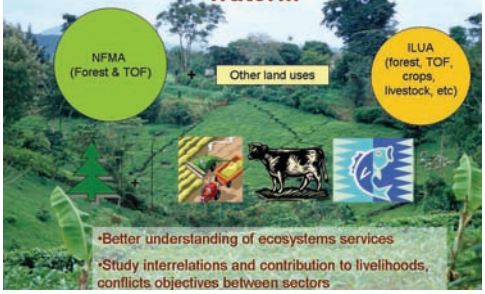
National Forest Monitoring and Assessment

N F
M A

Safeguards, Driving forces of FDD, impacts



ILUA: data on crops, livestock, water...



- Better understanding of ecosystems services
- Study interrelations and contribution to livelihoods, conflicts objectives between sectors

NFMA Process – time frame and costs

Activities of a typical NFMA project

- Preparation and management
- Capacity building
- Procurement of equipment
- Awareness raising
- Mapping
- Field survey
- Technical assistance
- Supervision
- Data entry
- Processing
- Reporting

NFMA actual or estimated budget

Country	Area (km2)	Funding (US$)		
		FAO	Government + donors	Total
Costa Rica	22,960	150,000	0	150,000
Guatemala	108,890	228,000	232,000	460,000
Philippines	300,000	250,000	300,000	550,000
Cameroon	475,440	224,000	314,648	538,648
Lebanon	10,100	314,000	200000	514,000
Bangladesh	144,000	352,000	168,000	520,000
Zambia	752,610	413,495	755,614	1,169,109
Honduras	112,090	402,938	97,514	500,452
Kenya	580,370	372,000	217,000	589,000
Algeria *	2,381,740	200,000	200,000	400,000
Congo	342,000	284,000	500,000	784,000
Angola	1,246,700	394,000	940,000	1,334,000
Kyrgyzstan	199,900	330,000	300,000	630,000
Nicaragua	130,000	218,000	850,000	1,068,000
Brazil**	8,514,880	440,000	55Mill.	56 Mill
Tanzania ***	945,090	0	3,811,000	3,811,000
Comoros ***	1,860	378,000	100,000	478,000
Gambia ***	11,300	440,000	100,000	540,000

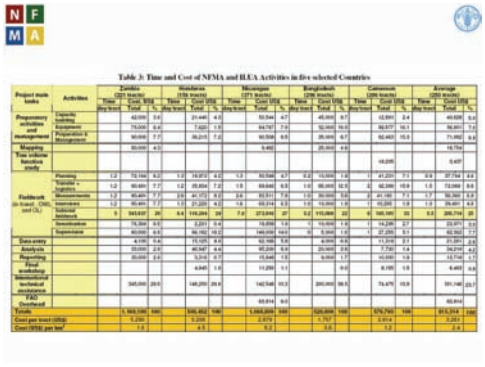


Table 3: Time and Cost of NFMA and ILUA Activities in five selected Countries

NFI Experiences on Costs, Time and Quality

National Forest Monitoring and Assessment

Items	Zambia	Honduras	Nicaragua	Bangladesh	Cameroon	Average
Sample size (SU number)	221	156	371	296	206	250
Precision of national level results	4-10%	13-17%	n.a.	17 – 45%	3-7%	Field + RSS
Total budget (M US$)	1.2	0.5	1.1	0.5	0.6	0.8
% fieldwork	29	24	27	22	32	25
Cost / Sample unit (US$)	5,300	3,200	2,900	1,800	2,600	3,300
Cost / km² (US$)	1.6	4.5	8.2	3.6	1.2	2.4

Breakdown of costs per selected activity

Items	ILUA	NFMA				
	Zambia	Honduras	Nicaragua	Bangladesh	Cameroon	Average
Total cost of fieldwork (USD)	343,636	118,204	273,016	115,000	185,105	205,714
% Fieldwork/ Total project budget	29.4	23.3	25.6	22.1	34.4	25.4
% Measurement/ Fieldwork	26.3	34.8	30.6	26.1	22.2	27.4
% Measurements/ Total project budget	7.7	8.1	7.8	5.8	7.6	7.0
% International TA	29.5	29.3	13.3	38.5	13.8	23.1
% Supervision National Consultants	6.8	19.0	14.0	1.0	5.1	8.1
% Equipment	6.4	1.5	7.9	10.0	16.1	7.8
% Preparation and Management	7.7	7.2	8.5	6.7	15.3	8.1

Breakdown of time per activity

Country	Number of inventoried tracts	Total project duration (months)	Fieldwork				% of total field work time				
			No of field teams	No of team members*	Effective months	% of total duration	Planning	Transfer	Measurement	interviews	Total
Bangladesh	296	33	10	3	5	11	6.1	31.3	31.3	31.3	100
Cameroon	206	24	8	6	7	13	18.3	36.1	36.5	9.1	100
Honduras	156	24	11	2	9	16	20.3	18.8	40.6	20.3	100
Nicaragua	371	24	24	3	7	8	18.6	21.4	37.1	22.9	100
Zambia	221	45	10	4	6	11	25	25	25	25	100
Average	250	30	12.6	3.6	6.8	11.8	17.7	26.5	34.1	21.7	100

* The number is related technical staff. Each team has at least one or two workers to guide and to help the technic staff

For further information

www.fao.org/forestry/site/nfma

National Forest Monitoring and Assessment

Thank you
for your attention

National Forest Monitoring and Assessment

(Appendix 5.7.5)

Long history - USA NFI program

Mr. John Coulston
USDA Forest Service

United States NFI Program:
A Long History of Inventory and Monitoring

John Coulston
US Forest Service

Outline

- Overview of the US Forest Service Forest Inventory and Analysis program
  - Basic sampling scheme
  - Variables collected
  - Use of remotely sensed data
  - Forest survey design tools
- Use of Forest Inventory and Analysis data for planning and policy
  - US Greenhouse Gas Inventory
  - Forecasting

Mission

"make and keep current a comprehensive inventory and analysis of the present and prospective conditions and requirements of the renewable resources of the forest and rangelands of the United States"

- 1928 McSweeney/McNary Act
- 1978 Research Act

The US Forest Inventory and Analysis program (FIA) is charged with this mission.

The FIA Vision

- **Provide an integrated inventory and monitoring program capable of providing scientifically reliable indicators of sustainable forestry**
  - including measures of the extent, condition, and trends in forest and rangeland ecosystem status and health in a timely and consistent manner across all ownerships

Statistical Survey:
A Method To Fulfill The Mission

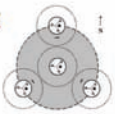
- The sampling grid is based on a global sampling scheme and a common plot design.
- A core set of measurements are made consistently across all plots.
- The National Land Cover Database (derived from Landsat TM, ETM imagery) is used to post-stratify observations.
- Standard design-based estimators (post-stratification) are used to report means and totals for attributes of interest.
- Each estimate has an accompanying standard error.
- Estimates are combined to meet a wide-range of reporting efforts across spatial scales

Global Sampling Grid

Truncated Icosohedron

North American Hexagon

248,832 area density intensification
(1 plot / 2430 ha)



Large footprint plot layout

U.S. Forest Inventory Status – across 10 time zones

Field Data Collected

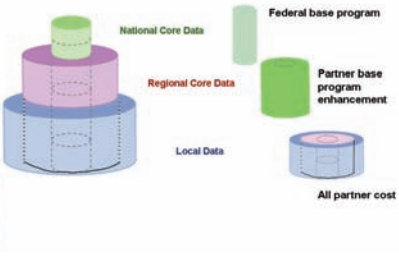
- Plot/subplot identification and location
- Observed condition (within subplots)
  - *land cover, ownership, forest type, stand age, size class, productivity class*
  - *origin, slope, aspect, physiographic class, disturbance*
- Observed tree attributes
  - *location*
  - *species, status, lean, diameter, height, crown ratio, crown class, damage, decay*
- Observed forest health variables on 1/16 subset of plots
  - *Crown condition, soils, down woody material, understory vegetation, lichen communities*
- Additional survey components
  - *Timber Products Output survey, National Woodland Owners survey, Ozone Biomonitoring*

FIA Has a History of Delivery Since 1928

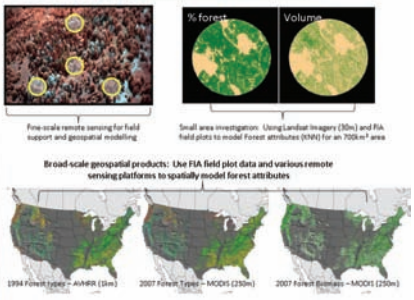
260+	STATE INVENTORIES
9	NATIONAL ASSESSMENT OF FORESTS 1953, 1963, 1970, 1977, 1987, 1992, 1997, 2002, 2007
3	NATIONAL WOODLAND OWNER STUDIES 1978, 1994, 2006
100's	PRIMARY MILL AND UTILIZATION STUDIES
3	SATELLITE FOREST COVER MAPS 1993, 1997, 2007

FIA reports from local to global

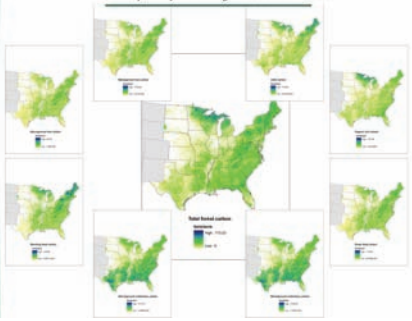
FIA is Adaptable to Address Regional And Local Issues



FIA Integration With Remote Sensing



Next Generation Integrated Field Plot - Remote Sensing Products: Spatially Modelling Forest Carbon Pools



Forest Survey Design Tools For Finer Scale Inventories

- In some situations forests within the United States require more precise information than is provided by the base FIA program.
- A survey design tool has been developed to aid in designing forest surveys but is adaptable to any spatial extent.
- Goals of the tool
  - Provide forest staffs with a method for identifying monitoring needs, and to specify sampling design to balance cost and precision in order to address monitoring questions.
  - Evaluate existing plot-based resource data to determine whether they are sufficient to answer the questions.
  - Identify unmet information needs and sample sizes to meet precision requirements and estimate acquisition costs.

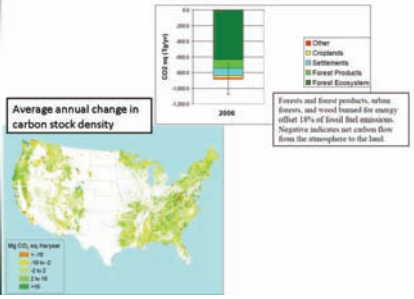
Outline

- ✓ Overview of the US Forest Service Forest Inventory and Analysis program
  - ✓ Basic sampling scheme
  - ✓ Variables collected
  - ✓ Use of remotely sensed data
  - ✓ Forest survey design tools
- Use of Forest Inventory and Analysis data for planning and policy
  - US Greenhouse Gas Inventory
  - Forecasting

FIA's Data and Products In Support of the US Greenhouse Gas Inventory

- Greenhouse Gas Inventory:
  - Identifying and quantifying sources and sinks of greenhouse gases is key to understanding climate change.
  - This inventory adheres to both
    - a comprehensive and detailed set of methodologies for estimating sources and sinks of anthropogenic greenhouse gases
    - a common and consistent mechanism that enables Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to compare the relative contribution of different emission sources and greenhouse gases to climate change.
  - The US EPA leads the overall greenhouse gas inventory however FIA data serves as one of the primary data sources for estimates of sequestration and flux from the forest sector.
- Forests in the conterminous US are sequestering about 700 Tg CO_2 Eq. (Teragrams, or million metric tons) in 2006, with uncertainty of ± 23% at the 95% confidence interval.

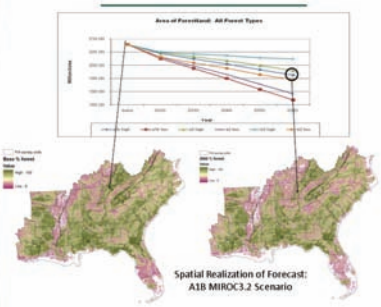
FIA's Data and Products In Support of the US Greenhouse Gas Inventory



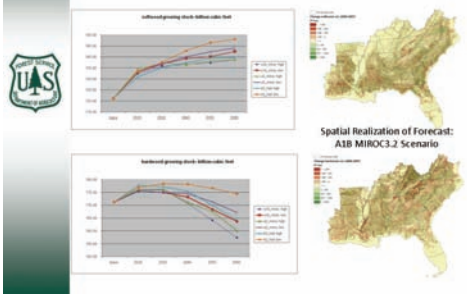
FIA's Data and Products as a Tool For Planning and Policy

- Inventory projection:
  - As the Nation's continuous forest census, our program projects how forests are likely to appear 10 to 50 years from now.
  - This enables us to evaluate whether current forest management practices are sustainable in the long run and to assess whether current policies will allow the next generation to enjoy America's forests as we do today.
  - Projections of forest resources, under different scenarios, provide vital information to government and industry for strategic planning.
- Examples from the Southern Forest Futures Project. The IPCC scenarios provide the cornerstones for these projections.

FIA's Data and Products as a Tool For Planning and Policy: Forecasted Forestland Area Under Various IPCC Scenarios



FIA's Data and Products as a Tool For Planning and Policy



Additional Information and Contributors

- USDA Forest Service Forest Inventory and Analysis: http://fia.fs.fed.us/
- National Inventory and Monitoring Applications Center: http://www.nrs.fs.fed.us/nimac/
- Southern Forest Futures project: http://www.srs.fs.usda.gov/futures/
- Forest Service Carbon work: http://www.nrs.fs.fed.us/carbon/
- Contributors: Brad Smith, Chip Scott, Linda Heath, Ty Wilson, Ron McRoberts, Bobby Huggett, Dave Wear

(Appendix 5.7.6)

Strengthening MAR : FAO - Japan program

Mr. Masahiro Otsuka
FAO Regional Office for Asia and the Pacific

Strengthening Monitoring, Assessment and Reporting on Sustainable Forest Management in Asia (GCP/INT/988/JPN)

Outcomes and perspectives of the MAR-SFM Project

(GCP/INT/988/JPN)

January 2006 – December 2010

Monitoring, Assessment, Reporting (MAR) on Sustainable Forest Management (SFM)

FAO Regional Office for Asia and the Pacific

Bangkok, Thailand

Project outline

- April 2006 – December 2010 (more?)
- Funded by Government of Japan
- Support harmonized forest monitoring, assessment and reporting (MAR)
- Asia-Pacific region
- Global activities: guidelines/frameworks
- National activities: networks, consultations, training, pilot testing

Regional workshops

- Land Cover Classification System (Dehradun, December 2006)
- National Forest Inventory (Beijing, March 2007)
- Pacific workshop (Nadi, October 2007)
- Database workshop (Rome, October 2007)
- Mid-term review (Bangkok, September 2008)
- Reporting harmonization (KL, October 2008)
- C&I training (KL, Vientiane, 2009/2010)

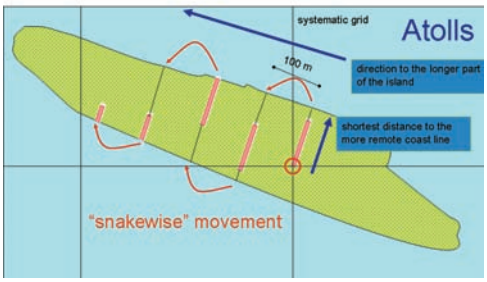
Regional activities in 2009

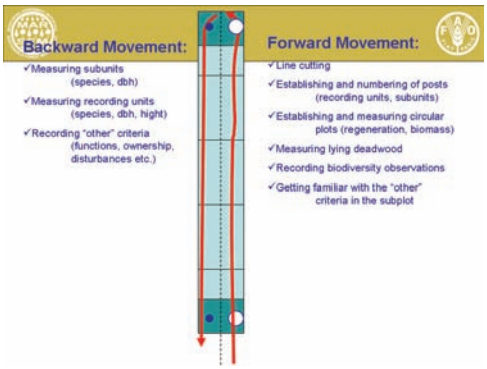
- Overall coordination and planning
  - Recruitment of a consultant on database management
  - Collaboration with International Workshop on National Forest Inventory (Dehradun, April)
  - Workshop planning (with HQs divisions)
    - ✓ Harmonized database management
    - ✓ Harmonized field monitoring
    - ✓ Reporting harmonization
  - Coordination with Group on Earth Observation (GEO)

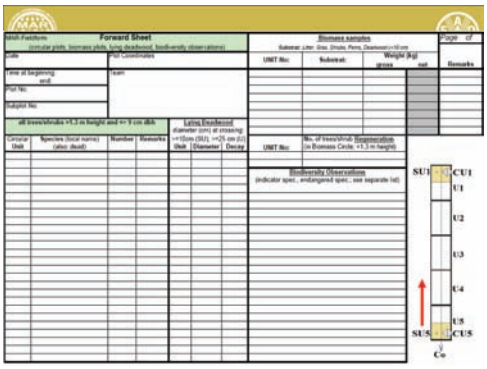
Sub-regional activities in 2009

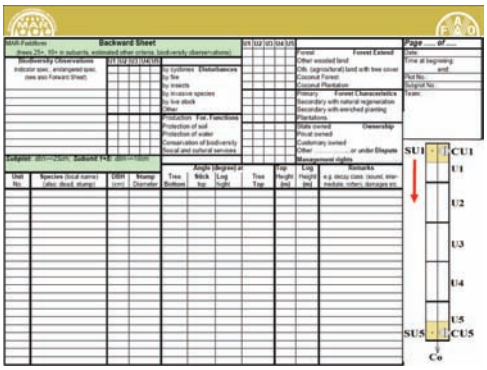
- Training workshop on Criteria and Indicators for SFM – ASE
  - Assessme
  - Online C&
  - Suggestio
- Follow-up I
  - Study of r
  - Assessme
  - Field studi
  - Planning of a training workshop

Monitoring Concept | How to monitor?



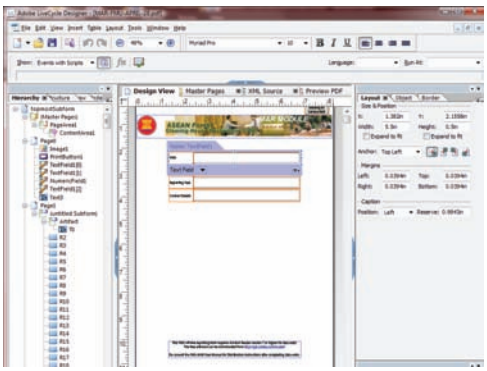






What is offline MAR format?

- *Offline MAR format was created with Adobe LiveCycle Designer EX 8.2 (part of Adobe Acrobat 9 Pro).*
- *The software allows anyone to create or modify dynamic (interactive) PDF forms from scratch or based on other documents or web pages.*
- *To modify, Adobe LiveCycle Designer should be installed in your computer.*



National activities in 2009

- 10 countries: Bangladesh, Bhutan, Cambodia, India, Mongolia, Myanmar, PNG, Philippines, Vanuatu, Vietnam
  - Under process: Brunei Darussalam
- Studies
  - Development/application of national C&I systems
  - Harmonization of national reporting systems
- Workshops/meetings
  - Harmonized MAR systems
  - Development of national C&I systems
- Pilot testing/training
  - Application of C&I at national/local levels
  - Field hands-on training for application of C&I
- Enhancement of MAR networks

Products in 2009

- Proceedings of Workshop on Harmonization of National Reporting to International Processes
- Report on the Regional Training Workshop on Strengthening MAR on SFM in ASEAN
- Reports on MAR programmes
  - 4 countries
  - SPC
- Newsletter (4 issues)
- MAR Website (updated) (http://www.fao.org/forestry/mar)

Considerations/lessons

- Project period: May 2006 – December 2010?
  Freezing: January - April 2006 (FAO Reform)
  - Time for synthesis?
- HQs (global) or regional (decentralized) office?
  - Linkages with other related programmes or independent approaches
  - Interactions with countries
- Synergy v.s. flexibility in activities
  - Common FAO approach v.s. individual country approach
  - Diversity in monitoring v.s. compatibility in reporting
  - Global demands v.s. countries' needs
- Project scope – budget size/staffing
  - Focused approach v.s. comprehensive package
- Timing for inputs and sustainability
  - Internal coordination
  - Delayed activities

Planned activities in 2010

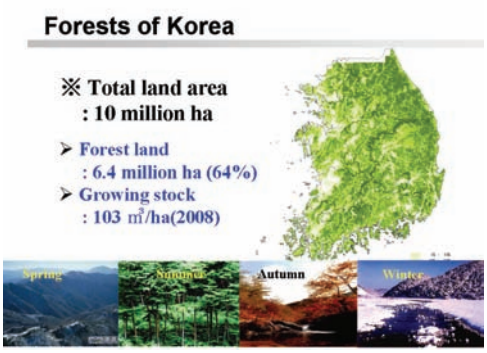
- Consultancy: database management
- Regional workshops: with FAO-HQs
  - Harmonized database management
  - Field monitoring techniques
  - Review of reporting and its harmonization
- Sub-regional/national programmes
  - Strengthening of networks
  - Development of MAR techniques (vegetation mapping, reporting systems, etc.)
  - Pilot testing of suggested MAR systems (C&I, etc.)
  - Training (C&I, etc.)
  - ➢ Synthesis of implementation
- Final project review

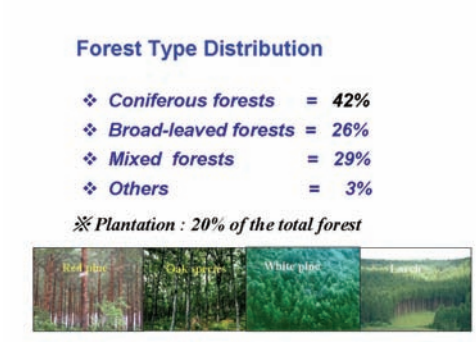
Thank you !

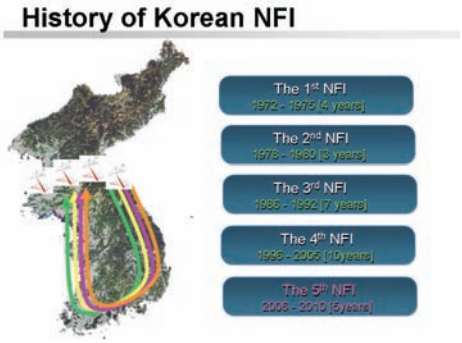
(Appendix 5.7.7)

New emerging sector : Korea NFI program

Mr. Sungho Kim
KFRI







Previous NFIs – How they worked

- Periodic inventory on 3~10 year intervals to know the status of forest resources
- Focused only on timber-related information
- Unable to monitor and assess forest changes over time
- Could not address the evolving information needs.

The 5th NFI (2006-2010)

➢ **Rationale for change from the 5th NFI**

- To meet increasing demands on reliable forest resources information
- To satisfy international reporting requirements ; SFM, UNFCCC/KP, FAO/FRA, etc.

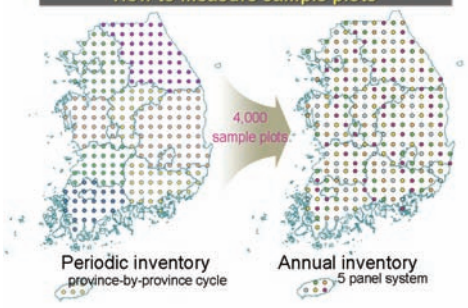
Summary of core changes in NFI 5

- Five-year inventory cycle with panel system
- New sampling and ground plot design
- More measurement variables
  - biomass, carbon stock, biodiversity, forest health, etc.
- Interagency collaboration
  - Forest Service, Forest Research Institute, and National Forest Cooperatives Federation (NFCF)
- Annual budget : US$ 2.5million for plot survey

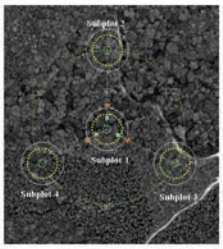
Sampling Design

- Systematic design on 4 x 4 km national grid
- Identify plot locations on digital orthophoto map
- Total forested plots : 4,000
  - sampling intensity : 0.01%
- Five panel system
  - one panel : 800plots

How to measure sample plots



Ground Plot Configuration



Permanent Sample Plot

- A cluster consisting of 4 subplots.
- Subplot : a tri-areal plot.
  - . large tree plot(16m, 0.04ha)
  - . basic tree plot(11.3m, 0.04ha)
  - . young tree plot(3m, 0.003ha)
- Microplots in 25% of the total
  - . vegetation plot(1m x 1m)
  - . soil plot(0.3m x 0.3m)

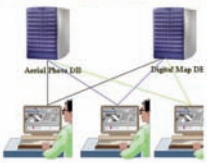
☞ only in subplot 1(center subplot)

Plot Measurement & Variables

Forest Type Map

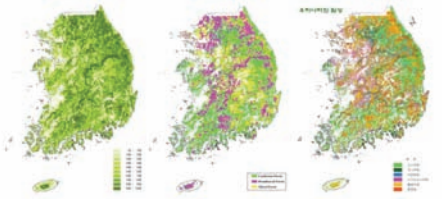
❖ *Aerial photo interpretation in*
tree species, dbh, age, and cr
to make digital forest type ma
(750 sheets at a scale of: 1/25

Forest Type Mapping Sys



Integration of 750 digital forest type maps

Forest Area *Forest Type* *Tree Species*



What information from NFI

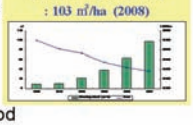
- Forest area(forest type mapping)
- Growing stock(NFI plots)
- Biomass(above/below-ground, deadwood)
- Carbon stock – five carbon pools
- Stand/tree growth
- Biodiversity – species, stand structure, etc.
- Forest damages, management activities, etc

NFI Results & Issues

Growing stock

- The 5th NFI for 2006-2008
  : 123.8m³/ha

The Statistical Yearbook of Forestry
: 103 ㎥/ha (2008)



✓ How to clarify it
✓ Statistical analysis method
- how to combine panel data.
- how to recalculate the previous statistics.
- how to estimate GS for small area(Gun).

(1) How to combine panel data

-Moving average

Year	Panel	No. of Plot	Growing Stock/ha	GS ㎥/year
2006	P1	800	120.8㎥	
2007	P2	800	125.4㎥	
2008	P3	800	123.8㎥	
2009	P4	800	12*.*㎥	
2010	P5	800	12*.*㎥	12*.*㎥/ha
2011	P1	800	㎥	㎥/ha
2012	P2	800	㎥	㎥/ha
2013	P3	800	㎥	㎥/ha
2014	P4	800	㎥	㎥/ha
2015	P5	800	13*.*㎥	13*.*㎥/ha

Annual inventory
- One panel will be measured every year.
- New panel data will replace the old

(1) How to combine panel data

-Moving average

Year	Panel	No. of Plot	Growing Stock/ha	GS ㎥/year
2006	P1	800	120.8㎥	
2007	P2	800	125.4㎥	
2008	P3	800	123.8㎥	
2009	P4	800	12*.*㎥	
2010	P5	800	12*.*㎥	12*.*㎥/ha
2011	P1	800	㎥	㎥/ha
2012	P2	800	㎥	㎥/ha
2013	P3	800	㎥	㎥/ha
2014	P4	800	㎥	㎥/ha
2015	P5	800	13*.*㎥	13*.*㎥/ha

Annual inventory
- One panel will be measured every year.
- New panel data will replace the old

(1) How to combine panel data

-Moving average

Year	Panel	No. of Plot	Growing Stock/ha	GS ㎥/year
2006	P1	800	120.8㎥	
2007	P2	800	125.4㎥	
2008	P3	800	123.8㎥	
2009	P4	800	12*.*㎥	
2010	P5	800	12*.*㎥	12*.*㎥/ha
2011	P1	800	㎥	㎥/ha
2012	P2	800	㎥	㎥/ha
2013	P3	800	㎥	㎥/ha
2014	P4	800	㎥	㎥/ha
2015	P5	800	13*.*㎥	13*.*㎥/ha

Annual inventory
- One panel will be measured every year.
- New panel data will replace the old

(1) How to combine panel data

-Moving average

Year	Panel	No. of Plot	Growing Stock/ha	GS ㎥/year
2006	P1	800	120.8㎥	
2007	P2	800	125.4㎥	
2008	P3	800	123.8㎥	
2009	P4	800	12*.*㎥	
2010	P5	800	12*.*㎥	12*.*㎥/ha
2011	P1	800	㎥	㎥/ha
2012	P2	800	㎥	㎥/ha
2013	P3	800	㎥	㎥/ha
2014	P4	800	㎥	㎥/ha
2015	P5	800	13*.*㎥	13*.*㎥/ha

Annual inventory
- One panel will be measured every year.
- New panel data will replace the old

(1) How to combine panel data

-Moving average

Year	Panel	No. of Plot	Growing Stock/ha	GS ㎥/year
2006	P1	800	120.8㎥	
2007	P2	800	125.4㎥	
2008	P3	800	123.8㎥	
2009	P4	800	12*.*㎥	
2010	P5	800	12*.*㎥	12*.*㎥/ha
2011	P1	800	㎥	㎥/ha
2012	P2	800	㎥	㎥/ha
2013	P3	800	㎥	㎥/ha
2014	P4	800	㎥	㎥/ha
2015	P5	800	13*.*㎥	13*.*㎥/ha

Annual inventory
- One panel will be measured every year.
- New panel data will replace the old

(2) Recalculation of the previous GS

- New GS : 123.8m³/ha
- Old GS : 103 m³/ha

Overlapping method suggested by IPCC GPG

y = new GS

x = previous GS

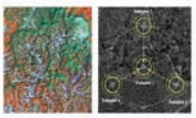
$$y_o = x_o \times \frac{\sum_{i=m}^{n} y_i}{\sum_{i=m}^{n} x_i}$$

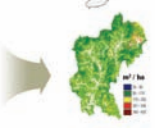
(3) Growing stock for small area(Gun)

- Sampling intensity : 0.01%

✓ Super county(Gun)
: combining with neighboring counties

✓ *k-nn* method
: satellite image + NFI data





Other challenging issues

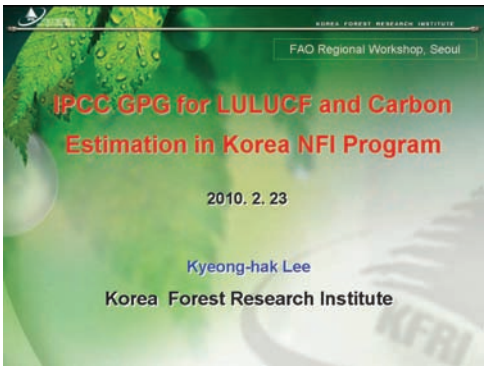
- Sampling design : cost-effective or not?
- Quality Assurance/Quality Control (QA/QC)
- Field manual improvement
- Database management and analysis system
- Statistical analysis procedure
- Re-measurement strategy
- Lack of human resources : field crew, statistician,

What to do for the future

(Appendix 5.7.8)

IPCC Good Practice Guideline for LULUCF & Carbon estimations in Korea NFI program

Mr. Kyunghwak Lee
KFRI



Contents

- Introduction
- IPCC GPG 2003 (LULUCF)
- GHG Inventory System in Korea
- National Forest Inventory System
- Emission/Removal Factors
- Challenges

Introduction

GHG Inventory under UNFCCC

- **Kyoto Protocol - Inventory Report**
  - **All the required items of GHG Inventory**
  - **Difference between submitted and adjusted estimates < 9%**
  - ➢ No meet => No RMUs (sink credits)
- **Post-2012 Climate Regime**
  - **Annex I - Measurable, Reportable, Verifiable Commitment**
  - **Non Annex I - Measurable, Reportable, Verifiable Action**
  - ➢ MRV <=> Credits/Incentives
- **Guidance for Post-2012 GHG Inventory Reporting**
  - **Requirement of Strict Guidance for Credits/Incentives**
  - ➢ IPCC GPG or 2006 IPCC GL

IPCC GPG LULUCF

Definition of Good practice inventories

- Contain neither over- nor under- estimates so far as can be judged
- Have uncertainties reduced so far as is practicable.

GPG is delivered by advice on choice of estimation method, quality assurance and quality control in the application of methods, documentation, archiving and estimation of uncertainties.

Contents of IPCC GPG LULUCF

- **LULUCF Sector GPG**
  - **6 land use categories (matrix)**
    - **forest land, cropland, grassland, wetland, settlement, & other land**
  - **5 carbon pools**
    - **above and below ground biomass, dead wood, litter, & soil**
  - **3 tiers for activity data & emission factors**
    - **default => country specific => model / forest inventory based**

Land Use Categories

- **Forest land**
  - All woody vegetation above national threshold
  - Must be sub-divided into managed and unmanaged
  - Could be divided by ecosystem, province, etc.
- **Cropland**
  - Includes agroforestry if biomass below national forest threshold
- **Grassland**
  - Includes rangeland, pasture, wild lands, recreational areas
  - Sub-divided into managed and unmanaged
- **Wetlands**
  - Covered by water for part of year and
  - Not forest, crop, grass or settlement
  - Sub-divided into managed (reservoirs) and unmanaged (rivers, lakes)
- **Settlements**
  - Includes developed areas, transportation and human settlements (not in another category)
- **Other**
  - Bare soil, rock, ice and any unmanaged land not included elsewhere
  - Used to allow identified areas to match total national area, where data allows

Land-use and Land-use change

- ***Forest land***
  - Forest land remaining Forest land
  - Land converted to Forest Land
- *Cropland*
  - Cropland remaining cropland
  - Land converted to cropland
- *Grassland*
  - Grassland remaining grassland
  - Land converted to grassland

❖ Similarly for wetlands, settlements, and other land

Development of Categories

- Put each land area in only one category
- Use existing data where possible
- Harmonise definitions between agencies
- Use GPG categories as top level with appropriate sub-divisions

Approaches for estimating land-use area and area changes

Approach 1: Basic land-use data

TABLE 2.3.1 EXAMPLE OF APPROACH 1: AVAILABLE LAND-USE DATA WITH COMPLETE TERRITORIAL COVERAGE

Time 1		Time 2		Land-Use Change between Time 1 and Time 2	
F = 18		F = 19		Forest =	+1
G = 84		G = 82		Grassland =	-2
C = 31		C = 29		Cropland =	-2
W = 0		W = 0		Wetland =	0
S = 5		S = 8		Settlement =	+3
O = 2		O = 2		Other =	0
Sum = 140		*Sum = 140*		*Sum =*	*0*

F = Forest Land, G = Grassland, C = Cropland, W = Wetland, S = Settlement, O = Other. Numbers represent area units (Mha in this example.)

Approach 2: Survey of land-use and land-use change

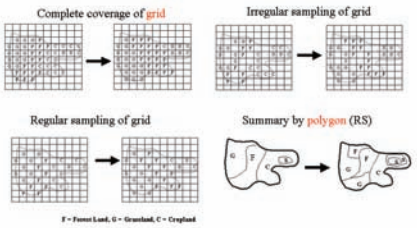
TABLE 3.3.4 ILLUSTRATIVE EXAMPLE OF APPROACH 2 DATA IN A LUC MATRIX WITH CATEGORY SUBDIVISIONS

Initial / Final	Forest (Unmanaged)	Forest (Managed)	Grassland (Rough grazing)	Grassland (Improved)	Cropland	Wetland	Settlement	Other	Final area
Forest (Unmanaged)	5								5
Forest (Managed)		10	1	2	1				14
Grassland (Rough grazing)		2	36						38
Grassland (Improved)			2	22					24
Cropland					29				29
Wetland						0			0
Settlement		1	1		1		5		8
Other								2	2
Initial area	5	13	40	24	31	0	5	2	160
NET change	0	+1	-2	0	-2	0	+3	0	0

F = Forest Land, G = Grassland, C = Cropland, W = Wetland, S = Settlement, O = Other. Numbers represent area units (Mha in this example.)

Approach 3: Geographically explicit land-use

Examples using grids for land-use



Tiers

- **Tier 1** employs basic method provided in the *IPCC Guidelines;* activity data and EF/RF are spatially coarse, default data provided
- **Tier 2** emission factors and activity data are defined by the country for the most important land uses/activities. Higher resolution activity data are typical
- **Tier 3**, higher order methods are driven by high-resolution activity data and disaggregated at sub-national to fine grid scales. A closer link between biomass and soil carbon dynamics established.

- Higher tiers for key categories
- Tiers are not fixed, they should be regarded as on a sliding scale
- Within a land-use category, tiers can differ per carbon pool

GPG arising from KP

- **LULUCF Activities under A 3.3 & 3.4**
  - **DF, AF, RF, FM, CM, GM, RV**
  - **Area Identification, Definition, Estimation and Reporting**
- **LULUCF projects under A6(JI) and A12(CDM)**
  - **Project boundary**
  - **Measuring, Monitoring and Estimating GHG Removals/Emissions**

Cross-Cutting Issues

- **Uncertainty, Sampling, Key Category, QA/QC, Time Series, Verification**

Sampling

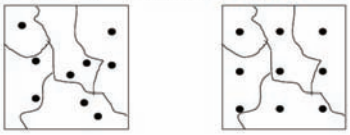
- **Data for the LULUCF sector**
  - **Sample surveys**
  - **Estimating changes in land use or in carbon stocks**
  - **National forest inventories**

  ⇒ Reporting of emissions/removals of GHG
- **Good practice guidance**
  - **Sampling principles, design, and methods**
  - **Uncertainty**

- **Scaling up the information from plots to population by sampling theory**
- **Increasing efficiency in the use of inventory resources by properly designed sampling**
- **Sampling theory**
  - **Random sampling : Standard**
  - **Subjective sampling : Limited resources**

Systematic sampling

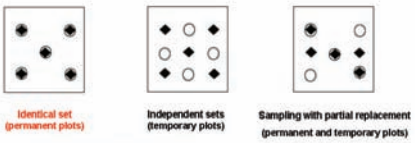
Simple random layout of plots (left) and systematic layout (right)



- Increasing the precision of the estimates
- Simplifying the field work

⇒ Superior to simple random sampling

Three sampling designs for change estimation



○ Sampling unit measured at occasion 1
◆ Sampling unit measured at occasion 2

- Permanent sample plots
  - More efficient than temporary plots : actual trend

GHG Inventory System in Korea

•Project funded by the Korea Forest Service ('07 - '11)

Forest and Forestry in Korea

- Forest land : 65% of total land area
- Location in warm temperate zone
- Heterogeneity in site, species and ownership
- Slow decrease of forest land : 0.1% annually
- Rapid increase of growing stock : 3% annually
- Immature stage
- Low economic efficiency in timber production
- Increasing demands of environmental services

Carbon Flux in Forests (2005) – based on 1996 IPCC Guideline

Categories of GHG emissions/removals	Emissions	Removals	Net emissions/ removals
	(Mg CO2)		
Total	9,625	(-)42,482	(-)32,856
A. Changes in Forest & other Woody Biomass Stocks	5,207	(-)43,472	(-)37,275
B. Forest & Grassland Conversion (biomass)	370	0	370
C. Abandonment of managed Lands	NE	NE	NE
D. Changes in Soil Carbon for Mineral Soil	4,052	0	4,052
E. others	NE	NE	NE

☞ LUCF in Korea - Net sinks

Objective

To establish the basis of

forest carbon inventory system

for reporting GHG inventory

under the UNFCCC and a potential Post-2012 agreement

☞ GPG LULUCF with tier 2 ~ tier 3

GHG Inventory System

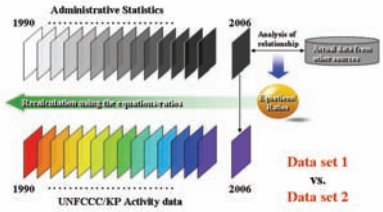
Statistical Sources for UNFCCC/KP Activity Data

Activity data / Statistical sources	AF/RF	DF	FM (narrow)	Forest fires	Harvest
Statistical yearbook	-	Forest conversion	Stand-level practices	Forest fire damage	Domestic timber supplies
Forest basic statistics	Reforesta-tion	Forest conversion	Stand-level practices	Forest fires	Various cuttings
Forest administrative statistics	-	Permit of forest conversion	Forest mgnt projects	Fire suppression	Permission of cutting
Forest products statistics	-	-	-	-	Harvest wood production

Complete time series,
but incomplete survey system

Activity Data Preparation

Recalculation of Administrative Statistics



National Forest Inventory System

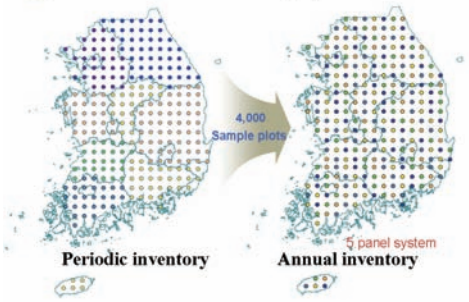
The 5th NFI (2006-2010)

➢ **Rationale for change from the 5th NFI**

To meet increasing demands for reliable forest statistics from domestic forest policies and international processes and conventions ;

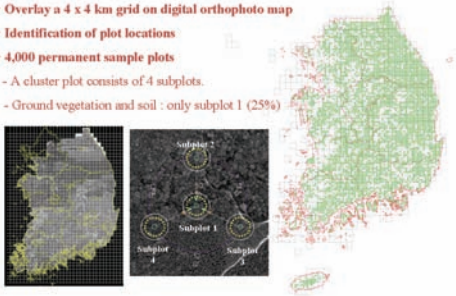
SFM, UNFCCC, CBD, FAO/FRA, OECD, etc.

Transition to Annual Inventory System



Sampling Design – systematic cluster sampling

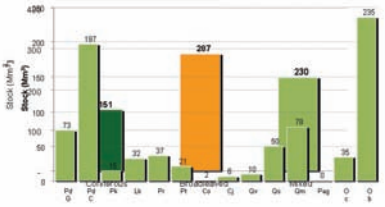
- Overlay a 4 x 4 km grid on digital orthophoto map
- Identification of plot locations
- 4,000 permanent sample plots
  - A cluster plot consists of 4 subplots.
  - Ground vegetation and soil : only subplot 1 (25%)



Carbon Stock Change Estimations in Living Biomass in the NFI

- ΔC_{LB} (I) = $C_{LB\ Gain} - C_{LB\ Loss}$
  - $C_{LB\ Gain}$ = GS x GR x WD x BEF x S/R x CF
    where GS : Growing stock
    GR : Growth rate
    (with only the 5th NFI)
- ΔC_{LB} (II) = $(GS_{t_2} - GS_{t_1})/(t_2 - t_1)$ x WD x BEF x S/R x CF
  (since the 6th NFI)

Growing stock 5th NFI ('06~'08)



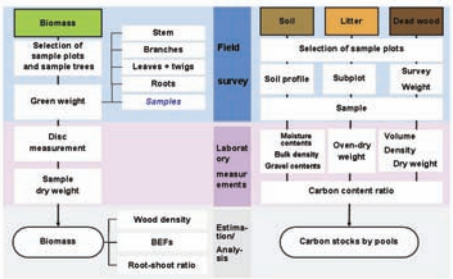
Emission/Removal Factors

Survey for Factors

- 12 major species
- 2007~2010
- Total 150 plots
  (allocation to species and provinces by growing stocks)
- Subjective sampling
- All 5 carbon pools

47 plots for *Pinus densiflora* (2007)

Process of Emission/Removal Factors Estimation

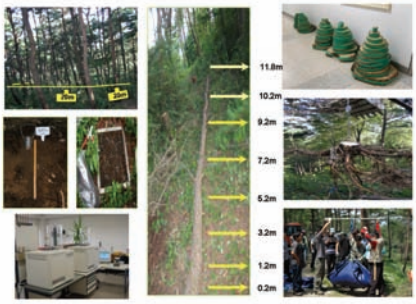


Field Survey Manual

- **Preparation of Standardized Manuals**
  - For 9 survey teams
  - **Survey Manual for Biomass and Soil Carbon**

Field Work

- **Training the Survey Teams**
  - Seminars, field demonstration, etc.
  - CD recording the process of standard field survey



Emission/Removal factors

Forest type / Tree species			WD	BEF	R
Results	Coni-ferous	Pd (G)	0.42	1.50	0.29
		Pd (C)	0.45	1.41	0.28
		Pk	0.39	1.89	0.28
		Lk	0.47	1.34	0.25
		Pr	0.46	1.41	0.59
		Cj	0.36	1.30	0.28
		Co	0.41	1.43	0.44
	Broad-leaved	Qv	0.73	1.34	0.34
		Qm	0.70	1.62	0.58

Carbon stock change estimation by tree species

(Gain-loss method, 2008, thousand tC)

Species	Net removals	Species	Net Removals
Pd (G)	1,189	Qa	270
Pd (C)	3,752	Qv	1,150
Pk	339	Qm	1,746
Lk	686	Pag	13
Pr	700	O c	798
Pt	463	O b	6,788
Co	47		
Cj	101	Total	18,041

Summary

- **IPCC Good Practice Guidance for MRV inventory in Post-2012 Climate Regime**
- **NFI with proper sampling design to address IPCC GPG LULUCF requirements**
- **Activity data in Korea**
  - **Current statistics with adjustments and/or supplementation**
  - **the 5th National Forest Inventory**
- **Emission/Removal factors in Korea**
  - **12 major tree species, 150 plots, & 5 carbon pools**
  - **Manuals & training**

Challenging Issues

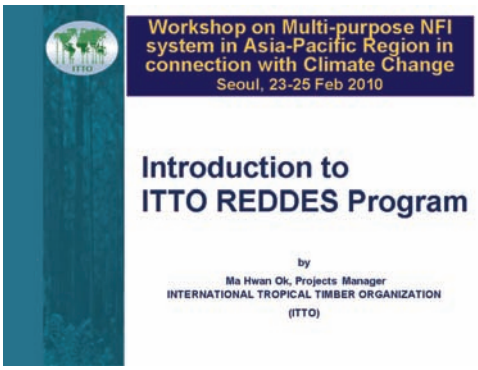
- Land-Use Change : 6 x 6 matrix
- Time Series & Recalculation
- Tier 3 model : DOM C & Soil C
- Uncertainty : Approach I & Approach 2
- QA/QC : Institution, Data & Experts

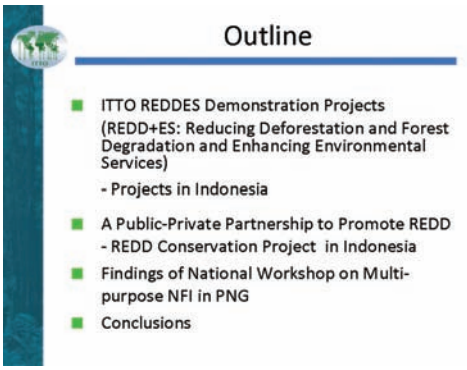
Thank you !

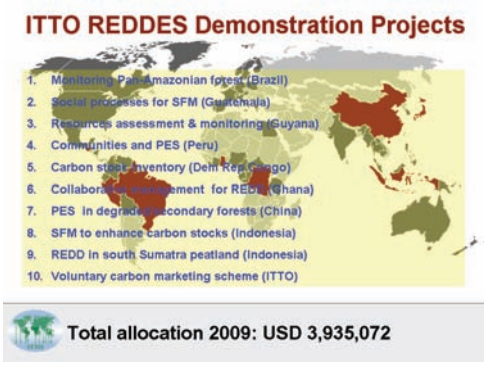
(Appendix 5.7.9)

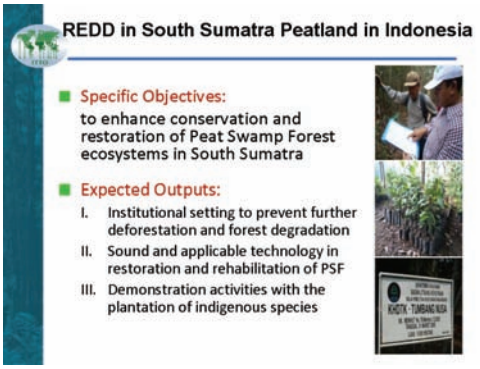
Introduction to ITTO REDDES program

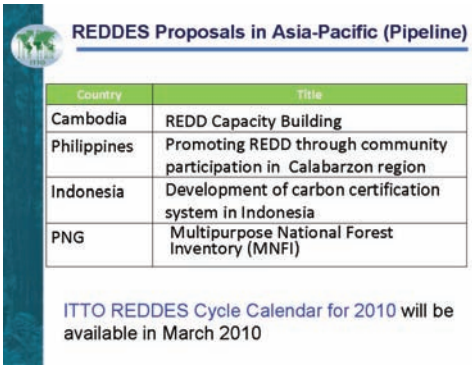
Mr. Hwanok Ma
ITTO

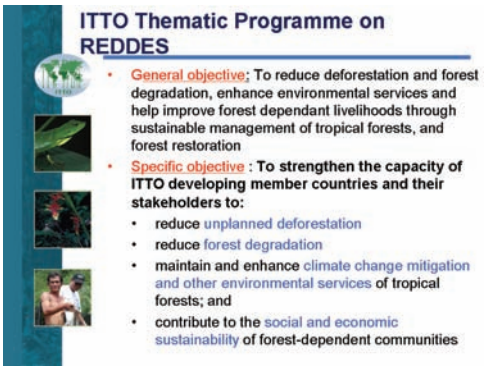


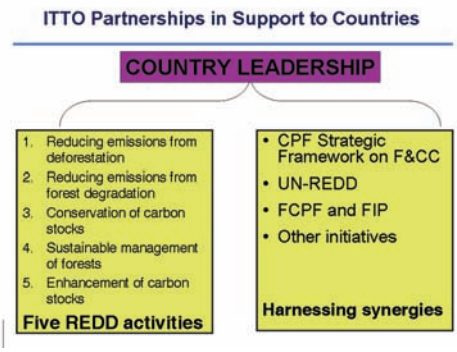






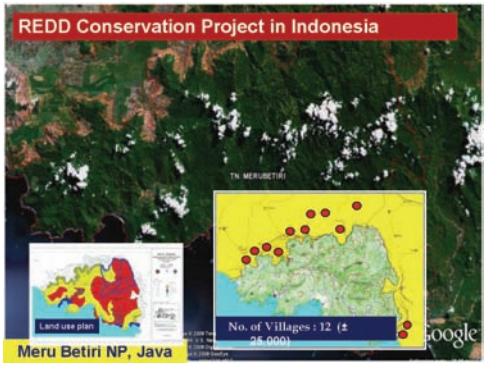



ITTO Thematic Programme on REDDES
General objective: To reduce deforestation and forest degradation, enhance environmental services and help improve forest dependant livelihoods through sustainable management of tropical forests, and forest restoration
Specific objective : To strengthen the capacity of ITTO developing member countries and their stakeholders to:
reduce unplanned deforestation
reduce forest degradation
maintain and enhance climate change mitigation and other environmental services of tropical forests; and
contribute to the social and economic sustainability of forest-dependent communities


ITTO Partnerships in Support to Countries
COUNTRY LEADERSHIP
1. Reducing emissions from deforestation
2. Reducing emissions from forest degradation
3. Conservation of carbon stocks
4. Sustainable management of forests
5. Enhancement of carbon stocks
Five REDD activities
CPF Strategic Framework on F&CC
UN-REDD
FCPF and FIP
Other initiatives
Harnessing synergies

A Public-Private Partnership to promote REDD
SEVEN&I HOLDINGS
(Japan)
Asia : Indonesia (under implementation)
Africa : Gabon (under project identification)
Latin America : Brazil (under project identification)

A Public-Private Partnership to promote REDD
REDD Conservation Project in Indonesia
Meru Betiri National Park, Java
P. Bali
Selat Bali
Executing Agency:
FORDA, MoF
Duration & ITTO budget
4 yrs (Jan 2010-Dec 2014)
Ceremony at Indonesian Embassy (Tokyo, Oct 2009)


REDD Conservation Project in Indonesia
TN. MERUBETIRI
Land use plan
No. of Villages : 12 (± 25,000)
Meru Betiri NP, Java

REDD Conservation Project in Indonesia: Challenges
To improve the livelihoods of local communities living inside and in the surrounding area of Meru Betiri National Park (MBNP) through participation in avoiding deforestation, degradation and biodiversity loss
To develop a credible measurable, reportable and verifiable (MRV) system for monitoring REDD and enhancement of forest carbon stocks in MBNP

DONORS to ITTO

Since 1987, funded 940 projects, pre-projects and activities valued at more than US$340 million to build capacity of ITTO producer member countries towards the achievement of SFM

Main donors for project work and other activities:

- Japan
- Switzerland
- United States
- Norway
- The Netherlands

Findings of National Workshop on Multi-purpose NFI in PNG (29 Jan 2008)

- There is a *clear and urgent need for a Multipurpose NFI* (MNFI) covering biomass and carbon stocks, water and soils, biodiversity and socioeconomic indicators
- Insufficient staff, financial resources and facilities of the National Forest Service, PNG for MNFI
- The results of the MNFI are to be used for *national and sub-national planning*, but not at lower levels
- The MNFI must be a permanent, continuous program incorporated in the National Forest Plan
- The MNFI being a multidisciplinary exercise, it is advisable to establish an *interagency coordinating committee*
- *International conventions* that consume forest based information should contribute more meaningfully to assist developing countries

Conclusions

- NFI is critical to make REDD work in tropical countries as they are critical to capacity-building
- ITTO is committed to promote five REDD activities in the tropics
- Financing is a big challenge:
  - Need for the public sector to support sufficient financing in the near term to help forest countries become REDD ready
  - Voluntary carbon markets for REDD can facilitate demonstration activities with VER credits
  - The private sector needs to play a major role in financing through the global carbon market in the long run

ITTO

Thank you for your attention

ma@itto.int

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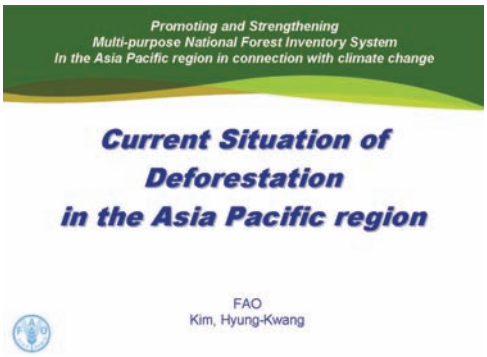
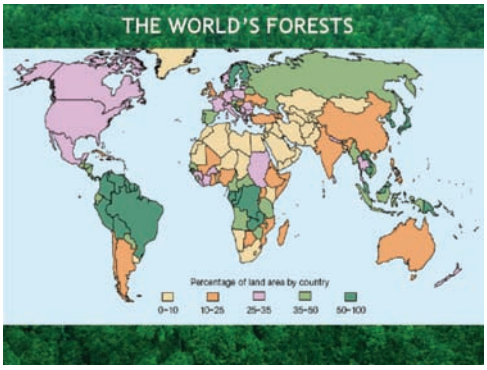
5.8 Presentation Materials of Session 3

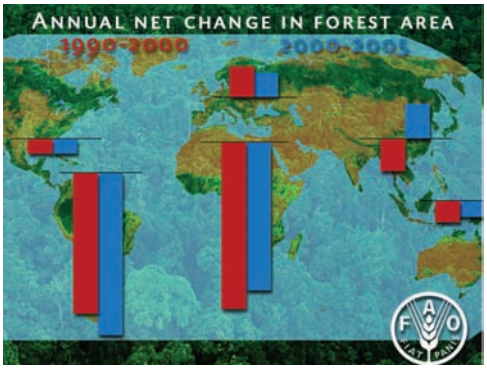
(Appendix 5.8.1)

Current situation of Deforestation in the Asia Pacific region

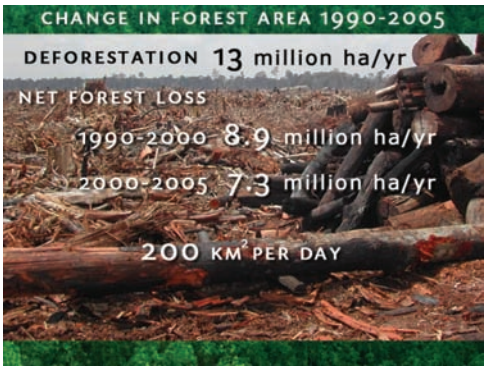
Mr. Hyungkwang Kim
FAO







Continent	Total Forest Area (2005)		Annual change 1990-2000		2000-2005	
	(1,000ha)	(% of land area)	(1,000ha/year)	(%)	(1,000ha/year)	(%)
World Average	*3,952,025*	*30.3*	*-8,868*	*-0.22*	*-7,317*	*-0.18*
Africa	635,412	21.4	-4,375	-0.64	-4,040	-0.62
South America	831,540	47.7	-3,902	-0.44	-4,251	-0.50
Europe	1,001,394	44.3	877	0.09	661	0.07
North & Central America	705,849	32.9	-328	-0.05	-333	-0.05
Asia	571,577	18.5	-792	-0.14	1,003	0.18
- East Asia	244,862	21.3	1,751	0.80	3,940	1.60
- South & southeast Asia	283,127	33.4	-2,578	-0.80	-2,851	-1.00
Oceania	206,254	24.3	-448	-0.21	-356	-0.17



Asia-Pacific's Forest

- The land area of Asia & the Pacific
  → 19% of the world
- Forests & wooded land
  → 1/3 of Asia & the Pacific
- Forest area (2005) : 734 million ha
  → 19% of global forest area

- Net increase in forest area (2000~2005)
  → 633,000ha (annually)

※ *Due to an increase of above 4million ha per year in China*

- However, most other countries : net loss
- Especially, Southeast Asia : largest decline
  → 2.8million ha/year
- The greatest forest loss : Indonesia
  → almost 1.9million ha/year
- Followed by Myanmar, Cambodia, the Philippines, Malaysia, North Korea etc.
- During the first 5 years of the 21C :
  several countries lost more than 1.5% /year
  → the highest rate in the world

Thank you!

(Appendix 5.8.2)

Review of NFI in Asia and Pacific region in context of UNFCCC

Mr. Kailash Govil
FAO Retiree

Emerging Dimensions of Demand and Supply of Information from National Forest Inventories in context of Climate Change and UNFCCC

Dr. Kailash Govil
Senior Advisor
MAR on Adaptation and Mitigation of Climate Change

Overview

Emerging Scenario

Key Messages

Copenhagen 2009

Trade Requirements

Where are we now

Emerging Scenario

- Recent years have seen exponential demand on forest information in extent and quality at national and sub-national levels
- Specially consistency, robustness, completeness, transparency, national sovereignty, comparability, accuracy, precision and verifiable

Key Message

- Demands of Information – Most of the demand from processes, conventions and others is generally broad and has insufficient specifications - Need to harmonize / standardize information demand – FAO with more than 40 years of experience.
- Supply of Information - None of the countries, specifically in AP region has complete and updated information – Immediate need to build capacities and dynamic integrated systems of forest information

Copenhagen 2009 Accord Key Elements

- a long-term goal of limiting climate change to no more than 2° C
- systems of "pledge and review" for mitigation for both developed and developing countries
- measures to address NAMA, adaptation and technology transfer,
- significant new financial resources

As of February 10, 2010, national pledges to limit GHGs from 67 countries (more than 80% of global greenhouse gas emissions)

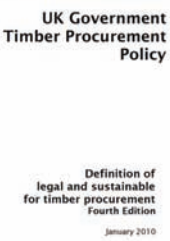
Copenhagen Accord (Contd.)

- Links **Funds** to results and actions like
  - **meaningful** actions
  - **transparency** on implementation,
  - **governance** of actons
  - **Copenhagen Green Climate Fund** (GCF)
  - **Consistent, Robust, Accurate, Complete, Comparable Information**
  - **QA/QC**
  - **Verification compliant systems**
  - **National and International - MRV**

MRV at Copenhagen

- Concerns about level of MRV
- Differentiation between developed and developing country MRV.
- "rigorous, robust and transparent" MRV of Annex I COP" (para. 4).
- Financially supported mitigation - NAMAs (developing countries) subject to international MRV
- Autonomous mitigation actions subject to national verification but
  - subject to "international consultations and analysis" under international guidelines that ensure that national sovereignty is respected (para. 5).
  - reported in national communications every two years

New Timber Procurement Standards Example: UK

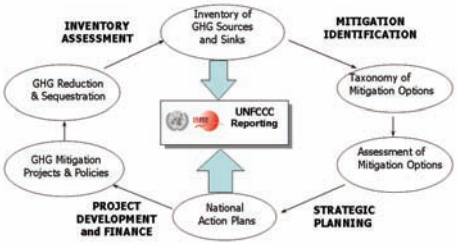


Social Criteria - Section 2.9 – Jan 2010

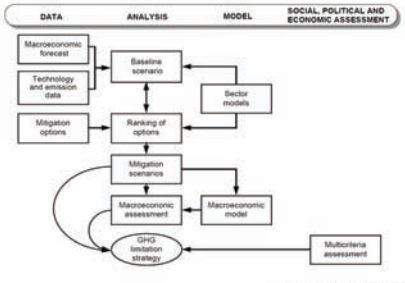
2.9 Management of the forest must have full regard for the interests of indigenous peoples, local communities and forest workers. In order to achieve this, the definition of sustainable must include requirements for:

- Identification, documentation and respect of legal, customary and traditional tenure and use rights related to the forest;
- Mechanisms for resolving grievances and disputes including those relating to tenure and use rights, to forest management practices and to work conditions;
- Safeguarding the basic labour rights and health and safety of forest workers.

UNFCCC, GHG Inventories, and GHG Mitigation Assessment Process



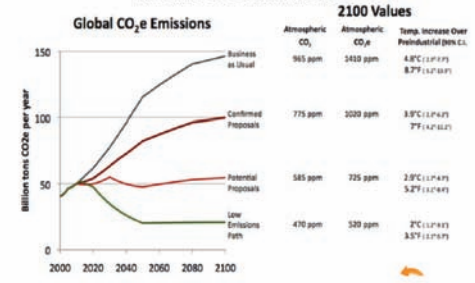
Structure of a Mitigation Assessment



NFI in Validation and Verification Processes of UNFCCC Example: CDM

Where are We (Feb 2010)

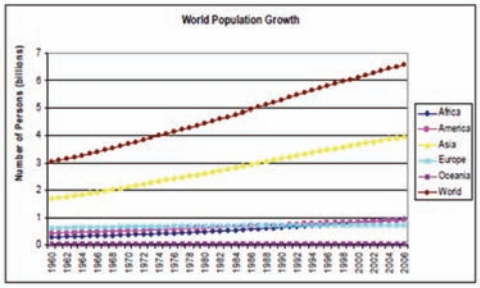
In terms of commitments



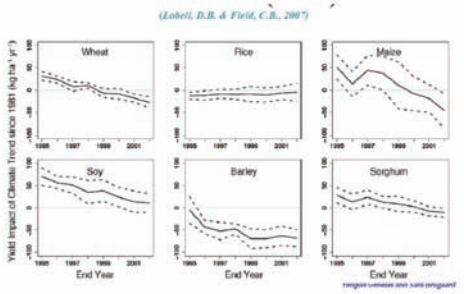
In terms of Forest Information including Annex 1

Data source for biomass carbon	GPG Tier	Nr. of countries
no data	-	77
IPCC Good Practice	1	87
IPCC-GPG, other sources	2	41
FAO publications	2	5
Expert estimate	2	5
country specific data	3	13

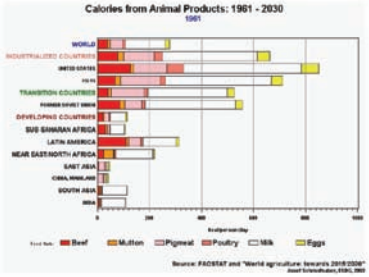
Some Drivers - Outside Forest sector Population Growth



Climate induced trends in Food Productivity



Increase in livestock for food

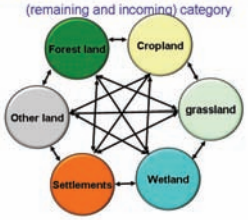


Where is the land

Land use	Current Cover	Potential for Crops
Crops	12	Nil
Barren and Water	24	Nil
Built Up	2	Nil
Forest	28	Deforestation
Grass and Shrub land	34	Little is Cultivable
Total	100	

Six Land Use Categories

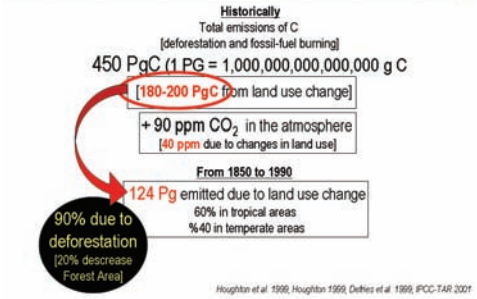
Emissions/removals to be reported under the final land use (remaining and incoming) category



Importance of LULUCF (Annex 1)

		1990	2000	2005
AUSTRALIA	Excluding LULUCF	416,714	494,855	524,638
	Including LULUCF	453,794	404,392	596,239
CANADA	Excluding LULUCF	591,793	717,101	730,967
	Including LULUCF	540,227	636,781	772,380
EU	Excluding LULUCF	5,556,323	5,041,650	5,098,160
	Including LULUCF	5,222,374	4,659,081	4,659,180
JAPAN	Excluding LULUCF	1,269,657	1,345,997	1,357,844
	Including LULUCF	1,195,370	1,265,360	1,272,256
RUSSIA	Excluding LULUCF	3,319,327	2,030,431	2,117,821
	Including LULUCF	3,359,567	2,368,009	2,005,842
US	Excluding LULUCF	6,084,490	6,975,180	7,082,213
	Including LULUCF	5,257,278	6,290,721	5,985,872
BELARUS	Excluding LULUCF	129,129	70,993	77,435
	Including LULUCF	107,101	43,747	52,346
NORWAY	Excluding LULUCF	49,695	53,358	53,701
	Including LULUCF	37,406	36,280	25,781
UKRAINE	Excluding LULUCF	926,033	389,714	417,529
	Including LULUCF	852,887	338,093	382,655
NEW ZEALAND	Excluding LULUCF	61,853	70,598	77,175
	Including LULUCF	43,714	50,626	51,901

Global Emissions from Land Use Change

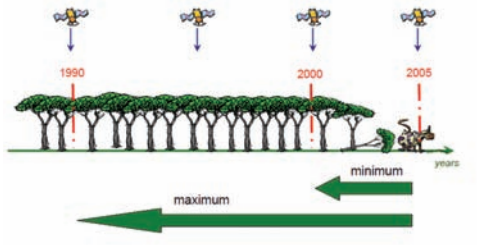


REL and RL

- The **reference emissions level** (REL) is the amount of gross *emissions* from a defined area estimated within a reference time period (REDD)
- The **reference level** (RL) is the amount of net/gross *emissions and removals* from a defined area estimated within a reference time period.

Reference Period

(Source: RFC)



Three Options

(Source: RFC)

- **Simplified**: only gross emissions from forest land converted to other land uses (Deforestation) -- Category 2
- **Complete**: gross GHGs emissions related to decreases in forest carbon stocks (Deforestation and degradation) – Category 3 / IPCC GPGS
- **Sector**: full GHGs balance from the whole Forest estate (Deforestation, forest degradation, SFM, conservation) -- Category 3

Three approaches for area change representation

Approach 1	Approach 2	Approach 3
Net area of land use for various land use categories; no tracking of land use conversions	Tracking of land use conversion on a non-spatially explicit basis	Tracking of land use conversion on a spatially explicit basis
Net-Net changes between categories	Gross-net changes between categories	Gross-net changes between categories & within categories

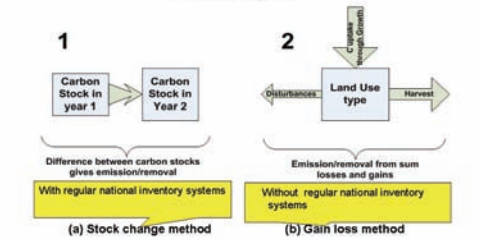
Three methodological Tiers

Tier1 :
- **Simple first order approach**
- Use Coarse activity data from global datasets, simplifying assumptions, IPCC default parameters, large uncertainties

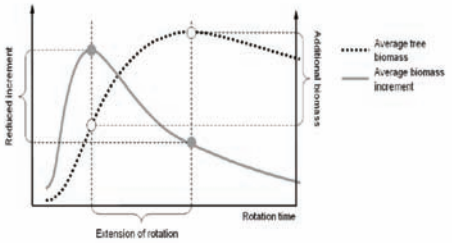
- **Tier 2**:
  - **A more accurate approach**
  - more disaggregated activity data, country specific parameter values, smaller uncertainties
- **Tier 3**:
  - **Higher order methods**
  - detailed modeling and/or inventory measurement systems driven by data at higher resolution and much lower uncertainties

- **Higher Tier methods (Tier 2&3)** are required for **key source categories**, source or sink categories that contribute substantially to the overall level, trend or uncertainty

Estimating Carbon Stock Changes



SFM – Some Issues on Rotation



Variability in Sampling Design in Asian NFI
Please update/correct

- **Systematic sampling**
  - **Japan, India, S.Korea** use 4km grid
  - **Philippines** (0.5^0 or approx. 27km grid)
  - **China, Mongolia, Myanmar** (3km grid)
  - **Indonesia** - (20km grid and 10x10 Km)
  - **Laos** – 2km grid
- **Simple random sampling**
  - **Pakistan**
- **Cluster sampling**
  - **Bhutan, Brunei, and Thailand**

Activity Data - Forest extent

Variables	Countries	Main methodology
Forest land area	15	Remote Sensing (RS)
Area of forest canopy/crown cover	12	RS (aerial interpretation & imagery)/ survey
Area under forest management	10	Maps/survey/records
Area under formal forest management plan	9	Records, maps & survey
Area under sustainable forest management	8	Records, maps, survey
Forest area with certification	2	Records (only 1 country)
Area under public owned forest	9	Records, maps, survey
Area under private owned forest	8	Records, survey, maps

Geo-physical (Partial) Information

Variables	Countries	Main methodology
Geo-Coordinates	15	Maps (also GIS), survey
Spatial Landuse Change	None	
Altitude	14	Maps, survey, GIS, RS
Topography	17	Maps, survey, GIS
Orientation	13	
Slope	15	
Soil	14	Records, soil sample & survey
Soil type	12	
Soil texture	10	
Soil organic matter	7	
Geological structure	8	Maps, sample survey, records
Rainfall	8	Records, map, survey, GIS

Bio-physical (Tree) information

	Variables	Countries	Main methodology
Main measurements for BE	Number & Diameter	17	Sampling (few: census)
	Diameter of trees	16	Sampling (few: census)
	Height of trees	14	Sampling
	Length of stem	9	Sampling
	Stump height	8	Sampling
	Age class	11	Sampling, census & record(1)
Selected measurements for BE	Branches	3	Length, mean diameter, thickness & weight measured mainly through sampling
	Twigs	2	
	Bark	3	
	Leaves	1	

Emission Data Biomass Estimation

- Only four countries collect (partially) information
  - Wood densities,
  - Volume expansion factors
  - Biomass expansion factors,
  - Allometric equations
  - Model
  - Estimation and reporting
- Only four countries estimate and report on forest carbon

Conservation-Biodiversity (Partial)

	Variables	Countries	Main methodology
Biodiversity	Tree species	14	Survey, knowledge
	Shrub species	9	Survey, knowledge
	Herbs species	8	Survey, knowledge
Status	Endangered species	5	Knowledge, survey
	Critically endangered species	4	
	Vulnerable species	4	
	Native species	5	
	Endemic species	5	
	Introduced species	2	

Information on Safeguards

Beneficiaries, IP, Multi-stakeholder Process

Variables	Countries	Main methodology
IPs, Locality of user	6	Record, survey, observation
Goods / Services used	5	Record, observation, knowledge, survey
Economic class of the beneficiaries	3	Record, observation (only 2 countries)
Level of dependency	3	Record
Physical accessibility	3	Map/record/knowledge
Multi-stakeholder Process (partly)	2	
Transparency (partly)	3	Web-site

Review of NFI (in the Working Groups)

- Does it satisfy all demands of forest information including QA/QC – what are the gaps
- Are specification on why and what to collect are well documented
- Are Justifications or basis for the selection of methods of data collection, analysis and reporting are available
- Does NFI ensure transparency, rigorousness, robustness. completeness, comparability, accuracy, and precision
- Is NFI validation, reporting and verification compliant
- Where to look for guidance, support and help – a system at national / regional / international level

Thank You

5.9 Country Presentation Materials of Session 3

(Appendix 5.9.1)

Country Presentation Template

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change

A Status of NFI policy to mitigate climate change

NFI experiences in (Country)

(Name of Presenter)
Name of the Agency

---

1. Current Situation of Deforestation and Degradation

- Change of Forest Area (1,000ha)
  - 1990: 2000: 2008:
  - ※ Main causes of Change
    1.
    2.
    3.

<Change of Designated functions of Forest (1,000ha)>

year	1990	2000	2008
Production			
Protection			
Conservation			
Social services			

---

1. Current Situation of Deforestation and Degradation

- Change of Growing Stock (㎥/ha)
  - 1990: 2000: 2008:
  - ※ Main causes of Change
    1.
    2.
- Change of Carbon Stock (million tons)
  - 1990: 2000: 2008:
  - ※ Main causes of Change
    1.
    2.

---

2. Strategy to reduce Deforestation and Degradation

- Strengthening Forest Policies
  - Establishment of long-term Planning
    - ex:
    - ex:
  - Enactment of Forest Laws
    - ex:
    - ex:

---

2. Strategy to reduce Deforestation and Degradation

- Enforcement of Forest Administration Organization
  - Central government
    - ex:
    - ex:
  - Local government
    - ex:
    - ex:

---

2. Strategy to reduce Deforestation and Degradation

- Increasing of Forest Budget (million$)
  - Central government
    - 1990: 2000: 2008:
  - Local government
    - 1990: 2000: 2008:

---

3. Brief on National Forest Inventory

- Brief history of Forest Inventory
  - 1st Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)
  - 2nd Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)
  - 3rd Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)

3. Brief on National Forest Inventory

  - 4th Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)
  - 5th Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)
  - 6th Inventory
    - Institution:
    - Inventory Year:
    - Budget (national: $, international: $)
  - 7th Inventory
  - 8th Inventory

3. Brief on National Forest Inventory

- Latest National Forest Inventory Design
  - Remote Sensing
    - Introduced year:
    - Type of satellite data:
  - Field Inventory
    - Sample intensity: X km
    - Interval of inventory: year
    - Sample size: square (x m) or circle(radius m)
    - Number of sample:

3. Brief on National Forest Inventory

- Implementation System of NFI in government
  - Administration
    - Organization: division name
    - Staffs: number Budget (2010): $
  - Research
    - Organization: division name
    - Staffs: number Budget (2010): $
  - Collaboration with policy-making system
    - Inside Forestry agency:
      ex:
    - Relating to national development plan:
      ex:

4. Suggestions for promoting and strengthening NFI System

- <Consideration Points>
  - Forest Policies
  - Administration Organization
  - Human Resources
    - administration
    - research
  - Financial Resources etc.
    - national
    - international

Thank you!

The Guideline to fill in the Template

<Common>

1. Cover page of the template: You have to write your country presentation title and name of presenter (name of the Agency).
2. p2~10: You have to fill in the green colour part.
3. p11: This is a key part of your presentation. It's the suggestions to improve your country's NFI system. I just show the examples, so it's better if you can suggest your own ideas after discussing with your staffs and colleagues.
4. Extra pages: Each country has to fill in the corresponding page more precisely and add some essential information at the extra pages.

<each country>

1. NFI experiences in Philippines
In the brief on national forest inventory (p7~10), you can describe the whole of your country's NFI experiences (lessons learned etc.) and future plan more specifically.
(You can add extra pages at this part. Other countries are the same.)

2. Availability of financial resources for NFI in Malaysia.
In the brief on national forest inventory (p7~10), you can describe the invested budget of each Inventory activities and the budget availability for future NFI project.
Especially, you have to write the national budget and international funds separately.

3. Importance of NFI in the policy-making system of Myanmar
In the implementation system of NFI in government (p10), you can describe the situation in your country more concretely.
Especially, you have to write how are the results of NFI reflected into the long-term National Forest Plan and the National Development Plan.

4. Reporting systems in Nepal
In the latest national forest inventory design (p9), you can describe how your country reports to each International Organization. (UNFCCC, FAO, UNFF etc.)
In addition, it's possible to explain your experiences. (difficulties etc.)

5. NFI and Forest management in Thailand
In the implementation system of NFI in government (p10), you can describe how NFI results have been reflected into national forest management planning.
You can explain the relationship between NFI and forest management plan.

6. Government organization for NFI in Pakistan
In the implementation system of NFI in government (p10), you can describe more specifically.
(name of division and section, function of these etc.)

7. Quality control of NFI in China
In the latest national forest inventory design (p9), you can explain the quality control of the sample design, field survey and data analysis in your country's NFI implementation more specifically

8. Extent of technical expertise in Mongolia
In the implementation system of NFI in government (p10), you can describe your country's NFI experiences more specifically.
(ex: human resources training system etc.)

9. Relationship between National development and NFI in Laos

In the implementation system of NFI in government (p10), you can describe your country's NFI experiences more specifically.
Especially, you have to write how the results of NFI have been reflected into the National Development Plan, how the results of NFI has contributed the National Development and how the NFI statistics have collaborated with forest and national policy system.

10. Strategy for NFI in Vietnam
In the implementation system of NFI in government (p10), you should explain the present and future strategy for NFI of your country more specifically.
(in terms of present and future strategy for NFI of the central government, cooperation with international organization and donor country)

11. Integration of NFI and MRV in PNG
In the latest national forest inventory design (p9), you have to describe your country's implementation situation more specifically.
(how do you integrate them? the degree of integration)

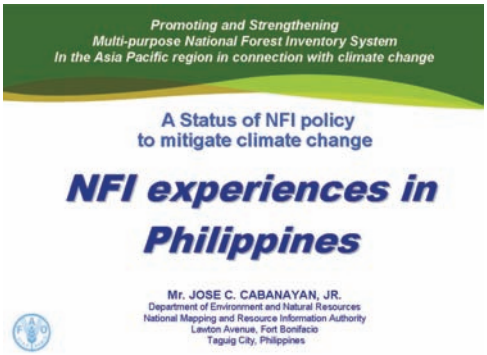
12. Necessity of NFI in Solomon Islands
In the brief on national forest inventory (p7~10), you have to describe the brief history of Forest Inventory and Implementation system of NFI in your country. After that, you can explain why NFI is necessary and essential for your country. .

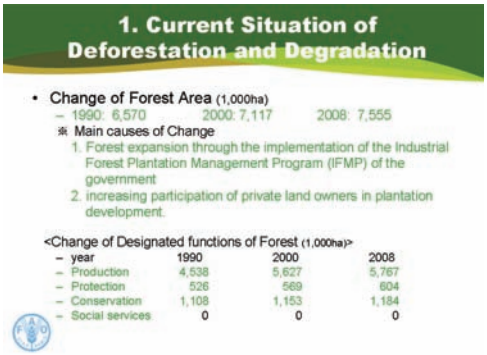
13. Carbon estimation in India
In the latest national forest inventory design (p9), you have to describe your country's methodology to estimate the carbon more specifically.
(in terms of FAO, UN-REDD and other projects)

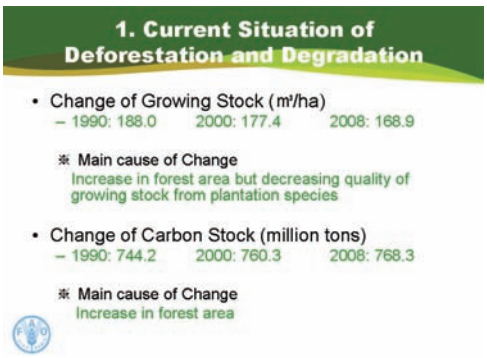
(Appendix 5.9.2)

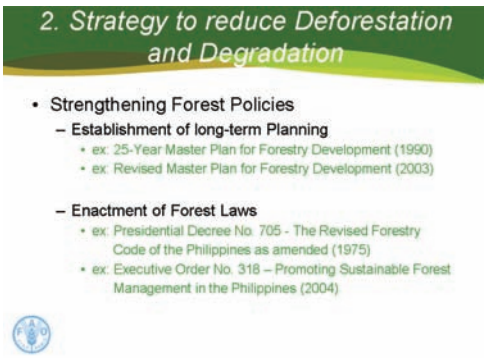
NFI experiences in Philippines

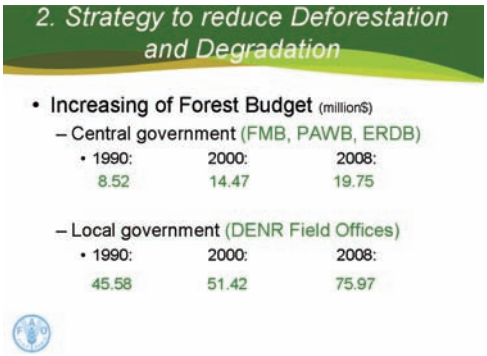
Mr. Jose C. Cabanayan, Jr.











3. Brief on National Forest Inventory

- Brief history of Forest Inventory
  - 1st Inventory
    - Institution: Bureau of Forestry
    - Inventory Year: 1965-1969
    - Budget (national: $, international: $)
  - 2nd Inventory
    - Institution: Bureau of Forest Development
    - Inventory Year: 1979-1988
    - Budget (national: $1.12M $, international: US$0.53 $)
  - 3rd Inventory
    - Institution: DENR-Forest Management Bureau
    - Inventory Year: 2002-2004
    - Budget (national: $10,000 $, international: 194,000 $)

3. Brief on National Forest Inventory

- 4th Inventory
  - Institution:
  - Inventory Year:
  - Budget (national: $, international: $)
- 5th Inventory
  - Institution:
  - Inventory Year:
  - Budget (national: $, international: $)
- 6th Inventory
  - Institution:
  - Inventory Year:
  - Budget (national: $, international: $)
- 7th Inventory
- 8th Inventory

3. Brief on National Forest Inventory

- Latest National Forest Inventory Design
  - Remote Sensing
    - Introduced year: 2002
    - Type of satellite data: Landsat ETM
  - Field Inventory
    - Sample intensity: approx. 27 km x 27 km
    - Interval of inventory: 15 years
    - Sample size: square (1000 m x 1000 m) or circle (radius __m)
    - Number of sample: visited 353 tracts (out of 395 tracts)

3. Brief on National Forest Inventory

- Implementation System of NFI in government
  - Administration
    - Organization: Forest Management Bureau (FMB)
      National Mapping and Resource Information Authority (NAMRIA)
    - Staffs: number / Budget (2009): $
      FMB: 244 US$ 2.18M
      NAMRIA: 820 US$ 22.03M
  - Research
    - Organization: Ecosystems Research and Development Bureau (ERDB)
    - Staffs: number / Budget (2009): $
      ERDB: 311 US$ 0.61M
  - Collaboration with policy-making system
    - Inside Forestry agency:
      ex:
    - Relating to national development plan:
      ex: One of the general objectives of the Revised MPFD is "to enhance and improve decision-making processes through adoption of improved MIS, a fully relevant M&E, continuing FRA, forest resource accounting, C&I and forest certification, etc."

4. Suggestions for promoting and strengthening NFI System

- <Consideration Points>
  - Forest Policies
  - Administration Organization
  - Human Resources
    - administration
    - research
  - Financial Resources etc.
    - national
    - international

Thank you!

(Appendix 5.9.3)

Availability of financial resources for NFI in Malaysia

Mr. Yusoff Bin Muda

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change

A Status of NFI policy
to mitigate climate change

Availability of Financial Resources for NFI in Malaysia

(Yusoff Bin Muda)
Forestry Department

1. Current Situation of Deforestation and Degradation

- **Change of Forest Area** (1,000ha)
  - 1990: 20,540 2000: 20,160 2007: 19,663
  - ※ Main causes of Change
    1. Land development

<Change of Designated functions of Forest (1,000ha)>

– year	1990	2000	2007
– Production	9,900	11,490	11,607
– Protection	2,700	2,910	2,694
– Conservation	1,120	1,120	1,946
– Social services	-	-	-

1. Current Situation of Deforestation and Degradation

- **Change of Growing Stock** (m³/ha)
  - 1990: 228 2000: 218 2005: 215
  - ※ Main causes of Change
  - ➢Changes in forest area
- **Change of Carbon Stock (million tons)**
  - 1990: 4,323 2000: 5,070 2005: 4,763
  - ※ Main causes of Change
  - ➢Tree growth

2. Strategy to reduce Deforestation and Degradation

- Strengthening Forest Policies
  - – Establishment of long-term Planning
    - ➢Forest Management Plan
    - ➢Forest District Action Plan
  - – Enactment of Forest Laws
    - ➢Act 313
    - ➢Act A864
    - ➢Sarawak Forest Ordinance 1954
    - ➢Forest Rules 1962[Sarawak]
    - ➢State Forest Policy 1954[Sabah]

2. Strategy to reduce Deforestation and Degradation

- Enforcement of Forest Administration Organization
  - – Central government
    - ➢National Forestry Council
    - ➢Ministry of Natural Resources and Environment
    - ➢Forestry Department [Headquarter]
  - – Local government
    - ➢State Forestry Department
    - ➢Forest District Office
    - ➢Forest Ranger Office

2. Strategy to reduce Deforestation and Degradation

- Increasing of Forest Budget (millionUSD)
  - – Central government
    - 1990*: 4.27 2000: 11.72 2008: 23.95
  - – Local government
    - 1990*: 50.62 2000: 85.13 2008: 107.40

Source
Annual report –FDPM
–Forestry Sabah
–Forestry Sarawak

3. Brief on National Forest Inventory

- Brief history of Forest Inventory
  - 1st Inventory
    - Institution: Forestry Department; UNDP/FAO
    - Inventory Year: 1970 - 1972
    - Budget : (national:USD172,500)
      : (international: USD 153,600)
  - 2nd Inventory
    - Institution: Forestry Department
    - Inventory Year: 1981 – 1982
    - Budget : (national: USD 176,000)
  - 3rd Inventory
    - Institution: Forestry Department
    - Inventory Year: 1991 - 1993
    - Budget : (national: USD 429,227)

3. Brief on National Forest Inventory

- 4th Inventory
  - Institution: Forestry Department (Technical aid from GTZ-German)
  - Inventory Year: 2002 - 2004
  - Budget : (National : USD 871,553)
- 5th Inventory
  - Institution: Forestry Department
  - Inventory Year: 2011 (expected)
  - Budget : (National : USD 3.09 million + USD 0.10 million)
- 6th Inventory
  - Institution:
  - Inventory Year:
  - Budget (national: $, international: $)
- 7th Inventory
- 8th Inventory

3. Brief on National Forest Inventory

- Latest National Forest Inventory Design
  - Remote Sensing
    - Introduced year: 2002
    - Type of satellite data: LANDSAT TM (scale 1:50,000)
  - Field Inventory
    - Sample intensity: 0.09 %
    - Interval of inventory: 10 years
    - Sample size: 50m radius (point sampling)
    - Number of sample: 1,644

3. Brief on National Forest Inventory

- **Implementation System of NFI in government**
  - **Administration**
    - Organization: Forest Management Division
    - Staffs*: 62 Budget (2010) : USD 58,853
  - **Research**
    - Organization: FRIM, UPM
    - Staffs: Budget (2010): USD

3. Brief on National Forest Inventory

- **Implementation System of NFI in government (con….)**
  - **Collaboration with policy-making system**
    - Inside Forestry agency:
      - Strategic Action Plan FDPM (2008 – 2020)
      - Five Year Development Plan
    - Relating to national development plan:
      - Vision 2020
      - Five Years Malaysian Plan
      - National Physical Plan

4. Suggestions for promoting and strengthening NFI System

- <Consideration Points>
  - Scope Inventory
    - timber
    - non-timber
    - bio-mass & carbon
  - Inventory Intensity
    - 0.004 – 0.005 %

4. Suggestions for promoting and strengthening NFI System

- <Consideration Points – con..>
  - Forest Strata
    - according major forest types
  - Financial Resources etc.
    - National – USD 3.09 million
    - International – USD 3.5 million (????)

Thank you

Kamsahamnida

(Appendix 5.9.4)

Importance of NFI in the policy-making system of Myanmar

Mr. Sein Tun

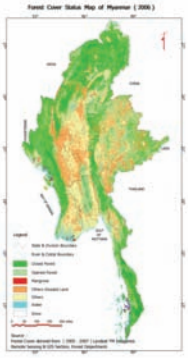
Importance of NFI in the Policy-making System of Myanmar

Sein Tun
Director, Planning &Statistics Division
Forest Department, Ministry of Forestry
Myanmar

Country profile

- **Location :** Between latitudes 9° 32' N to 28° 32' N and longitudes 92° 10' E to 101° 11' E
- **Total area :** 676.577km².
- **Forest cover:** 32.22 mil. ha (47.62% of the total land); FRA 2005
- **PFE :** 27. 97% (RF: 24.045, PA 3.93%.)

- In the past, forests of the country were managed on the sustained yield basis by formulating WP.
- After UNCED in 1992, Myanmar has been streamlining its national forest program to achieve national goal of SFM
- Policy and legislations were reviewed, revised and updated in line with SFM principles adopted by UNCED.
- Myanmar Forest Policy was issued in 1995.



Myanmar Forest Policy (1995)

- Protection
- Sustainability
- Basic needs
- Efficiency
- Participation
- Public awareness

- In order to implement MFP(1995), policy measures and strategic actions in short-term / medium term/long-term are stipulated in policy statement.
- Of which, the medium term strategic action under forestry planning is as follows:

"*Establish an information management system to provide qualitative and quantitative, socio-economic and resource data to facilitate the identification of policy options, planning and decision making*"

- In addition, Forest Rules 21(c) highlights *planning for forest inventory at 10 year interval; review of data at 5 year interval and submission to cabinet.*

NFI Projects in Myanmar

National forest survey and inventory project (BUR/79/011)

Key objectives

- *To inventory prioritized area of 10.7 million ha so as to support forest management planning & monitoring on development of forestry sector*
- *To take aerial photos in prioritized area (31 million ha) which were useful in forest inventory and in producing forest management maps, forest type maps and landuse maps.*
- *To set up NFI section well equipped with computer system and mapping facilities and to strengthen Institution for conducting forest inventory in continuity .*

Funding

- UNDP funded project :
  USD 4 million by UNDP
  Kyat 23.71 million by Myanmar Govt.

Project duration

- Operational in August 1981
- Terminated in May 1986
- 4 year & 9 months

Area covered by inventoried field work and number of crews employed *(BUR/79/011)*

Field Season	Inventoried Area (thousand ha)	No. crews
Early	768	60
1982-83	2129	80
1983-84	2259	80
1984-85	2514	80
1985-86	2166	80
Total	9836	

Area covered by aerial photography *(BUR/79/011)*

Flying Season	Scale	Gross area (km2)	Net Area (km2)
1981-82	1:25,000	41,200	40,600
1982-83	1:25,000	90,700	78,300
1983-84	1:25,000	143,300	142,825
1984-85	1:25,000	31,500	30,450
	1:50,000	54,800	52,925
Total		361,500	345,100

Gross area includes sea, islands and overlap, but net area excludes.

National Forest Management and Inventory Project (MYA/85/003)

- It was second phase of (BUR/79/011) project.
- *The development objective is:*

  to formulate and implement a National Forest Policy as part of an integrated, balanced land use plan.

- *Funding:*

  USD 3.89 mil by UNDP & Kyat 20.54 mil by Myanmar Govt.

- It became operational to run for another five years.

National Forest Inventory Programme

- Since the second phase project was terminated in 1993, Myanmar has been conducting the forest inventory, covering about 1.6 million hectares in average each year, with its own resources.
- This is in line with the statement made in the Forest Law (1992), in which forest resource data should be collected and collated every 10 years so as to obtain fresh data for planning purpose.
- The first 5-year plan of national forest inventory was carried out starting from 1996-97 up to 2000-2001 so as to include all secured areas of the country.
- After that, the second 5-year plan of national forest inventory was implemented starting from 2001-2002 up to 2005-2006.
- Now, the third 5-year plan of national forest inventory is being implemented starting from 2006-2007 to 2010-2011.

- In Myanmar, the Planning and Statistics Division of the FD has been conducting NFI since 1981-82.
- Generally, the forest inventory is carried out in the open seasons annually.
- Although all forest products cannot be inventoried, the data on teak and non-teak hardwoods are collected. In some areas the bamboos and rattans are also collected.
- Moreover, NR of tree species are collected in order to assess the silvicultural conditions of the forest.

Sampling design in NFI

Systematic Sampling Design

➢ FD has been using systematic sampling since 1982.

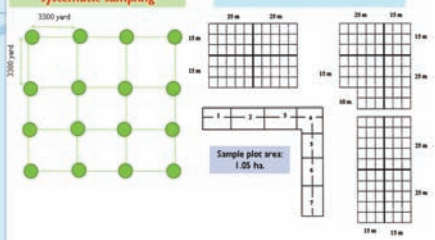
➢ Sampling units or plots are distributed systematically in a square gird of 3,300 × 3,300 yards over the forest area.

Cluster Sampling Design

➢ This design was used in hilly region, particularly in Chin State.

Layout of sample plot under systematic sampling

Configuration of a sample plot



Districts & Area covered by NFI from 1997-98 to 2007-2008

Year	District	Area (thousand ha)	No. of sample plots
1996-1997	Myitkyina, Bamaw, Falam, Loilin, Oktwin	2146	2093
1997-1998	Myitkyina, Mindat, Kyaukme, Taunggyi	2010	1901
1998-1999	Taunggyi, Kale, Mawlaik	1679	1760
1999-2000	Mawlaik, Sittwe, Kyaukphyu	1976	1116
2000-2001	Thandwe, Yangon(N), Hinthada	847	558
2001-2002	Bago, Taunggu, Tharyawaddy, Pyay, Hinthada	1751	1049
2002-2003	Magwe, Pakokku, Minbu, Gantgaw, Thayet	2272	1050
2003-2004	Pyin Oo Lwin, Yamethin, Kyaukse, Meikhtila, Mandalay	1307	990
2004-2005	Katha, Shwebo, Moniywa, Kale, Kyaukme, Sittwe, Maungdaw	1800	1440
2005-2006	Katha, Shwebo, Kyaukme	763	640
2006-2007	Taunggyi, Loilin	910	594

OUTPUTS AND UTILIZATION OF INFORMATION

➢ **Based on the national forestry inventory data collected, the following outputs are regularly produced.**

Stand Table: This table shows the number of tree by GBH classes, by species and by species group.

Stock Table : This table mentions the volume by GBH classes, by species and by species group.

Bamboo Table: This table shows the number of bamboo culm by age classes and species.

AAC Table of teak and other hardwoods: This table consists of annual yield of teak and other hardwoods.

AAC Table of bamboos: This table is made up of the annual yield of bamboo species.

Data Book of Forest Resources : Consists of stand table, stock table, bamboo table, and AAC tables.

➢ **These outputs are usually utilized in forest management planning, especially at district level.**

Importance of NFI in policy-making

- Fresh and reliable data of forest resources plays an important role in management planning & in successful implementation of plans.
- Similarly, inventory data are very important in monitoring, and assessment of forest management whether it leads to sustainable development.
- As stipulated in policy statement, Myanmar has strongly committed to ensure sustainable development of forest resources while contributing to socio-economic development from forestry sector.
- In order to achieve SFM goals, FD is monitoring and assessing its forest resources through forest cover assessments and forest inventories.

- In collaboration with FAO, FD is implementing MAR-SFM project and, also participating in ASEAN MAR on SFM.
- Presently, NFI and forest resource assessments are fulfilling data and information requested for MAR under regional cooperation programs to a large extent.
- In addition, these outputs, findings and feedbacks usually support policy making in Myanmar.
- The followings are milestones of policy intervention which can be seen as outcomes of monitoring & assessment.

✓ *Bago Yoma greening project (to restore the degraded forest)*

✓ *Project for Mitigation of Shifting Cultivation (to control improper landuse)*

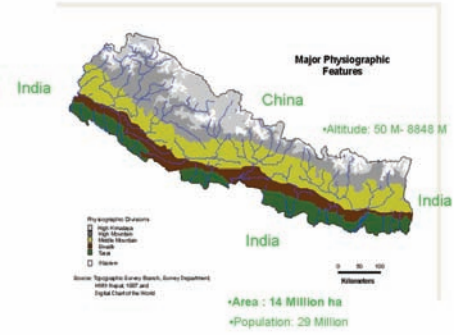
✓ *Private Forest Plantation program (to supplement the production of natural forests)*

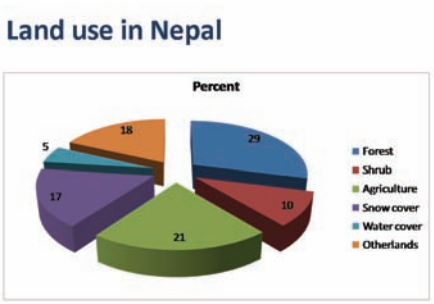
THANK YOU

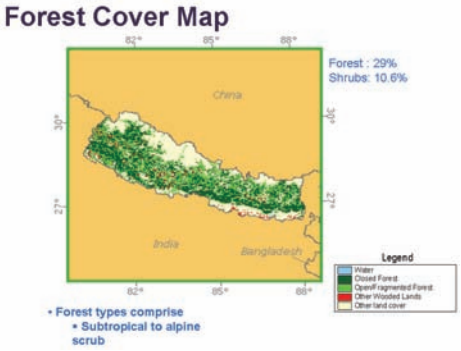
(Appendix 5.9.5)

Reporting systems in Nepal

Mr. Pem Narayan Kandel







Conceptualizing on FRA/Inventory

FRA/Inventory ?

- Process/Methods of generation forest resource data
- Processes involve:
  - Objective setting
  - Scaling up the FRA
  - data need assessment
  - Methodological and inventory design
  - Decision making on materials use
  - Execution etc.

Scales of FRA/forest inventory

1. Global FRA: Carried out by FAO to provide global level forestry information
2. National level FRA: Country level data acquisition used for broad level policy decision and international level reporting.
3. Sub-National level: inventory is for provincial or ecological level data generation.
4. Districts level : for district forest resource planning and management.
5. Management level inventory: is for SMF, Silvicultural operations and harvesting.

Why NFI ?

- A tool for generating national level forest statistics.
- National level baseline data needed for forestry planning and making broad decision.
- Provide dataset for international reporting.
- Periodic monitoring of forest to update changes.
- Thus, NFI commences in Nepal to address present national and international data needs.

History of NFI in Nepal

1. **NFI (1963-67):** Carried out in the technical and financial support of USAID

- **Objective:** determining status of commercial forest
- **Materials used:** Aerial photos of 1954 and 1963
- **Field inventory methods:**
  - Systematic approach
  - Rectangular grid (2.2 miles by 10 miles)
  - 270 plots in hills and 285 plots were measure
  - Terai's result came in 1967 but in 1973 of hills
  - Measure only on **commercial forests(47%)** of total forest area.

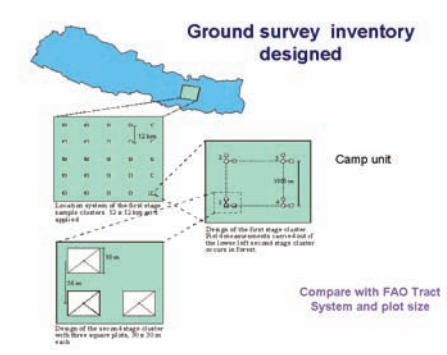
2 LRMP 1978/79

- Wall to wall assessment of Nepal's forest cover was accomplished .
- Conducted with financial support of Canadian Government

- Objective:
  - Land cover and land use mapping
- **Material used** : Based on RS data (aerial)
- **Methods**
  - NFI 1960s data were used to produce maps
  - Aerial photo interpretation
  - Ground verification

3 NFI 1986-1997 (Finnish cooperation)

- Objective
  - **to generate forest statistics of accessible forest and produce forest cover and change maps**
- Materials used
  - **Satellite images (lansat TM) 1990 &1991** (Nov-Dec) for forest cover mapping of Tetrai 14 districts
  - Spatial resolution 30*30 M
  - Spectral resolution 1-7 band
  - Aerial photos 1989-1996 (1:25000-50000 scale) for forest cover mapping of 51 hill districts.
  - Topo maps used as a mapping materials



FRA Nepal- Project (2010-2014) for 4th NFI

- Bilateral cooperation between Governments of Finland and Nepal.
- Objective for strengthening forestry information system through updating forest/forestry statistics.
- Target to produce national/ sub-national data and maps of forests, biodiversity, NTFPs and TROF.
- Under the Ministry of Forests and Soil Conservation(MFSC) Department of Forest Research and Survey (DFRS) is the coordinating organization.
- Starting from January 2010

Issue in NFI

- Complicated terrain and heterogeneity
- Diversity in forest types and compositions
- Methodological issues (lot of criticisms)
  - Inventory design
  - Representativeness
  - Sampling intensity (0.015%)
  - Accuracy
- Institutional
- Lack of data set consolidation of forests for all processes
- Lack of permanent plot for periodic update.

NFI processes purposed by FRA project

- Assessment of National level Data need
- Multi source data use such as:
  - Satellite images (high medium to low resolutions), Lidar data, aerial photos and field inventory.
- Reviewing of previous field inventory methods
- Increasing stakeholder participation
- Finalizing the comprehensive methods for NFI
- Using local knowledge and expertise
- Establishment of data sharing Mechanism
- Generation of need based and accurate data.
- Human resource development in RS and GIS

Proposed Approach and Methodology

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Conclusion

FRA-Nepal Team is in planning phase

The team has to decide on:

- Consolidating data set of forests for all processes.
- Kind of RS technologies and materials to be used.
- Percent of sampling intensity to be applied with available fund.
- Using stratification and/or systematic sampling?
- Using FAO tract system or Camp unit(Cristoph K) ?
- Rectangular or circular plots or both?
- Your great contributions is requesting to make NFI effective and efficient in Nepal.

THANKS

(Appendix 5.9.6)

NFI and Forest management in Thailand

Mr. Tosporn Vacharangkura

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change

A Status of NFI policy to mitigate climate change

NFI and Forest Management in Thailand

Tosporn Vacharangkura
Royal Forest Management

1. Current Situation of Deforestation and Degradation

- Change of Forest Area (1,000ha)
  - 1990:14,005.75 2000: 17,001.08 2008: 17,158.65
  - ※ Main causes of Change
    1. demand of forest land by rural people
    2. occupation of large forest areas by capitalists
    3. Illegal logging

<Change of Designated functions of Forest (1,000ha)>

year	1990	2000	2008
Production	320	748	1,800
Protection	6,377.12	9,132.66	9,826.80
Conservation	7,308.63	7,087.52	5,130.10
Social services	-	32.90	401.75

1. Current Situation of Deforestation and Degradation

- Change of Growing Stock (m³/ha)
  - 1990: n/a 2000: n/a 2006: 92.74
  - ※ Main causes of Change
    1. Deforestation by illegal logging
    2. Change in land use pattern
    3. Forest fire damage
- Change of Carbon Stock (million tons)
  - 1990: n/a 2000: 1741.01 2006: 1,741.12
  - ※ Main causes of Change
    1.Logging banned
    2.Promoting private plantation and tree planting

2. Strategy to reduce Deforestation and Degradation

- Strengthening Forest Policies
  - Establishment of long-term Planning
    - ex: rehabilitation of important forest area 59,200 ha during 2005-2008
    - ex: Promoting forest community management 2,790 communities during 2005-2008
  - Enactment of Forest Laws
    - ex: National Park Act B.E. 2504(1961)
    - ex: Wildlife Preservation and Protection Act B.E. 2535(1992)

2. Strategy to reduce Deforestation and Degradation

- Enforcement of Forest Administration Organization
  - Central government
    - ex: Increasing protected area such as national parks and wildlife sanctuaries
    - ex: Promoting rural people participate in community forest management

2. Strategy to reduce Deforestation and Degradation

- Increasing of Forest Budget (million$)
  - Central government
    - 1990: 110.29 2000:198.97 2008:369.09
  - Local government
    - 1990: - 2000: - 2008: -

3. Brief on National Forest Inventory

- Brief history of Forest Inventory
  - 1st Inventory
    - Institution: Royal Forest Department
    - Inventory Year: 1969-1976
    - Budget (national: n/a $, international: - $)
  - 2nd Inventory
    - Institution: Royal Forest Department
    - Inventory Year:1987-1981
    - Budget (national: n/a $, international: - $)
  - 3rd Inventory
    - Institution: Royal Forest Department
    - Inventory Year: 1993-1996
    - Budget (national: n/a $, international: - $)

3. Brief on National Forest Inventory

- 4th Inventory
  - Institution: Department of National Park Wildlife and Plants
  - Inventory Year:2004-2006
  - Budget (national:677,743 $, international:382,677 $)

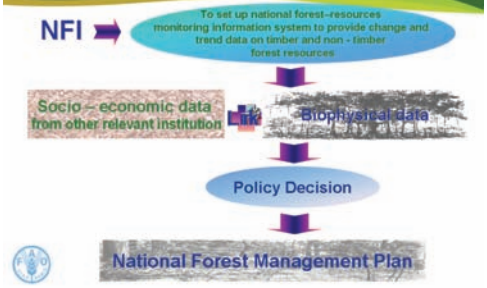
3. Brief on National Forest Inventory

- Latest National Forest Inventory Design
  - Remote Sensing
    - Introduced year: 2000
    - Type of satellite data: LANDSAT-5 TM
  - Field Inventory
    - Sample intensity: 20X20 km
    - Interval of inventory: 5 year
    - Sample size: circle (radius 17.84m)
    - Number of sample: 5,645

3. Brief on National Forest Inventory

- Implementation System of NFI in government
  - Administration
    - Organization: Forest Resources Assessment Division
    - Staffs: number 26 Budget (2010): 0.49 million $
  - Research
    - Organization: Forest Resources Assessment Division
    - Staffs: number - Budget (2010): - $
  - Collaboration with policy-making system
    - Inside Forestry agency:
      ex: to support central information system
    - Relating to national development plan:
      ex: to develop national data base system to maintain natural resources, conflict problem solution and natural disaster protection

Relationship between NFI and Forest management plan



4. Suggestions for promoting and strengthening NFI System

- <Consideration Points>
  - Forest Policies

The change in policy perspective over the past two decades (from timber production to social, economics and environmental issues) has necessitated the need to integrate policy development and information from different sources . NFI system is needed to present information in a useful format for policy – making, planning and reporting requirement.

- Administration Organization

In Thailand forest information collection activities are now supervised by more than one agency.

Good cooperation make these activities possible and also formal regulation are needed, particularly concerning reporting for international assessment.

- Human Resources

- **Administration**
  Core office for forest resources inventory should be established in forest regional office to promote NFI system.
- **Research**
  New technologies/methodologies is needed for evaluating forest resources because some areas could not access.

- Financial Resources etc.

- **National**
  The state should support enough budget in order to develop an effective continuous national forest resources monitoring information system.
- **International**
  International fund is needed for continuous NFI system.

Thank you!

(Appendix 5.9.7)

Government organization for NFI in Pakistan

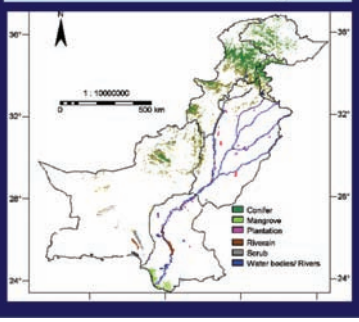
Mr. Shahzad Jehangir

Promoting and Strengthening Multi-purpose National Forest Inventory System in the Asia Pacific region in connection with Climate Change

Government organizations for National Forest Inventory in Pakistan

Dr. Shahzad Jehangir
DIG-Forests Acting Inspector General Forests
Ministry of Environment

Current Situation of Deforestation and Degradation



Current Situation of Deforestation and Degradation

	1992 (m ha)	2004 (m ha)	% Annual Change
Natural, contiguous forests	3.587	3.440	(- 0.36)
Farmland Trees	0.466	0.781	(+ 7.50)
Others (Linear +Miscellaneous)	0.171	0.171	0
Overall Forest Area	4.224	4.392	(+ 0.39)
Percent of Total Area of Pakistan	4.8	5.0	

Gross Deforestation (Natural Forests) 27,000 ha per year (1992-2004)

Current Situation of Deforestation and Degradation

Causes

- Ownership / dependence for livelihood
- Widening gap of demand & supply (43-14=29 mm^3)
- Expansive fuel/wood alternates
- Taxes on wood imports
- Climate change (droughts, shifting season, epidemics, fires)
- Shortage of irrigation water

Contribution of Forestry in National GHG emission

Pakistan's total GHG emission is estimated at 108,000 Gg (108 Mton), which makes a small fraction (0.15-0.20%) of total global emissions

CO_2:
- Energy sector (81%)
- Forestry/land use 7.5 MtonCO_2/yr (7%)
- Industries (12%)

Methane:
- Agriculture (87%)
- Fugitive/wastes (13%)

N_2O:
- Agriculture (81%)
- Sewage/Energy sector (19%)

CO:
- Transport (81%)

Strategy to Reduce Deforestation and Degradation

Sources of Funding

A. Public Sector

• Ministry of Environment / Mega Projects	300,000 ha
• Provincial Forest Departments (*ADPs, Regular budget*)	100,000 ha
Total	**400,000 ha**
Estimated financial requirement	Rs. 16 or $ 200 m

B. Private sector (President's Mass Afforestation Programme)

• Public Sector Corporations / Autonomous bodies	300,000 ha
• Private Sector Companies	300,000 ha
Total	**600,000 ha**
Estimated financial requirement of PMAP	Rs. 24 b or $ 300 m

Brief history of Forest Inventory

- 1st Inventory
  - Institution: Ministry of Food & Agriculture (though consultants)
  - Inventory Year: 1989-1991 (Published FSMP 1992)
  - Budget: (national: $ 0.23 m, ADB: $ 1.12 m)
- 2nd Inventory
  - Institution: Ministry of Environment (through Pak Forest Institute)
  - Inventory Year: 2003-04
  - Budget: (national: $ 0.12 m, international: $ 0.40 m)

Latest National Forest Inventory Design

Remote Sensing Landsat TM, Landsat ETM+ (1989-90, 1997, 2001-03

Latest National Forest Inventory Design

RS-based: Number of sample plots actually laid in provinces, AJK and NAs

Sl #	Province	Conifer		Scrub		Riverain		Range		Total	
		F	O	F	O	F	O	F	O	F	O
1	N.W.F.P.	23	135	13	79	-	-	20	124	56	338
2	Punjab	7	39	29	166	17	102	33	192	86	449
3	Sindh	-	-	-	-	16	96	21	126	37	222
4	Balochistan	5	30	8	48	2	12	23	138	38	228
5	N.As.	25	156	-	-	-	-	41	264	66	420
6	AJK	7	45	-	-	-	-	3	18	10	63
Total		**67**	**405**	**50**	**293**	**35**	**210**	**141**	**862**	**293**	**1770**

F = Number of Full Enumeration plots O = Number of Ocular observation

Sample intensity 10 km x 10 km, Sample size 3pixel x 3 pixel, RSME <1

Local Inventory Indicators in use of Forest Depts

Forest MAR Indicators	Scope	Producer(s)	Frequency	Methodology	Users
Area under forest	Forest Division	Working Plan Officer (DFO)	10-20 year	Field surveys	Foresters, Planners
Crown Cover Density %	Forest Division	Working Plan Officer (DFO)	10-20 year	Field surveys	Foresters, Planners
Tree species and composition	Forest Division	Working Plan Officer (DFO)	10-20 year	Field surveys	Foresters, Planners
Forest growth and yield	Forest Division	Working Plan Officer (DFO)	10-20 year	Volume tables	Foresters, Planners
Rate of forest change	Forest Division	Working Plan Officer (DFO)	10-20 year	Field surveys	Foresters, Planners Policy makers
Seasonal / annual targets / progress of tree planting	Provincial	CCF, CFs, DFOs	6 monthly	Estimation	Foresters, Planners
Boundaries, encroachment / transfer of forest lands	Forest Division	Working Plan Officer (DFO)	10-20 year need-based	Field surveys	Foresters
Dev and Non-dev budget allocation	Provincial	Territorial DFOs	Annual	Working Plan prescriptions	Foresters, Planners
Forest Revenues Share of forests in national economy	Provincial	DFO → CF → CCF CCF	Annual Annual	Government remittances	Finance Dept Planners, policy makers
Extent of damages (fire, illegal felling, theft, and epidemics)	Provincial	Forest Guard → CCF	Daily	Field inspection	Foresters
Demand / supplies of forest products	Provincial	CCF	Annual	Market surveys	Foresters, Planners
Forest ownership, tenure, conflicts, benefit sharing	Provincial, national	Working Plan Officer (DFO)	10-20 year	Social surveys	General public, Foresters
System of forest management	Forest Division	Working Plan Officer (DFO)	10-20 year	Forest surveys	Foresters, Planners
Level of community participation	Local to national	Working Plan Officer (DFO)	10-20 year	Social surveys	Foresters, Planners CBOs, Others

Government organizations for NFI

National Network on MAR-SFM of Pakistan includes:

- Federal Ministries (Ministry of Environment, Ministry of Food, Agriculture and Livestock, Statistics Division, Ministry of Defense, Ministry of Commerce, Planning & Development Division) and their attached departments and programmes
- Provincial Forest Departments
- Agricultural Universities
- National Non-Government Organizations
- Concerned Civil Society organizations
- International partners (including FAO, UNDP/TFP)
- Private Sector Companies

Government organizations for NFI

Ministry of Food, Agriculture & Livestock

MINFAL: MAR-related Profile of the Organization	
Type of Organization	Ministry of Environment
Main activities MAR	"Agricultural Statistics of Pakistan"
Name of Wing	Economic Wing
Organizational Structure	Secretary Economic Consultant, Director
Funding	Government of Pakistan
Infrastructure	Combined
Sources of Information	Secondary data from provincial Agricultural and Forest. Det
Forest Reporting	Uniform but not standardized
Frequency	Annual
Scope of MAR	National, provincial
Users	Planners, researchers

Government organizations for NFI

National Agricultural Research Centre

NARC: MAR-related Profile of the Organization	
Type of Organization	Public sector, Autonomous
Main activities MAR	Forest and range surveys, GIS/RS, reporting
Name of Wing	Rangeland Research Program., Water Resources Res. Institute
Organizational Structure	Director WRRI, GIS Experts
Funding	Government of Pakistan, Projects (APN, ICIMOD, MOE)
Infrastructure	Semi-detached Institute
Sources of Information	Remote sensing
Forest Reporting	Need-based, client choice
Frequency	Project-based, casual
Scope of MAR	National, international
Users	Researchers, planners, decision makers, general public

Government organizations for NFI

Space & Upper Atmosphere Research Commission

- Using space technologies for natural resource inventorying and environmental monitoring
- Executing application projects of national significance
- Transferring technology to users in public,private sectors
- Imparting RS-GIS training to potential users

Government organizations for NFI

Pakistan Forest Institute, Peshawar

Pakistan Forest Institute: MAR-related Profile	
Type of Organization	Attached Department of Ministry of Environment
Main activities MAR	Forestry Statistics of Pakistan, Survey and RS-based MAR
Name of Wing	Forest Economics Branch GIS Branch
Organizational Structure	Director General Director Forestry Research Div., Forest Economist, GIS Experts
Funding	Federal Government
Infrastructure	Semi-detached Branches
Sources of Information	Secondary Sources, Field surveys, RS-based assessment
Forest Reporting	Self-designed forms
Frequency	"Forest Statistics of Pakistan" is published at 4-5 years interval RS-based MAR is need-based / project-based.
Scope of MAR	National, provincial
Users	Researchers, planners, decision makers, general public

Government organizations for NFI

Forest Management Centre, Peshawar

FMC: MAR-related Profile of the Organization	
Type of Organization	A Unit of NWFP Forest Dept
Main activities MAR	RS/GIS based MAR, Working plans
Name of Wing	FMC
Organizational Structure	Conservator of Forests, Forest Officers RS/GIS Consultants / Analysts
Funding	Govt of NWFP
Infrastructure	Separate
Sources of Information	Field Surveys, Remote Sensing
Forest Reporting	Forest Maps (different scales), Working Plans
Frequency	Need-based
Scope of MAR	Provincial, Forest Divisional
Users	NWFP Forest Department

Suggestions for promoting and strengthening NFI System

National Forest Policy 2010: Key objective is to establish regular forest assessment and reporting system in Federal and Provincial setups

Administration Organization: Central Monitoring by Ministry of Environment, Planning Commission

Human Resources: Proposal for National Geomatics Centre in MOE, Pooling of resources, Upgrading capacities of PFI

Financial Resources: Government plans to finance $ 500,000, MAR Project completed, negotiations underway for TA, ODA not available

Thank You

(Appendix 5.9.8)

Quality control of NFI in China

Mr. Zhang Min

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change

Forest Resources Update & Measures of NFI Quality Control In China

Zhang Min
SFA, China
Feb. 24, 2010

Issues

1. Forest Resources Update
2. Development of NFI in China
3. Measures of NFI Quality Control
4. Suggestion on NFI Quality Control

Forest Resources Update

Significant achievements have been taken since 1949, benefit from great importance of forestry attached by the government and national strategic acts supporting forestry development.

Forest resources in China is playing more and more important role in mitigation of global climate change and maintaining the ecological safety.

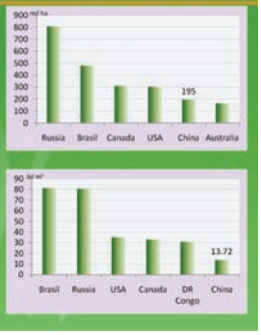
Forest Resources Update

According to 7th NFI (2004-2008),

- Forest area: 195 million ha, forest cover: 20.36%, and forest volume: 13.72 billion m^3
- Plantation area: 62 million ha, and volume: 1.96 billion m^3
- According to assessment result, the Carbon storage of the forest vegetation: 7.81 billion tons

Forest Resources Update

- Forest area: rank No. 5 in the world
- Forest volume: rank No. 6 in the world
- Plantation: rank No. 1 in the world



Forest Resources Update

Characteristic

The continuous increasing total amount of forest resources, improving forest quality, and enhancing forest ecological functions and carbon fixation show that forest resources step into the fast developing period.

Issues

2 Development of NFI in China

Development of NFI in China

- The sampling inventory techniques were introduced in 1964. The methods including stratified sampling, two/three phases sampling and double-sampling were gradually popularized. The methodology based on plots survey and precision control is established.
- Inventory at National level was initiated aiming at identification of national-wide forest resources, through setting up ground fixed plots in relevant provinces in 1973.
- The total of 7th inventory have been finished, the 8th NFI was started in 2009, and will be end in 2013.

.

Development of NFI in China

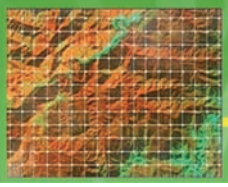
- The inventory area cover the whole country, the number of the fixed ground plots reaches 415,000, 2.844 millon RS plots
- The equal-distance systematic sampling is applied in each population
- High techniques & tools including RS, GIS, GPS and PDA are widely applied in NFI
- The inventory quality and efficiency in terms of field measurement, data management and information analysis are largely enhanced.

Development of NFI in China

Methodology

- ground plots

Fixed on the intersection point of X, Y-coordinate in kilometer unit.



Development of NFI in China

Methodology

- Intensity of plots

Decided by the required estimate precision of forest land area, growing stock, plantation area, amount of growth and consumption, and net increase amount of trees volume in the specific population.

In general, distance per plot from 2*2km to 8*8km.

- Shape and Size of Plots

Shape: Square (generally) and rectangle.

Area: 0.06-0.1ha, 0.0667ha(generally).

Size : 25.8*25.8m for 0.0667ha square plots

Development of NFI in China

Organization and Management

NFI is deployed by the State Forestry Administration (SFA), and implemented by the Department of Forest Resources Management, SFA, and cooperated by the provincial forestry administrative agencies and the regional forest resources monitoring centers.

Technician: About 20,000.

Issues

3 Measures of NFI Quality Control

Measures of NFI Quality Control

1 .make plan and specification PREPARATION

- Building up the mechanism of inventory working scheme and technical scheme review, and approval of provincial technical specification for plots survey, which assures the scientific of inventory technical documents.

Measures of NFI Quality Control

- Provincial forestry agencies responsible for preparation of above schemes and specification, and provincial review.
- Regional monitoring centers review above schemes and specification.
- SFA approve to start provincial inventory, according to the review results.

Measures of NFI Quality Control

2. SETUP TEAM AND TRAINING

- Implementing the system of inventory technical team setup and training effects assessment, which ensures job skills of technician

Measures of NFI Quality Control

- Provincial forestry agencies setup the inventory team, organize technical training and award work license for inventory, insisting on the principal of professionals.
- Regional monitoring centers review the provincial technical team composition and evaluate technical training effects.

Measures of NFI Quality Control

3. guiding check and quality assessment check

- The regulation of first-piece-inspection is carried out during guiding check, namely the survey results of first ground plot for each group (including 2-3 persons) must be checked.
- The regulation of three-level quality check (including inventory team, provincial and national levels) is implemented during quality assessment check of field visit, the checked plots number is clear stated.
- The specific criteria & standard of quality evaluation and specification for rewards and penalty are prepared to comprehensively assess the quality of field visit at plot level and the whole inventory work.

Measures of NFI Quality Control

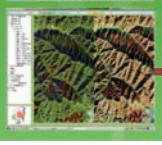
4. results review & argumentation that make certain of inventory report quality

- Regional monitoring agencies are responsible for data analysis and provincial report preparation.
- Three-level review system including preliminary review, second review and final review is respectively carried out by regional monitoring agencies, experts group of NFI, and launching expert consultation meetings.
- Establishment of preparation, examination, approval and release system of nationwide statistics every five years

Measures of NFI Quality Control

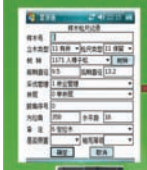
5. high technologies application

GPS and GIS are applied to automatically collect position of plots and visit track to make sure plots positioning and revisit quality.



Satellite images-based plots are set up and interpreted to analyze the spatial distribution of forest and control the sampling precision of dominant inventory indicators.

Measures of NFI Quality Control



The integration of PDA, GPS and GIS are applied to save the plot revisit time, and realtime check of collected data about plot & trees to in-situ resolve the issues on measure error or missing indicators .

Modern survey machines liking Laser Rangfinder are gradually introduced to enhance the measured precision.

Measures of NFI Quality Control

The quality and level of inventory are efficiently ensured, due to strengthen quality control with a series of action and countermeasure. Both of revisited plots percent and re-measured trees percent are above 98% during previous NFIs.

The inventories results always track the process of forestry construction since 1970s, and impersonally image the latest achievements of forest reform and development in China in different stages.

Issues

4 Suggestion on NFI Quality Control

Suggestion on NFI Quality Control

High importance of regulation building, taken it as the main issue of NFI system development

Promotion of modern survey techniques and machines to enhance inventory quality and efficiency

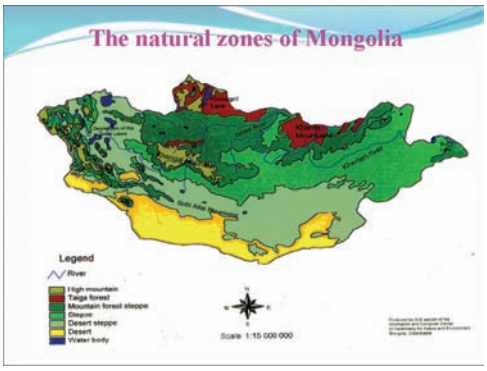
Could FAO develop common guidelines of inventory quality control, and promote in the national forest monitoring and assessment project?

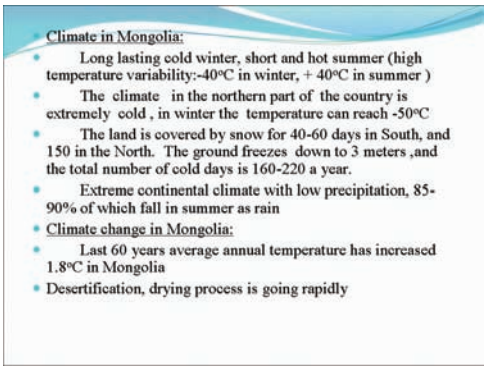
Thanks

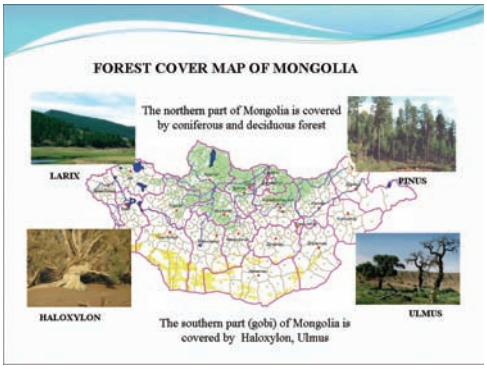
(Appendix 5.9.9)

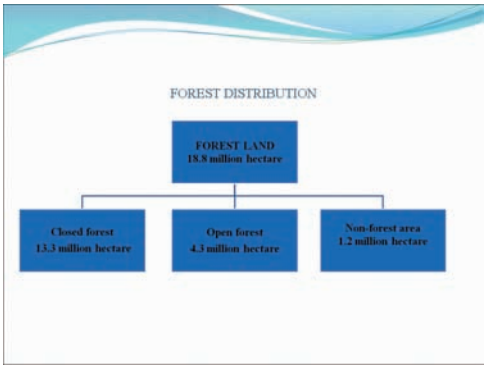
Extent of technical expertise in Mongolia

Mr. Batgombo Otgonsuren









Current Situation of Deforestation and Degradation

- Change of cloused natural Forests Area (million.ha)
  - 1990: 13.5
  - 2000: 12.7
  - 2008: 12.5
- Change of Growing Stock (m³/ha)
  - 1990: 112.0
  - 2000: 112.0
  - 2008: 110.9

The natural forest area and growing stocks are decreasing every year. Main causes of Change are:

1. Forest fire (wild fire)
2. insects Disturbance
3. illegal logging

Forest fire (wild fire)

insects Disturbance

illegal logging

Brief history of NFI Mongolia

The Russian-Mongolian joint expedition started Mongolian national forest inventory in 1956 first time. Study results:

-First formal data about forest foundation of Mongolia

-National specialists were trained by Russian experience.

The second national level forest inventory was done by Russian and Mongolian joint expedition again in 1974. Study results :

-Forest inventory for aerial photographic new technology was used.

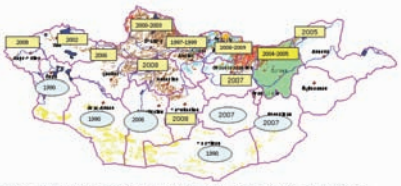
-General plan how to use the forest resource of Mongolia was refined.

After that forest inventory has not been done for national level.

Considered that since 1990 Mongolia changed to Market economy, national forest inventory policy was reformed. 1990-2005 forest inventory has been finished for provinces one by one. Since 2006 forest inventory is recurring.

Nowadays every year 1.9 million hectare forest areas are researched.

OVERVIEW OF FOREST INVENTORY IN MONGOLIA



The forest inventory have to be done every ten years according to the Mongolian Law on Forests
-NFI frequency is 10 years by province
1.9 million hectare area can be inventoried per a year.

Brief on National Forest Inventory

Latest National Forest Inventory Design

The forest inventory system has been described previously that is based on the Russian -forest inventory system. The forest is divided into compartments based on topographic features as natural boundaries (aspect, ridge, creeks).
The compartments are divided into sub-compartments (average area approximately. 100 ha) and delineated by main timber species, average diameter, and age class.
For each sub-compartment the species composition, diameter distribution, standing timber volume, natural/artificial regeneration, damage (fire, insects), and Non timber forest products -in some inventory projects – are recorded.
Prior to each forest inventory, a sample plot is delineated and all trees are sampled. This exercise is intended as a "calibration" of the forest inventory team in order to define which volume tables and site indices should be used for the inventory of the region.

Brief on National Forest Inventory

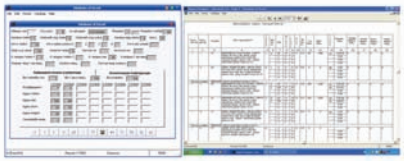
MAPPING FOREST COVER

Mapping on Arc View 3.3 GIS application /since 2002/

Scan the topographic map with compartment and sub-compartment polygon based on air-photograph. Geo-process /geo-reference/ scanned map and digitize forest cover polygons. Join attribute data to map to classify forest types

Brief on National Forest Inventory

Data processing on database software "FOREST"/Visual fox pro 6.0/



Entering field data into the forest database software "FOREST" /visual fox pro 6.0/. Developing data analyze and creating results for forest management planning.

Brief on National Forest Inventory

The Results of National Forest Inventory forest detailed map, forest management report and forest database book have made for particular given area /province, sub-province/ of the country

REMOTE SENSING (SPACE) TECHNOLOGY IN FORESTRY INVENTORY OF MONGOLIA

Current situation

The remote sensing (space) technologies are only beginning to use for forest inventory, forest mapping and forest management

The first remote sensing method was used in forest survey for 60 thousands hectare area in 2002

Under the joint research of GTZ project and Forest research center of Ministry of Nature and Environment have used remote sensing technology on forest inventory, forest mapping and forest management planning in Khan-Khentii special protected area of Mongolia

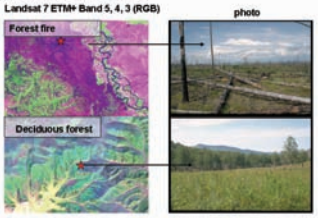
REMOTE SENSING (SPACE) TECHNOLOGY IN FORESTRY INVENTORY OF MONGOLIA

STUDY RESULTS

- Developed forest cover map based on satellite image / scale 1:100 000, 1 : 50 000/ for special protected area.
- Developed detecting keys of forest type on satellite images
- Geo-referenced
- Used the systematic sampling design
- 12 trees are measured on sample plot
- Forestry sector's specialists are trained in remote sensing method.

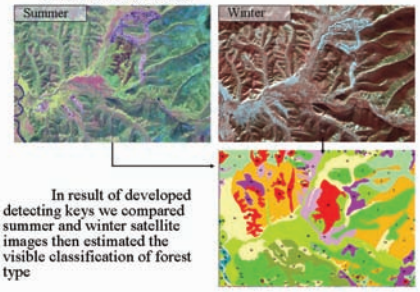
REMOTE SENSING (SPACE) TECHNOLOGY IN FORESTRY INVENTORY OF MONGOLIA

METHOD OF DEVELOPING DETECT KEYS



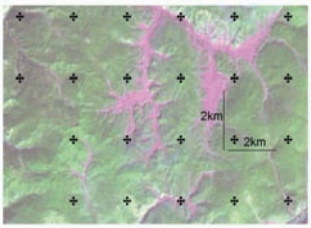
Developing the detecting keys to identify forest type on satellite image by using color. Then ground truth work have been done.

METHOD OF CLASSIFICATION



In result of developed detecting keys we compared summer and winter satellite images then estimated the visible classification of forest type

Systematic sampling design used on sample plot
Destination of sample plots are 2 kms
The closest 12 trees with the central point are measured



Collected data on sample plot /12 tree/

- COORDINATE
- SLOPE
- TREE SPECIES
- DIAMETER OF BREAST HEIGHT
- TREE HEIGHT
- AGE CLASS
- TIMBER VOLUME
- FOREST DAMAGE (FIRE, INSECT, INJURY)

Benefits

•Estimate forest cover change in short time caused by forest fire, insect, illegal logging
•Geo-reference forest cover map on each sub-provinces and provinces
•Collecting new datas of the recent years

Challenges:

Remote Sensing technologies are not used NFI in Mongolia because of not enough budget forest satellite data, lack of professional capacity, non licensed Remote Sensing software

Suggestions for promoting and strengthening NFI System

Problems:

The frequency of the "national" forest inventory is set at 10 years.

At the moment, it is avarage 20 years. The reasons are a lack of forest inventory survey crews as well as no adapted design for a national forest inventory

. The technical term used for forest inventory is "forest taxation". The existing legal regulations provide precise guidelines. Existing old method have been used for 35 years.

Beginning to create GIS database of forest inventory, updating is every year for certain area but not used for national level

Lack of professional capacity /GIS, Remote sensing specialists/

From nowadays forest inventory are tendered and professional organizations have an opportunity to submit a quote.

Even though Remote sensing technology is planned in 2002 it can not be implemented for whole forest found area on account of economy problem .

Suggestions for promoting and strengthening NFI System

- Suggestion for forest Policies

Forest inventories are a tool for the forest manager to obtain needed information serving its objectives. Forest inventories are differentiated according to objectives and size. All planning of forest inventory and the drafting of forest management plans has to be in strict correlation with the purpose of the land management and the need for information. The collection of unneeded information increases unjustified costs. In Mongolia, only one type of forest inventory (regional inventory) is conducted Consequently, the general approach of forest inventory has to be fundamentally changed. Different forest inventory techniques should be developed at the:

-National level: national forest inventory (State of Mongolia);

-Regional level: reconnaissance inventories (Province, District);

- Local level: working plan surveys (Forest User Group, Forest Concession);

New methods needs to be implemented in Field monitoring and assessment (surveys, inventories)

The need assistance for development countries

Mongolia forest inventory working announce Tender professional private sector improve the ability support of educate specialist necessary.

(Appendix 5.9.10)

Relationship between National development & NFI in Laos

Mr. Linthong Khamdy

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change
23-25/2/2010 Seoul, Korea

Relationship between National Development and NFI in Lao

Presented by Mr Linthong KHAMDY
Deputy Director of Forest Inventory and Planning Division,
Department of Forestry

Brief on National Forest Inventory

– 1th Inventory
- Lao NFI was done two provinces per year. so NFI was completed for 8 years (1991-1998) for first inventory.
- It was done by Forest Inventory and Planning Division, Department of Forestry.
- Budget (national: N/A, international: SIDA fund)
- From 1998 to now, NFI can not be continued, because of lack of fun and Human resources.

Brief on National Forest Inventory (cont)

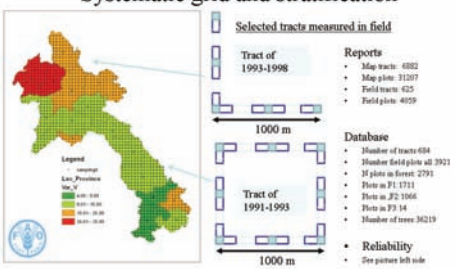
- Latest National Forest Inventory Design
  - Two-phased, stratified, systematic, cluster sampling (square shaped tracts/clusters).
  - In the first phase a large number of tracts are laid out on the Land Use Maps (based on the SPOT satellite images). The tracts are located in a systematic way according to the map grid net. The tracts are classified according to land use and accessibility. Based on this classification the tracts are assigned to five different strata.
  - In the second phase a certain ratio of the tracts, different for different strata, are selected for field inventory. This selection is done with random.

Brief on National Forest Inventory (cont)

– Field Inventory in accessible area
- The clusters consist of square shaped, tracts. The tract sides have a length of 1 km x 1 km. Along the sides different types of sample plots are located. The tracts are drawn on the 1:100 000 scale topographic map and on the land use map during the first phase of the inventory.
- Sample (plot) size:
- type (a) is 20x20 m,
- b) 20x40 m and
- c) 20x400 m.
- **Number of tract is 583**
- **number of plot is 3849**

NFI 1991-1998

Systematic grid and stratification



The result of NFI has been reflected into the National Development Plan in term of:

–Country Forest Cover Monitoring.
–Forest Policy Formulation.
–Forest Development Strategy to contribute to poverty eradication.
–Species Identification and Growth Volume for Sustainable Management of Forests contributing to the targets of the national socio-economic plans.

The major Forest sector targets

- To improve quality of existing forested area so as to recover forest cover rate to about 70% of total area by naturally regenerating up to 6 million ha and planting tree up to 500.000 ha in tmporary unstocked forest area as an integral part of rural livelihood support system including stable water and forest products supply and mitigation of natural disasters.

The major Forest sector targets (cont)

- To generate a sustainable stream of forest products for domestic processing and consumption, and many of them for eventual export generating adequate household incomes, contributing to the country's foreign exchange resources and fiscal revenue and increasing direct and indirect employment.
- To preserve the existence of many species and unique habitats, which are threatened with extintion
- To conserve environment including protection of soil, conservation of watershed and climate.

Thank you
Kob Chai

(Appendix 5.9.11)

Strategy for NFI in Vietnam

Mr. Dinh Huu Khanh

Strategy for National forest inventory in Vietnam

(Presented by: Dinh Huu Khanh
National forest inventory and planning institute)

1 History of national forest inventory
2 The changes on forest resources by the time
3 Strategy for NFI in Vietnam

1 History of national forest inventory

Year	Title	Institution	Scale map	Estimation Level	remote senssing	(Percentage area, %)	Budget /000USD
1978	National forest resources inventory	Forest Inventory and Planning Institute	1/25,000; 1/50,000 1/100,000	National Sub-national	Arial photo	Partial, 70%	500
1981-1983	National Forest resources Inventory	Forest Inventory and Planning Institute	1/500,00	National	Arial photo	Full	700
1987-1989	National natural Forest Inventory	Forest Inventory and Planning Institute; Management units	1/25,000 1/50,000	National, Sub-national, District, Managem ent Unit	Arial photo	Partial, 50%	2,000

1 History of national forest inventory

Year	Title	Institution	Scale map	Estimation Level	remote senssing	(Percentage area, %)	Budget /000USD
1991-1995	National Forest Inventory and Assessment Program	Forest Inventory and Planning Institute	1:250,000; 1:100,000; 1:25,000	National, Sub-national	Spot (30m*30m)	Full	1,500
1996-2000	National Forest Inventory and Assessment Program	Forest Inventory and Planning Institute	1:250,000; 1:100,000; 1:25,000	National, Regions	ETM (30m*30m)	Full	2,500
2000-2005	National Forest Inventory and Assessment Program	Forest Inventory and Planning Institute	1:250,000; 1:100,000; 1:25,000	National, Sub and Province	ETM (10m*10m)	Full	3,000
2006-2010	National Forest Inventory and Assessment Program	Forest Inventory and Planning Institute	1:250,000; 1:100,000; 1:25,000 1:10,000	National, Sub and Province, districts and some communes	Spot5 (2.5m*2.5 m)	full	3,500

2 The changes on forest resources by the time

2.1 Change of Forest Area (1,000ha)
1990: 9.363
2000: 11.725
2008: 12.931

※ ***Main causes of Change***
- Five million ha reforestation programme
- Forestry land allocation to household
- Support for production plantation

2.2 Change of funtion

Purpose	*1990*	*2000*	*2008*
Production	5,707	4,519	6,330
Protection	2,925	5,502	4,979
Conservation	731	1,570	2,078

2 The changes on forest resources by the time

2.3 Change of Growing Stock (m3/ha)

1990: 76
2000: 78
2008: 74

※ ***Main causes of Change***

Most new forest area is young and new plantation with low growing stock

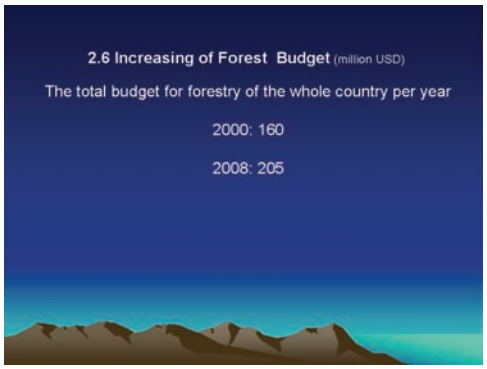
2 The changes on forest resources by the time

2.4 Change of Carbon Stock (million tons)
1990: 777
2000: 927
2008: 952

※ ***Main causes of Change***
Forest area and growing stock is increasing

2.5 Strengthening Forest Policies

- Establishment of long-term Planning of National Forest conservation and developing plan
- Enactment of **Forest conservation and developing Law**
- **Decree for Payment for environment service**


2.6 Increasing of Forest Budget (million USD)
The total budget for forestry of the whole country per year
2000: 160
2008: 205

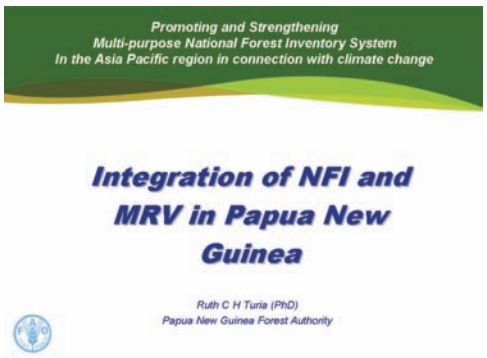
3 Strategy for NFI in Vietnam
3.1 Objectives of NFI
- Collecting data of quantity and quality of forest, forestry land to manage effectively and bio-diversity, environment conservation
- Propose recommendation to Government to revise policy
- To establish forest development plan in different level (Nation, region, province, district and commune.
- Forest and forestry Land allocation to household
- Supply data of exploitation potention of wood and NWFP for sociaty (expecially plantation)
- Contribute to share payment for environment service to forest owners

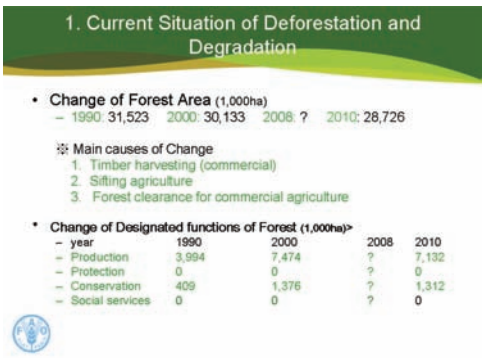
3 Strategy for NFI in Vietnam
3.2 How to NFI in Vietnam
- Satellite emagery with high resolution (Spot5 2.5m x 2.5m)
- Edit forest type map with many scale from 1/1,000,000 to 1/10,000 for making plan in different levels
- Sampling system plot with density 8km x 8km. The total SP is 2,100
- Collecting all data from seedling to big tree, NWFP, social economic and natural conditions.

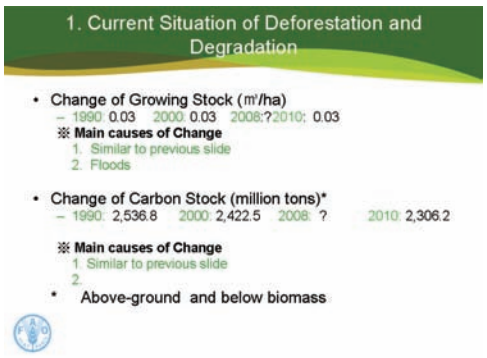
(Appendix 5.9.12)

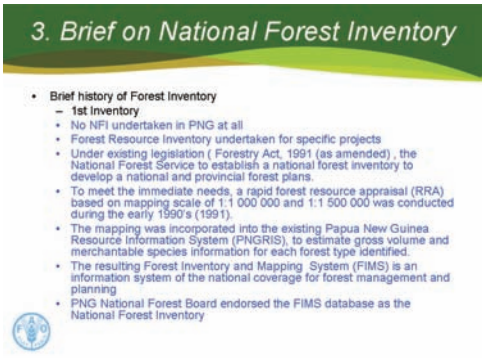
Integration of NFI and MRV in PNG

Ms. Ruth Turia









3. Brief on National Forest Inventory

- Latest National Forest Inventory Design
  - Remote Sensing
    - An academic project with the University of Papua New Guinea (UPNG) using remote sensing on the state of the forest. However, no actual ground truthing done.
    - PNG National Forest Service is seriously looking into opportunities for remote sensing service providers and, is currently seeking funds through various Aid Donors to establish some understanding or agreement with reputable RS service providers.
    - Type of satellite data: Spot/Landsat
  - Field Inventory
    - Sample intensity: X km

    Sampling Intensity;
    - In real life Budgets dictate the SI
    - 100% SI is desired but not possible due to Budgets
    - Acceptable SI have been 1% - 10%

3. Brief on National Forest Inventory

•Interval of inventory:
Project based inventory based on approved work program budgets on annual bases (by provinces)

Sample size: square (x m) or circle (radius m)

-Based on acceptable plot design and plot size by field data computation software called FIPS (Forest Inventory Processing System);
-All forest inventories carried out based on a "systematic continuous line plot design".

-Sample Plot Size are;
(1) a. 50m X 20m – Sawlog (Main Plot)
b. 50m X 10m – Pulpwood (Sub Plot)
(2) a. 100m X 20m – Sawlog (Main Plot)
b. 100m X 10m – Pulpwood) (Sub Plot)

All plots are laid out continuously along the traverse lines that are brushed ahead by line cutters. Lines usually vary in lengths (distances in Kms)

NB: Both plot intervals and lengths of traverse lines depend on terrain conditions.

3. Brief on National Forest Inventory

- Number of sample:
  - > Number of sample plots depend on terrain conditions.
  - > Number of plot samples usually predetermined in the office using 1:100 000 scale topographic maps and dependent on terrain conditions

3. Brief on National Forest Inventory

- Research
  - PNG Forest Research Institute, the research arm of the PNG Forest Authority, National Forest Service
    - > PINFORM (Papua New Guinea and ITTO Natural **For**est Model)
  - Staffs: 5 Budget (2010): US$300,000
- Collaboration with policy-making system
  - Inside Forestry agency:
    ex: FIA
  - Relating to national development plan:
    ex: Department of National Planning and Monitoring

3. Brief on National Forest Inventory

- Integration with MRV?:
  - ➢Will need 1400 PSPs (only has 100 PSPs at moment)
  - ➢Has FIMS and PINFORM (need to integrate data)
  - ➢Will require new satellite imageries to assess resource situation
  - ➢Capacity lacking

4. Suggestions for promoting and strengthening NFI System

- <Consideration Points>
  - Forest Policies

    Need to revise the policy to accommodate Climate Change and Carbon issues (REDD/CDM)
  - Administration Organization

    New structure under implementation
  - Human Resources

    Need to build manpower capacity in terms of trained staff on the latest forest inventory methods and build capacity in GIS facilities and staff
  - Financial Resources etc.

    The financial resource is currently seen as the main constraint which over the years has been the problem, therefore the absence of NFI for PNG

3. Brief on National Forest Inventory

- Implementation System of NFI in government
  - Administration
    - Project based inventory to establish commercial volume coordinated by the Forest Policy & Planning Directorate, PNG Forest Authority, National Forest Service
    - Field work conducted by staff of the PNG Forest Authority, National Forest Service
      - Staffs: 10 Budget (2010): $235,800

Thank you!

(Appendix 5.9.13)

Necessity of NFI in Solomon Islands

Mr. Terence Titiulu

Promoting and Strengthening
Multi-purpose National Forest Inventory System
In the Asia Pacific region in connection with climate change

A Status of NFI policy
to mitigate climate change

Necessity of NFI in Solomon Islands

Terence Titiulu
Ministry of Forestry and Research

Presentation Outline

1. Background of Solomon Islands
2. Forest Composition
3. Merchantable volume summary
4. Major Export Commodity
5. Natural Forest Depletion
6. Future Wood flow predictions
7. Status of Deforestation & Degradation
8. Strategies to reduce Deforestation & Degradation
9. Gaps of Inventory Data in the Country
10. Suggestions for Strengthening NFI
11. Why NFI is necessary for Solomon Islands

Background Information

- Total land Area = 2,334,900 Ha
- 90 % of land covered by Natural Forest
- 87% of land area under Customary Ownership
  - 9% is Government land & 4% Private land
- Population (2008) = 580,000
  - Melanesian, Polynesian, Micronesian, Chinese and others

Background Information Cont

- 80% of Population live in rural areas and depend extensively on Subsistence farming.
- Comprises 992 Islands
- 70 languages and various dialects
  - English official Language
- Shipping becomes main transportation and becomes uneconomical route

Forest Composition

- Six major forest Stratification types
  - Saline Swamp Rainforests
  - Fresh water Swamps and River site
  - Lowland rain forests
  - Hilly Forests
  - Upland Forest Hills
  - Non – Forest and other lands

Forest Composition Cont

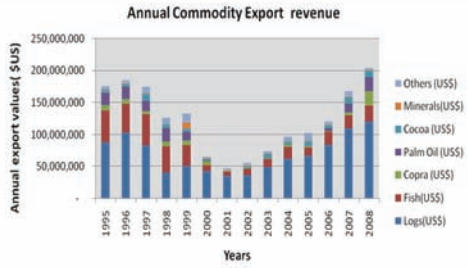
- Virtually only 278,221 ha of total forest area is available as commercial forest when;
  - Excluding forests above 400m a.s.l and Conservation areas.
- However

Summary of merchantable volumes for unlogged natural forests with export potential

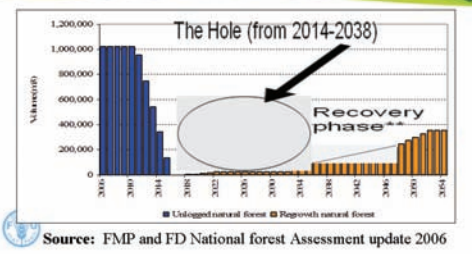
Province	National Inventory update 2006	
	(m3/ha)	(m3)
Guadalcanal	12	481,200
Western	42	2,079,000
Isabel	21	1,190,700
Choiseul	31	2,573,000
Makira	28	487,200
Malaita	26	751,400
Central	49	279,300
National 2006		7,841,800
Revised 2009	2,981,253m3 exported in 2007 & 2008	4,860,547

Source: URS (2003 and 2006) and CBSI 2007 and 2008

Annual Major Export commodity in Solomon Islands

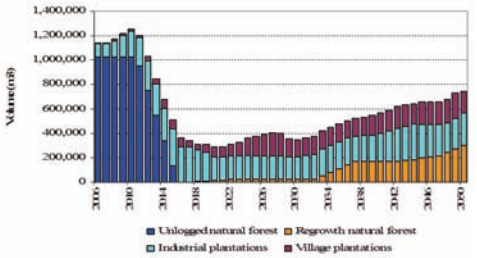


Natural Forest depletion Predictions updated for 2006



Source: FMP and FD National forest Assessment update 2006

Combined future wood flow scenario based on 2006 forest inventory updates



1. Current Situation of Deforestation and Degradation

- Change of Forest Area (1,000ha)
  - 1990 = 2324
  - 2000 = 2268
  - 2005 = 2241

  Trend

- Main causes of Change
  1. Commercial Logging
  2. Small Scale milling operations
  3. Subsistence farming

1. Current Situation of Deforestation and Degradation (cont)

- Change of Growing Stock (m³/ha)
  - 1990: 218.5
  - 2000: 213.2
  - 2005: 210.7
- Main causes of Change
  1. **Regeneration low**
  2. **Commercial growing stock reduced due to poor harvesting operations and Unsustainable harvest**

2. Strategy to reduce Deforestation and Degradation

- Strengthening Forest Policies
  - Establishment of long-term Planning
    - Forest Act and Regulations amended to support Forest Policies
    - Enforcement of Other related Acts incorporated
    - National Reforestation programme now in place
  - Enactment of Forest Laws
    - Current Forest Act does not support policies
    - Enforcement and monitoring of Code of logging and regulations and Environmental Act 2008

2. Strategy to reduce Deforestation and Degradation

- Enforcement of Forest Administration Organization.
  - Central government
    - Effective budget system to support services
    - Training and Technology for Field data collection
  - Local government
    - Include budget for forestry administration
    - Creation of alternative forest uses for income

3. Gaps on National Forest Inventory

- Inventory 1995, 2003 and updated 2006 is no longer relevant due to intensive forest Deforestation.
- Policy and Legislations outdated and inconsistent
- Implementation System of NFI in Ministry of Forestry is not given as a priority as indicated.
  - Example;
    - Ministry of Forestry and Research (includes Recurrent and Development Budget)
      - Staff: 184 Budget (2010): USD$4 million

4. Suggestions for promoting and strengthening NFI System

- Government Forest Policy
  - Forest Policies incorporated in Forest Act
  - Organization structure indicative
  - Financial Resources input from
    - National Government policy for data update
    - International Assistance needed

5. Why NFI is necessary and essential for Solomon Islands1

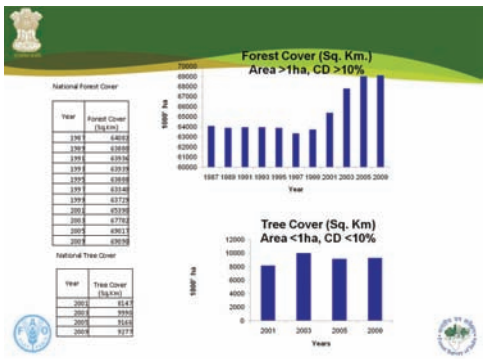
- **Forest Resource Management**
  - **Determination of Sustainable Allowable cut**
  - **Reliable Field data of commercial timber**
  - **Forest Development and Forest Uses**
  - **Determination of Forest Value available**
  - **Research and Mapping Records**
  - **Identification of Conservation Sites**
  - **Environmental Assessment Determination**

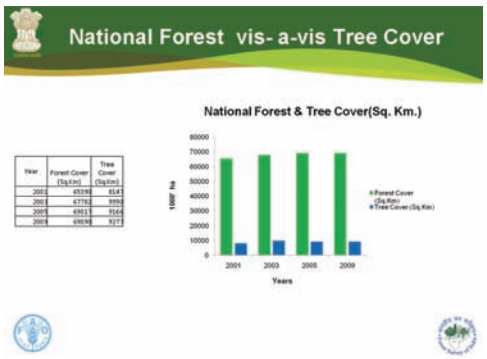
Thank you

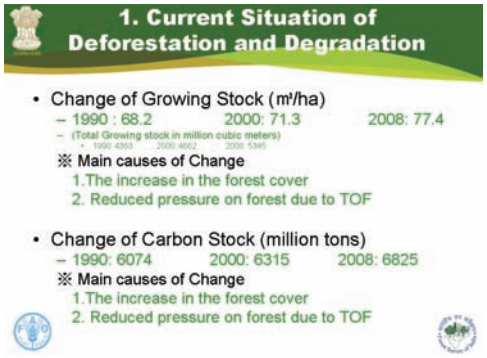
(Appendix 5.9.14)

Carbon estimations in India

Mr. Shiv Raj Singh







2. Strategy to reduce Deforestation and Degradation

The National Action Plan on Climate change released by Hon'ble Prime Minister focuses attention on 8 priorities National Missions

- 1. Solar Energy
- 2. Enhanced Energy Efficiency
- 3. Sustainable Habitat
- 4. Conserving Water
- 5. Sustaining the Himalayan Ecosystem
- 6. A "Green India"
- 7. Sustainable agriculture
- 8. Strategic Knowledge Platform for Climate Change

3. Brief on National Forest Inventory

- Brief history of Forest Inventory
  - PISFR started as FAO, UNDP project from1965 to 1968. Continued till 1981.
  - In 1981 PISFR into FSI. But inventory on local and project basis only.
  - 1st Inventory
    - By Forest Survey of India on national level during the year 2002-03 to 2003-04.
  - 2nd Inventory
    - Inventory Year: 2004-05 to 2005-06
  - 3rd Inventory
    - Inventory Year: 2006-07 to 2007-08

  4th Inventory – Only TOFI is taken up during 2008-09 to - 2009-10

  5th Inventory to be taken up during 2010-11 to 2011-12. (25% districts will be revisited of 1st FI.)

3. Brief on National Forest Inventory

- Latest Design
  - Remote Sensing
    - Introduced year: 2002
    - Type of satellite data: P6, LISS IV Mx, 5.8 m
    - RS is used only for TOF (Rural) inventory
  - Field Inventory
    - Sample intensity: 3 X 3km approx. 1point represents 9 sq. Km
    - Interval of inventory: Two year cycle
    - Sample size: square (31.62 x 31.62 m)
    - Number of sample: Approx.7000 sample plots for FI & 8000 sample plots for TOFI are taken in 60 districts in per cycle

3. Brief on National Forest Inventory

- Implementation System of NFTRI in government
  - Administration
    - Organization: Forest Survey of India, Forest inventory division
    - Staffs: 14 Supervisory and 165 Technical & field staff in Hq and 4 regional offices. (Support staff is extra)
    - Budget (2010): Approx. 70 M INR, 1.5 M $
  - Research
    - Creation of separate research wing for Inventory is under consideration
  - Collaboration with policy-making system
    - Inside Forestry agency: Information is shared
      - Conservation strategies
      - Planning for farm/agro forestry strategies
      - Input for policy making for forest/wood based industrie

3. Brief on National Forest Inventory

- Relating to national development plan:
  - GDP – Contribution of forestry 1.70% - 888.23 billion INR. Out of which about 40% comes from TOF
  - Input for impact assessment of various infrastructure projects like Hydroelectric, road and rail network, power projects etc.

4. Suggestions for promoting and strengthening NFI System

- Human Resources
  - Administration – Capacity building desirable
  - Research – A separate wing needs to be developed
- Financial Resources etc.
  - National – need more for further strengthening
  - International –required for technical collaboration and capacity building.

Assessment of Biomass Carbon Stock of India's Forests- various components

- Forest cover maps,
- Forest types maps,
- National Forest and Tree Resource Inventory,
- Estimation of other components of forest biomass, and
- Integrating the above four components to estimate the forest carbon and change

Forest Cover Assessment

INPUTS

- Satellite data of the entire country from National Remote Sensing Centre (NRSC) IRS ID/IRS-P6 (23.5m spatial resolution)
- SOI Topographic sheets - 1: 50,000

METHODOLOGY

- Digital / visual Interpretation
- Ground Verification
- Minimum map able area is I ha

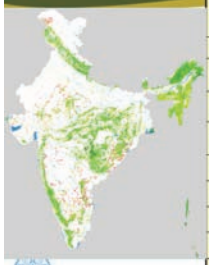
OUTPUTS

Forest cover maps on 1:50,000 scale in digital or hard copy form showing following forest cover classes:

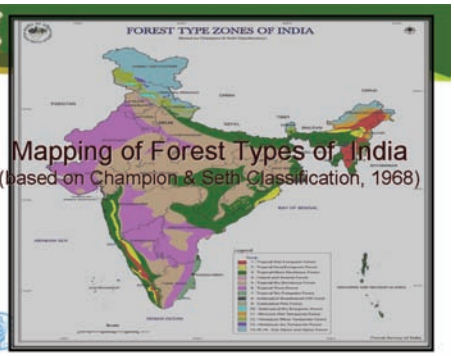
CATEGORY	CANOPY DENSITY
Very Dense Forest	More than 70% canopy
Moderately Dense Forest	40-70%
Open Forest	10-40%
Scrub	Less than 10% in forest lands

It takes almost two years to complete the assessment process

Forest Cover of the Country - 2007



Class	Area (km²)	% of Geo. Area
Forest Cover		
a) Very Dense Forest (more than 70% density)	83,510	2.54
b) Moderately Dense Forest (40% to 70% density)	319,012	9.71
c) Open Forest (10% to 40 % density)	288,377	8.77
Total Forest Cover	690,899	21.02
Non-forest Area		
Scrub	41,525	1.26
Non-forest	2,554,839	77.72
Total Geographic Area	3,287,263	100.00



Forest Types of India*

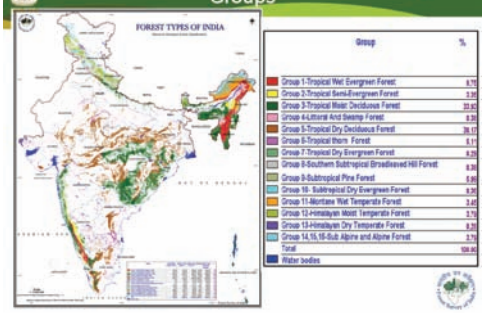
MAJOR GROUPS	TYPE GROUPS
Moist Tropical Forests	Group 1-Tropical Wet Evergreen Forests
	Group 2-Tropical Semi-Evergreen Forests
	Group 3-Tropical Moist Deciduous Forests
	Group 4-Littoral And Swamp Forests
Dry Tropical Forests	Group 5-Tropical Dry Deciduous Forests
	Group 6-Tropical thorn Forests
	Group 7-Tropical Dry Evergreen Forests
	Group 8-Southern Subtropical Broadleaved Hill Forests
Montane Temperate Forests	Group 9-Subtropical Pine Forests
Montane Subtropical Forests	Group 10- Subtropical Dry Evergreen Forests
	Group 11-Montane Wet Temperate Forests
	Group 12-Himalayan Moist Temperate Forests
Sub Alpine Forests	Group 13-Himalayan Dry Temperate Forests
	Group 14-Sub Alpine Forests
Alpine Scrub	Group 15-Moist Alpine Scrub
	Group 16- Dry Alpine Scrub

SUB-GROUPS: *Sub-group- 22 Nos.*

TYPES: *Types - 200 Nos.*

*As per Champion and Seth classification(1968)

Forest Cover of India in Different Forest Type Groups



National Forest and Tree Resources Inventory- methodology

- Two year cycle
- Multistage and multiphase design is followed.
- The country is stratified into 14 physiographic zones
- Ten percent (60) districts are randomly selected in every cycle from each physiographic zone (proportion to size of zone).
- In each following 3 surveys are carried out:
  - Forests,
  - TOF (rural), and
  - TOF (urban)

Schematic diagram of the National Forest Inventory (NFI) in India

Step 1. Stratify the Country into 14 homogeneous physiographic zones.

Step 2. Randomly select 60 districts (10% of the total) from these zones in proportion to their sizes.

Step 3. Divide the area of selected districts into grids of 2½′ × 2½′.

Step 4. Divide each grid of 2½′ × 2½′ into four sub-grids of 1¼′ × 1¼′.

Step 5. Randomly select two sub-grids out of four grids starting at one end. Systematic sampling is then adopted to select two sub-grids in other grids of the district.

Step 6. Lay out a square sample plot of size 0.1 ha at the centre of each selected forest sub-grid.

Step 7. Measure dbh of all tree over 10 cm, collect litter and soil sample, record regeneration status, bamboo, land use, legal status, crop composition, etc.

Step 8. Conduct manual check of sample data on random basis and then enter into data entry module.

Step 9. Conduct inconsistency check of sample data through software and then process.

Step 10. Analysis and estimation of various parameters

National Forest Inventory-Methodology

Physiographic Zone Map of India

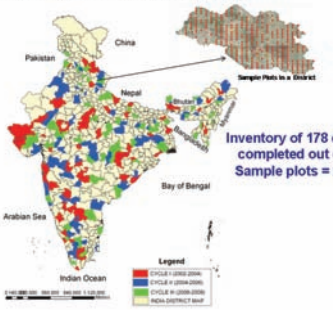
National Forest Inventory- Methodology --contd

Physiographic Zones on Forest Cover

National Forest Inventory – Methodology --contd

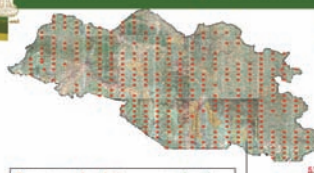
Randomly Selected 60 districts

Districts Completed Under National Forest Inventory



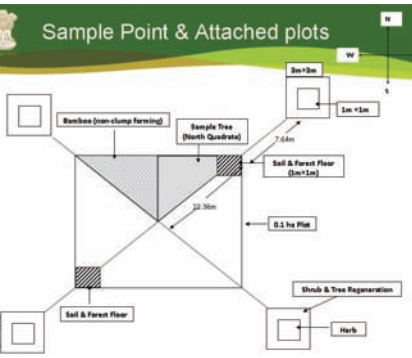
Inventory of 178 districts completed out of 593
Sample plots = 22,000

Distribution of sample plots in a selected District



Two sample plots are randomly selected. Thereafter, every alternate 1¼'X 1¼' GRID is systematically selected to form two systematic samples. At center of selected 1¼'X 1¼' SUB GRID, sample plots of 0.1 ha is laid out.

Sample Point & Attached plots



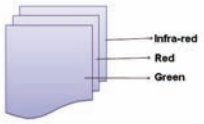
Methodology of NFI -- contd

- Use of the suitable volume equation for accurately estimating the volume (biomass) of the tress.
- To estimating growing stock about 250 volume equations have been developed for tree species growing in different physiographic zones.
- These volume equations are based on measurement of trees above 10 cm dbh and excludes volume of main stem below 10 cm and branch wood below 5 cm diameter.

ASSESSMENT OF TREES OUTSIDE FORESTS (TOF)

Methodology Adopted

- Remote sensing technique is used for stratification.
- The IRS P6 LISS IV scenes of the study area are identified and procured from NRSA.
- IRS P6 LISS IV scenes provides information in 3 spectral bands.



As a first step, corresponding toposheet No. (1:50,000 scale) and District boundaries are identified with the help of S.O.I grid and boundary map.

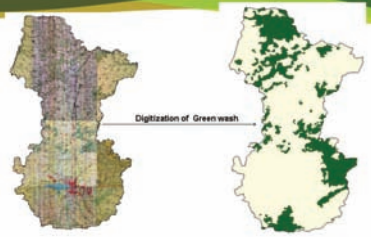
Map of India showing Administrative Boundaries

Boundary and Toposheets ID

- **The Toposheets corresponding to district boundary are scanned and geo-referenced to give them co-ordinate system.**
- **Further mosaicing of referenced toposheet and subsetting is done.**

Total No. of toposheets falling in the district

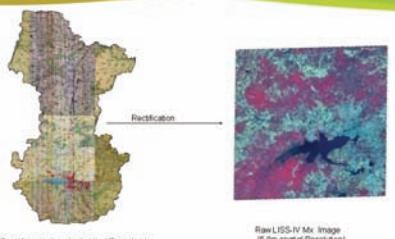
The Reserved and Restricted forest area is digitize to prepare the greenwash map



Mosaiced and subsetted Toposheets of district

Green wash map of district

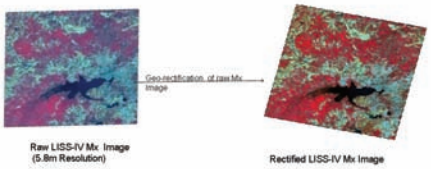
The geo-referenced and sub-setted Toposheets are then utilized for the rectification of the LISS-IV Mx Satellite Image.



Georeferenced and subsetted Toposheets

Raw LISS-IV Mx Image (5.8m spatial Resolution)

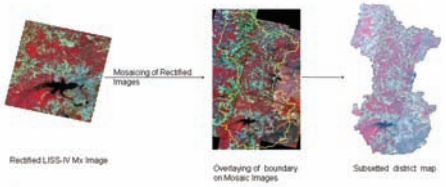
The raw IRS P6 LISS-IV Mx Satellite Data having spatial resolution of 5.8m is rectified from the georefernced toposheet of the district



Raw LISS-IV Mx Image (5.8m Resolution)

Rectified LISS-IV Mx Image

Rectified LISS IV Mx Images are mosaiced together and overlayed with the district boundary for making a subset.



Rectified LISS-IV Mx Image

Overlaying of boundary on Mosaic Images

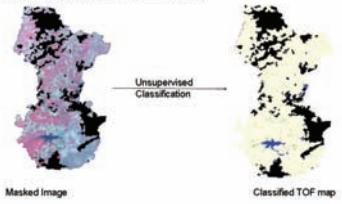
Subsetted district map

The greenwash area is masked out from the mosaic image of the district

Greenwash map overlayed over mosaic image of the district

Greenwash masked out

- Then Unsupervised classification is performed over the masked image.
- The classification is done to obtain two classes: TOF area, and water bodies.
- TOF area is further divided into three classes :- Block, Linear & Scattered which are identified according to their geometric shape.



Classified Trees Outside Map of district showing three different stratums i.e. Block, linear and Scattered.

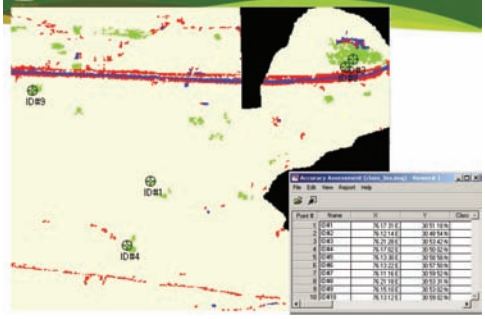
Plot & Sample Size

Field survey requires plot sizes and sample sizes

Strata	Plot size	Sample size
Block	0.1 ha	35
Linear	10x125 m	50
Scattered	3.0 ha	50
Scattered (Hill)	0.5 ha	95

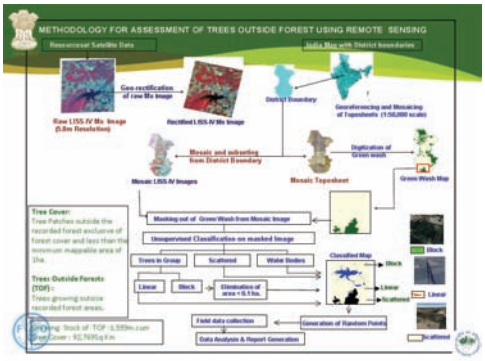
These sizes will provide estimate at 85% accuracy.

Automatic generation of random points in block, linear and scattered stratum in the TOF area.



Field Survey

- Random points for block, linear & scattered stratum along with coordinates communicated to field units for survey
- Survey carried out in the field using GPS & data recorded in prescribed formats
- Data processed to obtain estimates for all TOF parameters on Culturable Non Forest Area (CNFA)



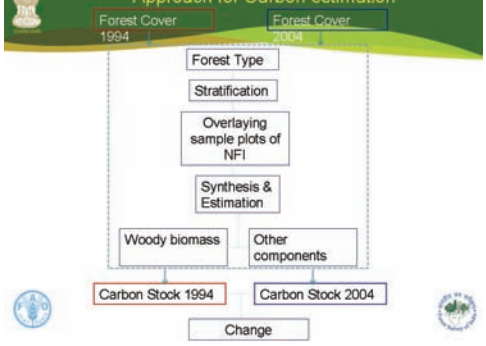
Other Components of Forest Biomass

- Volume of trees below 10 cm dbh, branches below 5 cm, foliage etc.
- Shrubs, herbs, climbers etc.
- Dead wood
- Litter (branches only)
- Soil organic carbon
- Below ground root volume
- Tree bark

New Biomass Study

- FSI launched a new biomass study in August 2008 to measure other components of forest biomass which are not measured by NFI.
- The study has followed two approaches
- (a) measure biomass of herb, shrub, climber, dead wood and litter by laying out sample plots (about 100 plots in each physiographic zone thus in all 1,400 sample plots)
- (b) select 20 to 30 number of trees for each species in different zones cut and measure their biomass to generate biomass equations for:
  - i) Dbh of NFI trees Vs. biomass of branch for trees above 10 cm dbh.
  - ii) dbh/collar dia Vs. total biomass of trees below 10 cm dbh.

Approach for Carbon estimation



Preliminary Component wise estimates of Biomass and Carbon stock in India's Forests (2004)

	Components	Biomass (m tonnes)	Carbon (m tonnes)
A.	Above Ground		
	Woody biomass of trees above 10 cm dbh	3076	1507
	biomass of small wood of trees above 10 cm dbh	872	410
	biomass of foliage of trees above 10 cm dbh	53	24
	biomass of small wood of trees below 10 cm dbh	132	61
	biomass of foliage of trees below 10 cm dbh	6	2
	Biomass of shrubs	27	12
	Biomass of climbers	14	6
	Biomass of herbs	3	1
	Total Above Ground	4182	2023
B.	Below ground	1319	638
	total live biomass	5501	2661
C.	Deadwood	56	26
D.	Litter	-	80
E.	Soil Organic Carbon	-	3972
	Total		6740

Gratitude

- FAO
- Republic of Korea
- India

Thank you!

www.fsi.nic.in

5.10 Presentation Materials of Session 4

(Appendix 5.10.1)

A long-term strategy for NFI activities in the Asia Pacific region

Mr. Hyungkwang Kim
FAO

A Long-term Strategy for NFI Activities *in the Asia Pacific Region in Connection with Climate Change*

FAO
Senior Forestry Officer
Kim, Hyung Kwang

1. Requirements to reduce deforestation and degradation

- Strengthening forest policies
- Providing adequate financial resources
- Supporting institutional and technical capacity-building
- Strengthening the information and databases on forest and tree resources etc.

2. The criteria for priority country selection

- Countries with large forest area
  - → countries with a major portion of total land area
- Countries with serious deforestation and degradation
- Countries with significant growing stock
  - → the possibility of a big carbon sink
- Countries which deserve special consideration

A. Countries with large forest area

According to FRA 2005, countries with over 10million ha forest areas
→ Indonesia, Myanmar, Cambodia, Philippines, Malaysia, PNG, North Korea, Mongolia, Lao, Thailand, Viet Nam, China, India and Turkey.
(Underlined countries mean over 50% of land area)

B. Countries with serious deforestation and degradation

No statistics on forest degradation is available.
Therefore only deforestation is taken into consideration.
According to FRA 2005, countries with over 0.5% annual change rate
→ Indonesia, Myanmar, Cambodia, Philippines, Malaysia, PNG, North Korea, Mongolia, Lao, Nepal, Pakistan, Solomon Islands, Sri Lanka and Timor-Leste.
(world average annual change rate : -0.18%)

C. Countries with significant growing stock

According to FRA 2005, countries with over 500 million m^3 growing stock
→ Indonesia, Myanmar, Cambodia, Philippines, Malaysia, PNG, Mongolia, Lao, Nepal, Bhutan, Viet Nam, China, India and Turkey.
However, on the contrary, the annual growing stock of Indonesia, Cambodia, PNG, Viet Nam and China is decreasing.

D. Countries which deserve special consideration

As seen A, B, C above,
→ North Korea, Viet Nam and Nepal come under 2 kinds of criteria but just 1 criterion is not applicable.
In addition, in the case of Bhutan, its total forest area is not very big, but forest proportion of the land area is quite high (68%) and further it's growing stock is also big.
Moreover, in the case of the Solomon Islands, like Bhutan, its total forest area is not very big, but forest proportion of the land area is quite high (78%) and further its deforestation rate is so high (1.7%).

Table: Change of forest area and growing stock in selected Asia & the Pacific Countries (Source: FRA 2005, State of the World's Forests 2007)

Country	Forest Area				Growing stock		
	Total forest area (2005)		Annual change ('00-'05)		Per ha ('05)	Total ('05)	Annual change ('00-'05)
	(1,000ha)	(% of land area)	(1,000ha/year)	(%)	(m^3/ha)	(million m^3)	(m^3/ha)
Indonesia	88,495	48.8	-1,871	-2.0	58.9	5,216	-4.61
Myanmar	32,222	49	-466	-1.4	85.0	2,740	-0.74
Cambodia	10,447	59.2	-219	-2.0	95.5	998	-0.11
Philippines	*7,602*	*24*	*-157*	*-2.1*	*174.3*	*1,248*	*-0.09*
Malaysia	20,890	63.6	-140	-0.7	250.9	5,242	-1.94
PNG	29,437	65	-139	-0.5	35.2	1,035	-0.01
North Korea	6,187	51.4	-127	-1.9	63.8	395	-0.18

Mongolia	10,252	6.5	83	0.8	130.9	1,342	n.s
Lao	16,142	69.9	78	0.5	59.3	957	n.s.
Thailand	14,520	28.4	59	0.4	41.3	59	n.s.
Nepal	3,636	25.4	53	1.4	177.9	647	n.s.
Pakistan	1,902	2.5	43	2.1	97.3	185	0.49
Solomon Islands	2,172	77.6	40	1.7			
Sri Lanka	1,933	29.9	30	1.5	21.7	42	0.19
Timor-Leste	798	53.7	11	1.3			
Kazakhstan	3,337	1.2	6	0.2	109.1	364	0.19

Bangladesh	871	6.7	2	0.3	34.4	30	0.18
Bhutan	3,195	68	11	0.3	194.4	621	1.18
Viet Nam	12,931	39.7	241	2	65.7	850	0.40
China	197,290	21.2	4,088	2.2	67.2	13,255	0.52
India	67,701	22.8	29	n.s	69.4	4,698	0.08
Turkey	10,175	13.3	25	0.2	137.6	1,400	0.23
Uzbekistan	3,295	8	17	0.5	7.3	24	0.31
Kyrgyzstan	869	4.3	2	0.3	34.3	30	0.34
Lebanon	136	13.3	1	0.8	36.8	5	

3. The result of criteria application

A. The first priority countries:
Indonesia (already selected as UN-REDD pilot country), **Myanmar, Cambodia, PNG** (already selected as UN-REDD pilot country), **Lao** (funding of WB/FIN SURFORD program, 2009～), **Malaysia**

B. The second priority countries:
Mongolia, Philippines

C. The third priority countries:
North Korea, Viet Nam (already selected as UN-REDD pilot country), **Nepal** (funding of FIN program, 2009～)

D. The fourth priority country:
Bhutan, Solomon Island

4. The selection of priority country

A. The first priority strategic countries:
Myanmar (US$ 2.5million), Cambodia (US$ 2million)
Malaysia(-----)

B. The second priority strategic countries:
Mongolia (US$ 1.5million), Philippines (US$ 1.5million)

C. The third priority strategic countries:
North Korea (US$ 1.5million)

D. The fourth priority strategic country:
Bhutan (US$ 0.5million), Solomon Island(US$ 0.5million)

5. Implementation Steps

A. Searching for the funding sources
(1) Project summary
- o Total budget : US$ 10million
- o Duration : 5 years
- o Countries : 7

(2) Funding potentials
- o Norway, Japan, Germany, Rupublic of Korea, GEF, EU etc

B. Holding a regional workshop
(1) Period : 2010 February (3 day)
(2) Participants
- o Partner countries etc : Myanmar, Cambodia, Mongolia, Philippines, North Korea, Bhutan, Solomon Island
- o Donors (candidates)
- o FAO Staff & NFI Experts

(3) Venue: Seoul

C. Project approach

Reference

- 1. Status of NFMA in the Asia Pacific
  - Philippines : US$ 550,000 (FAO:250,000) < 2003～2005 >
  - Lebanon: US$ 514,000 (FAO: 250,000) < 2003～2005 >
  - Bangladesh: US$ 520,000 (FAO: 352,000) < 2004～2007 >
  - Kyrgyzstan: US$ 630,000 (FAO: 330,000) < 2007～ >
- 2. UN-REDD countries
  - Vietnam: US$ 4,385,000 (2009.7～ ,20 month)
  - PNG: US$ 2,596,000 (2009.11～ ,12 month)
  - Indonesia: US 5,000,000 (2009.11～ ,18 month)

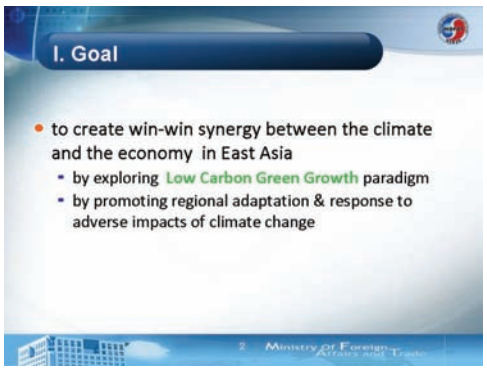
* Observer (2009.10～): Cambodia, Sri Lanka, Nepal

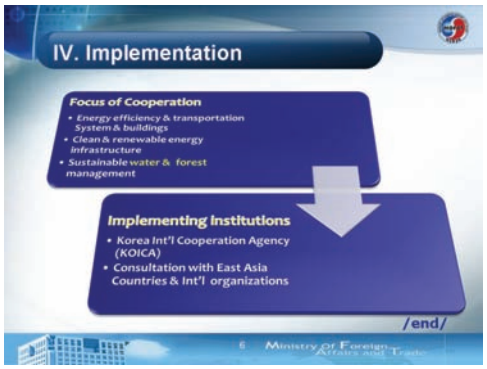
Thank you very much

(Appendix 5.10.2)

East Asia Climate Partnership Program of Korean Government

Ms. Hyoeun Kim
Ministry of Foreign Affairs and Trade

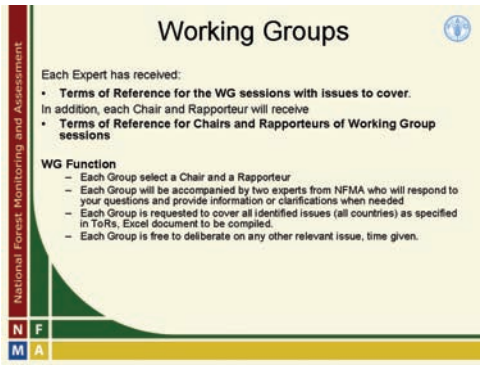


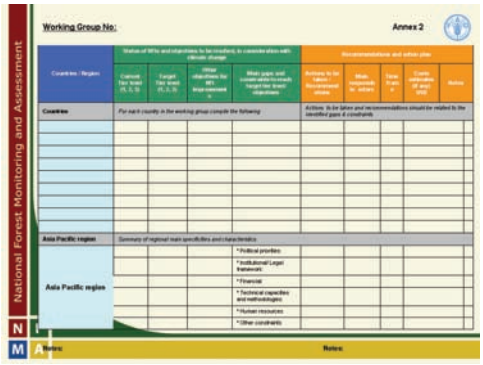

IV. Implementation
Focus of Cooperation
• Energy efficiency & transportation System & buildings
• Clean & renewable energy Infrastructure
• Sustainable water & forest management
Implementing Institutions
• Korea Int'l Cooperation Agency (KOICA)
• Consultation with East Asia Countries & Int'l organizations
/end/
6 Ministry of Foreign Affairs and Trade

(Appendix 5.10.3)

Guide for the Working group discussion

Mr. Dan Altrell and Ms. Anne Branthomme
FAO





5.11 Presentation Materials of Session 5

(Appendix 5.11.1)

Main Findings from the Working Group Sessions

Workshop on promoting and strengthening multi-purpose national forest inventory system in the Asia Pacific Region, in connection with climate change
23-25 February 2010, Seoul, Republic of Korea

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timefra me	Costs estimate s (if any) USD	Notes
Countries					*Actions to be taken and recommendations should be related to the identified gaps & constraints*				
China	1	3	1. Biomass & Carbon Stock and Changes 2. Enhanced protection 3. Improved Livelihoods 4. Ecological security	1. Technical capacity & methodology 2. Financial capacity 3. Human resources	1. Technical support & cooperation 2. Capacity building 3. Pilot study & research on carbon estimation 4. Common guidelines on monitoring & reporting REDD, especially for degradation	1. International organization, FAO 2. Govt. 3. International organization, Govt, FAO. 4. FAO/IPCC	5-10 yrs	5.0 million	
India	2	3	1. Consolidated national policies 2. Conservation and enhancement of forest carbon stock 3. Sustainable use of forest resources 4. Forestry research	1. Lack of Human resource 2. Capacity building (skill enhancement in RS & NFTRI) 3. Institutional & Technical capacity	1. Recruitment 2. Training, research and collaboration (national and international)	1. Govt. 2. National & International organizations & FAO	5 yrs	1. National budget 2. 0.5 million	* Workshop provided some insight into how processes for funding (project proposals) can be developed and meet Donors * Learn from others so to develop NFI system * Use of human resources developed for the same project should be mandatory
Korea	2	3	1. Dead wood biomass & below ground biomass	Not much work on wood density			5 yrs		

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timeframe	Costs estimates (if any) USD	Notes
Laos	1	3	1. Biomass & Carbon Stock 2. Sustainable use of forest resources 3. Livelihood 4. Forest research	1. Financial capacity 2. Technical capacity 3. Human resources 4. Institutional capacity	1. Collaboration with national/international 2. Training 3. Recruitment	1. Govt., international organization 2. Govt., international organization 3. Govt.	5-10 yrs	1.0 million	* Budget has been a concern
Nepal	1	2,3	1. Consolidated national policies 2. Sustainable use of forestry resources 3. Improved livelihoods 4. Enhanced protection of forestry resources 5. Food security 6. Forestry research	1. Political priorities and will 2. Financial capacities 3. Institutional capacities / legal framework 4. Technical capacities and methodologies	1. Increase the fund for NFI by the government and donors		2, 5, 10	2, 6, 7	
Pakistan	1	2	1. Improved livelihoods 2. Sustainable use of forestry resources	1. Technical capacities and methodologies 2. Financial	1. Gap analysis 2. Training programs (TOT) on NFI for CC 3. Capacity building of concern institutions 4. Testing of tier 2 reporting on pilot level 5. Develop site specific methodology 6. pooling of technical, financial and human resources, 7. Mobilize additional resource for NFI-CC to make up short fall	1 Ministry of Environment 2 FAO, consultants 3 FAO, master trainers and R&D institutions 4 Forest department (with FAO) 5 FAO and R&D 6 Ministry of Environment (with FAO) 7 National Government, NGOs, FAO, JICA, KOICA, EU, GTZ, ITTO	2, 5, 10	1, 3, 5	

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timefra me	Costs estimate s (if any) USD	Notes
PNG	1	3	1. Consolidated national policies 2. Sustainable use of forest resources 3. Improved livelihood	1. Political priorities and will 2. Institutional capacities 3. Technical capacities & methodologies 4. Financial capacities	1. Clear policy on issues relating to climate change 2. Recruit & train personnel (in GIS/RS) 3. Conduct research to improve on methodologies 4. Seek external as well as internal funding	1. Govt., International organization 2. Govt., International organization 3. Govt., International organization 4. Govt	5-10 yrs	10.0 million	* Concerns about dissemination of information not getting through to countries so to improve on their processes of inventory* FAO to consider how best it can assist countries to improve its processes
Malaysia	2	3	1. Sustainable use of forestry resources 2. Enhanced protection of forestry resources 3. Consolidated national policies 4. Improved livelihoods 5. Forestry research 6. Climate change mitigation (carbon market)	1. Technical capacities and methodologies	1. Trainings on RS, GIS and inventory methods 2. Trained the personnel and retained	1 Forestry Department	2, 5, 10	2, 5, 5	
Mongolia	1	2	1. Sustainable use of forest resources 2. Consolidated national policies 3. Forest research	1. Institutional capacity 2. Financial capacity 3. Technical capacity	1. Technical support & cooperation 2. Budget 3. Capacity building	1. International organizations 2. Govt., Donors 3. FAO	10 yrs	5.0 million	
Myanmar	1	2	1. Consolidated national policies 2. Sustainable use of forestry resources 3. Enhanced protection of forestry resources 4. Improved livelihoods	1. Political priorities and will 2. Financial capacities 3. Human resources 4. Institutional capacities / legal framework 5. Technical capacities and methodologies	1. Increase the fund for NFI by the government and donors 2. Out sourcing from the university and research institute and forest school 3. satellite image for the whole country, computers, GPS etc. 4. Training on RS and GIS and inventory design 5. Formulation of land use policy	National Government, NGOs, FAO, JICA, KOICA, EU	2, 5, 10	2, 3, 5	Target must be to reach up gradually Setting time line is important? Compatible with international demand and national need/capacity Institutional building processes Take time, fund and capacity to generate data Need National priority and support from the international communities (donors) Phase wise approach (immediate and long term).

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timeframe	Costs estimates (if any) USD	Notes
Philippines	2	3	1. Consolidated national policies 2. Sustainable use of forestry resources 3. Forestry research	1. Institutional capacities / legal framework 2. Financial capacities 3. Technical capacities and methodologies	1. Increase the fund for NFI by the government and donors		2, 5, 10	2, 5, 5	
Solomon Island	1	2	1. Consolidated national policies 2. Sustainable use of forest resources 3. Forest conservation	1. Forest legislation outdated (weak) 2. Land tenure problems 3. Financial difficulties 4. Technical capacity	1. Amendment to current legislation 2. Develop policies to recognise land tenure 3. Budget for NFI 4. Recruit & train personnel	1. Policy makers & other stakeholders 2. Customary landowners 3. National Govt. & International Assistance 4. National Govt. & International Assistance	5 yrs	2.0 million	
Thailand	2	2	1. Enhanced protection of forestry resources 2. Sustainable use of forestry resources 3. Improved livelihoods 4. Forestry research	1. Political priority 2. Institutional capacities / legal framework 3. Human resources 4. Financial capacity	1. Lobbying 2. Trainings on RS, GIS and inventory methods 3. Increase the fund for NFI by the government and donors 4. Outsourcing from academic and research institutions.	National Government, NGOs, FAO, JICA, KOICA, EU, GTZ, ITTO	2, 5, 10	1, 5, 7	
Vietnam	1	2	1. Sustainable forest management 2. NTFP (Livelihood) 3. Biomass & Carbon Stock 4. Forestry research	1. Institutional capacity building 2. Technical capacity and methodology	1. Investment 2. Training, research & cooperation (international)	1. Govt. 2. Donor/FAO	5 yrs	1. 20.0 million (Govt.) 2. 2.0 million (international organization)	

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timeframe	Costs estimates (if any) USD	Notes
Asia Pacific region	*Summary of regional main specificities and characteristics*								
Asia Pacific region (All)	1	3	1. Sustainable use of forest resources 2. Consolidated national policies 3. Improved livelihoods 4. Biomass & Carbon Stock /Climate change mitigation (carbon market) 5. Enhanced protection of forestry resources 6. Forest research	1. Technical capacities and methodologies	1. Training / capacity building 2. Technical partnership and cooperation (National & international) 3. Research 4. Developing / improving methodological framework and guidelines (formulating, testing, adopting) 5. Networking	1. National level departments and international organizations (FAO) 2. Member countries within FAO and concerned international communities 3. National and international organisations, research institutions and universities 4. International assistance and donors (FAO, ITTO, JICA, USAID, FINNIDA, DFID, SIDA, AUSAID, KOICA, GTZ , French, EU, UNFF, UNEP, UNDP, GTF, WB ADB, IPCC) 5. FAO as facilitator	2,5,10 years	1 million/year on average (depends on country size)	Particular needs: * Pilot studies and researches on carbon estimation * Common guidelines on monitoring and reporting for REDD, especially on degradation * Capacity building and training programs in RS/GIS, and inventory design and methods, NFI for Climate change * Satellite imagery availability * Formulation of land use policies * Exchange experiences on NFI between countries * Concerns about dissemination of the information not getting through to countries to improve on their processes of inventory (FAO to consider how best assist to improve these processes)

Countries / Region	WG session 1				WG session 2				
	Status of NFIs and objectives to be reached, in consideration with climate change				Recommendations and action plan				
	Current Tier level (1, 2, 3)	Target Tier level (1, 2, 3)	Other objectives for NFI improvements	Main gaps and constraints to reach target tier level/ objectives	Actions to be taken / Recommendations	Main responsible actors	Timefra me	Costs estimate s (if any) USD	Notes
				2. Institutional capacities/ Legal framework	1. Prioritizing and allocating more funds/ investment for NFI 2. Developing Partnership to increase the national capacity on NFI 3. Amendment of legislation 4. Institutionalization the whole functions needed for NFI	1. National government and external donors (JICA, USAID, FINNIDA, DFID, SIDA, AuSAID, KOICA, GTZ , French, EU, UNFF, UNEP, UNDP, GTF, WB, ADB) 2. National government 3. Policy makers and other stakeholders 4. Member countries within, FAO and concerned international communities			
				3. Financial capacities	1. Prioritizing and increase budget for NFI 2. Fund raising (to government and donors)	1. National government and donors (JICA, USAID, FINNIDA, DFID, SIDA, AUSAID, KOICA, GTZ , French, EU, UNFF, UNEP, UNDP, GTF, WB, ADB) 2. National government			The workshop provided some insight into how processes for funding can be developed and meet donors requirements
				4.Political priorities & will	1. Lobbying 2. Clear policies on issues related to climate change	1. Responsible departments			
				5.Human resources	1. Collaboration with academic/university and research institutions 2. Recruitment 3. Training	1. National forestry agency 2. National Government 3. International assistance			
Notes:					Inventory includes other forest resources		Target must be to reach up gradually (at least 5 years to go from one tier to the other) Phase wise approach (immediate and long term).		

(Appendix 5.11.2)

Lists of Participants to the Working Groups

List of participants to the Working Group 1				
#	Name	Country	Chair (X)	Rapporteur (X)
1	Sein Tun	Myanmar	X	
2	Tosporn Vacharangkura	Thailand		
3	Yusoff bin Muda	Malaysia		
4	Shahzad Jehangir	Pakistan		
5	Jose C. Cabanayan, JR	Philippines		
6	Pem Kandel	Nepal		X
7	Claude Vidal	French Forest Service		
8	John Coulston	US Forest Service		
9	Dan Altrell	FAO		
10	H-K Kim	FAO		
11	Masahiro Otsuka	FAO		
12	Tonny Oyana	Visiting scientist (USA)		

List of participants to the Working group 2				
#	Name	Country	Chair (X)	Rapporteur (X)
1	Shiv Raj Singh	India	X	
2	Terence Titiulu	Solomon Island		
3	Dinh Huu Khanh	Vietnam		
4	Zhang Min	China		
5	Otgonsuren Batgombo	Mongolia		
6	Khamdy Linthong	Laos		
7	Ruth Turia	PNG		X
8	Hiroki Miyazono	JICA		
9	Kaliash Govil	FAO Retiree		
10	Anne Branthomme	FAO		
11	Sungho Kim	Korea		
12	Hyungkwang Kim	FAO		

5.12 Field Trip Information

(Appendix 5.12)

Field Trip Information

FAO Workshop

"Promoting and Strengthening

Multi-purpose National Forest Inventory System

in the Asia Pacific region in connection with climate change"

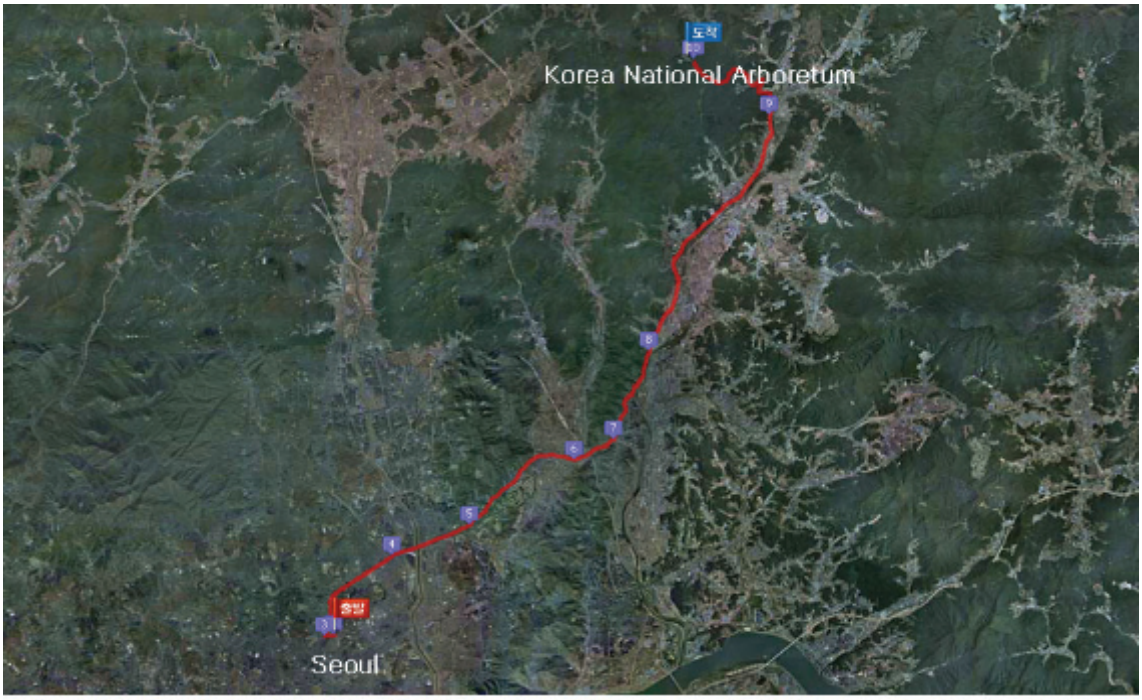
23-25 February 2010

Korea Forest Research Institute, Seoul, Republic of Korea

Schedule

Thursday, 25 February, 2010	
13:00 - 14:00 :	Transfer (KFRI to Korea National Arboretum)
14:00 - 16:00 :	NFI plot measurement demonstration
16:00 - 17:00 :	Visit to the Korea National Arboretum
17:20 - 18:00 :	Transfer (Korea National Arboretum to Hotel)

Location map of Field Trip


Korea National Arboretum
Seoul

Forest Practice Research Center
Korea National Arboretum