Forestry Department

Food and Agriculture Organization of the United Nations

BRIEF ON NATIONAL FOREST INVENTORY NFI

JAPAN

Forest Resources Development Service

Rome, June 2007

MAR-SFM Working Paper 19/ 2007

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

FAO initiated activities to strengthen Monitoring, Assessment and Reporting on Sustainable Forest Management in January 2006 with the objective to facilitate development of harmonized forest related national monitoring, assessment and reporting (MAR) for contributing directly to the improvement of national sustainable forest management (SFM) regimes. It also aims to catalyze national discussions, analyses, policy actions and planning that promote national SFM regimes besides clarifying the contribution of forests to global environment and to human well-being. This initiative shares the ambition of the Collaborative Partnership on Forests (CPF) about simple, harmonised, efficient and action oriented MAR systems both at international and national levels and thus provides a response to some of the key recommendations made by the CPF task force on streamlining the reporting on forests with particular focus on national capacity building.

The MAR initiative has recently updated goals include country capacity building for better, consistent and regularly updated information to facilitate implementation of non-legally binding instrument (NLBI) on SFM, adopted at UNFF 6 (2007) that aims to,

- Strengthen political commitment and action at all levels to implement effectively sustainable management of all types of forests and to achieve the shared four global objectives ((a) reverse the loss of forest cover worldwide, (b) enhance forest-based economic, social and environmental benefits, (c) increase significantly the area of protected forests worldwide, and (d) reverse the decline in official development assistance for SFM;

- Enhance the contribution of forests to the achievement of the internationally agreed development goals, including the Millennium Development Goals, in particular with respect to poverty eradication and environmental sustainability; and

- Provide a framework for national action and international cooperation.

All countries can participate in this initiative, although the actual level and intensity of their involvement may vary among them. The initiative is organized under the Forest Resources Development Service (FOMR) of FAO Forestry Department. The contact persons are:

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Brief Note on MAR-SFM Working Paper Series (AP) on NFI- Brief

The NFI – Brief for a country attempts to provide a bird's eye view of the National Forest inventories (NFI). However, some countries conduct forest inventories at sub-national and or field management unit level. Therefore, this brief presents brief information on the forest inventories in a country at national level, sub-national level and or field management level depending on the available information.

It is useful to regularly update our understanding of elements and specifications of forest inventories because the information generated by forest inventories is simply manifestation of its span, design and methods to collect and analyse the primary information during its implementation. This is important because the NFI provides information on the state and trends of forest resources, their goods and services, and other related variables that support. It also defines the policy and trade decisions, science and field initiatives, national and international reporting, and direct and indirect contribution of forests to society like poverty alleviation. Regular updates are necessary because countries do change the set of elements, their specifications, designs and methods over period of time to address new emerging demands and to take advantage of new technologies.

The purpose of developing the NFI-briefs is, therefore, to document (working paper) the current and historical span of elements (variables or fields), their specifications, sampling designs and methods used in NFI. The document may serve as data source as well as reference material.

These briefs have been initially developed on the basis of the country submission to FAO. The initial draft of this report was sent to following national focal point for review and country validation before its finalisation.

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B. Compilation and Supervision

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Table of Contents

Figures

List of Tables

General Information

Japan is an island country in East Asia. Located in the Pacific Ocean, it lies to the east of China, Korea and Russia, stretching from the Sea of Okhotsk in the north to the East China Sea in the south. Its capital and largest city is Tokyo.

Map of the Country

Figure 1. Map of Japan

(Source:https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html)

Land Area and Landuse

The total area of Japan is 377 800 square km and the following table presents the categorisation and projection of land use in Japan for 1990, 2000 and 2005 (FRA 2005).

Table 1. Categorisation and projection of land use in Japan (FRA 2005).

FRA 2005 Categories	Area (1000 hectares)		
	1990	2000	2005
Forest	24 950	24 876	24 868
Other wooded land			
Other land	11 500	11 574	11 582
Other land of which with tree cover			
Inland water bodies	1 330	1 330	1 330
TOTAL	**37 780**	**37 780**	**37 780**

Forests

Japan has a wet monsoon climate and experiences distinct seasonal changes between the four seasons. Also, meteorological conditions vary because of the latitudinal difference, dividing the forest into six types: Alpine zone forest, Sub-frigid forest, Cool temperate coniferous forest mixed with broadleaved trees, Cool temperate forests, Warm temperate forest, Sub tropical forest. A map of the vegetation zones of Japan is presented in figure 2. Moreover, since high mountains range through the centre of the country, it is possible to find vertical variation in forest types even in areas at the same latitude. Thus the forests are extremely rich in variation.

The total forest cover extends for almost 25 million hectares [1] that is equal to 65 percent of the land, and approximately 40 percent of it is plantation as shown in Table 2. Japan's planted forests mostly consist of native species, with some introduced planted species. The entire area of planted forests is counted as "Protective plantations" since all of them are expected to perform some degree of protective functions (soil and water conservation, protection of living environment, etc.) Although there are some planted forests with introduced species and managed primarily for production purpose, no data are available on planted forests with introduced species. Private ownership consists of about 60 percent of total forest as reported in Table 3 which provides a matrix of forest ownership status by forest type.

Table 2. Categorisation and projection of forest area in Japan (FRA 2005)

	Area (1000 ha)		
	1990	**2000**	**2005**
Primary	3 764	4 054	4 591
Modified natural	10 899	10 491	9 955
Semi natural			
Productive plantation	n.a.	n.a.	n.a.
Protective plantation	10 287	10 331	10 321
TOTAL	**24 950**	**24 876**	**24 867**

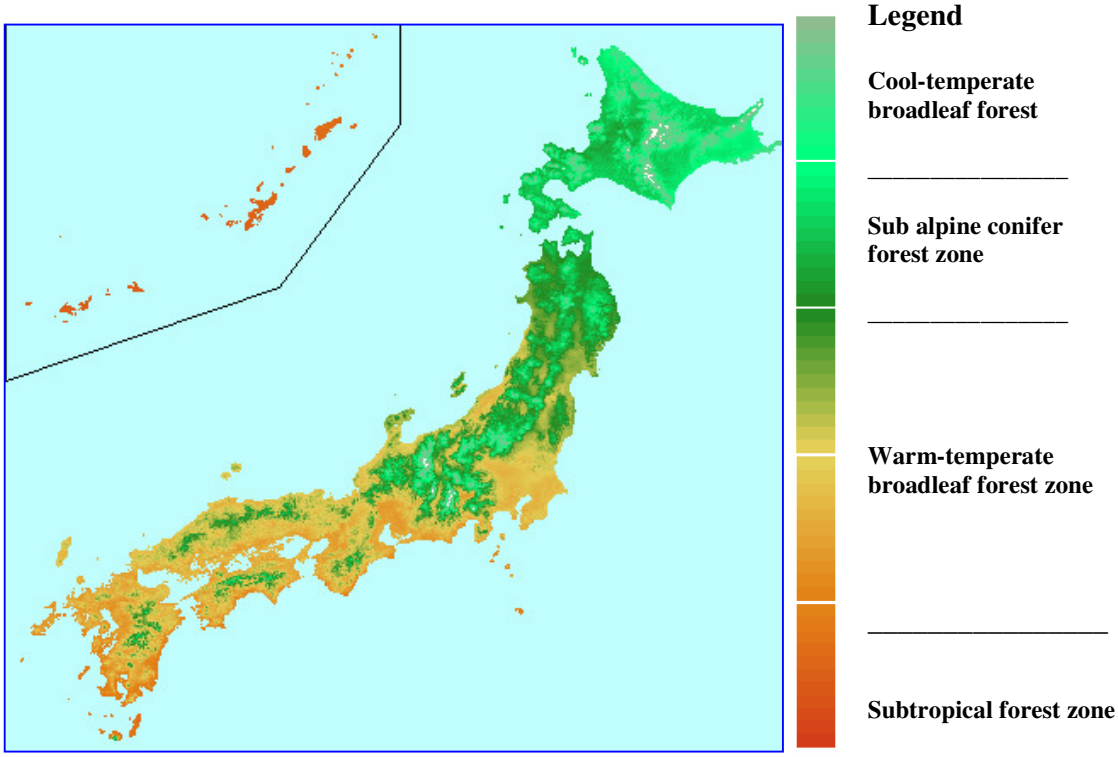
[1] The differences in total forest area between tables 2 and 3 is due to the fact that FAO utilized FAOSTAT data as the baseline for all countries and the definition of forest designation may not exactly match those of national data. In particular for Japan, the inclusion or not inclusion of the Northern Territories may lead to data discrepancies.

Table 3. Matrix of forest ownership status by forest type in Japan

	Area (1000 ha)				
	Artificial forest	**Natural forest**	**Cutover land and others**	**Bamboo forest area**	**TOTAL**
National forest	2,411	4,770	656	0	**7,838**
Public forest [2]	1,232	1,426	133	5	**2,796**
Private forest	6,705	7,126	461	149	**14,440**
Total	**10,361**	**13,349**	**1,255**	**156**	**25,121**

[2] Prefectural forest, municipal bodies and property ward.
Source: adapted from: Forest Resources, Statistical Handbook of Forestry, Forestry Agency, Ministry of Agriculture, Forestry and Fisheries. 2002

Figure **2**. Vegetation zones of Japan



Brief History of Forest Inventories

Management plans and actions to ensure forest conservation date back to the beginning of the Edo period (1600) with the first establishment of restrictions on felling and exploitation of forest area. It was then in 1897 that the first Forest Law was enacted to establish a nation wide protection system. These facts make it evident that attention to forest resources in Japan dates back at least four centuries.

National and sub-national inventories are conducted every five years, however no historical record is currently available. Table 4 reports the sources of information that were cited for the compilation of the tables for FAO FRA 2005.

Table 4. History of Assessments

Publication Year[1]	Title[2]	Institution[3]	Ground Inv. Year(s)[4]	Remote Sensing		Estimation Level [7]	Country Coverage (Full/Partial, %)[8]	Thematic cover**
				Data Year(s)[5]	Scale of Interpretation [6]			
1990, 1995, 2002 (As of 31 March of each year)	"Survey on the State of Forest Resources"	Forestry Agency					Data do not include figures for the Northern Territories (Habomai Islands, Shikotan Island, Kunashiri Island and Etorofu Island)	Forest, Forest with standing trees, Forest without standing trees, Cut-over land, Understocked land, Bamboo forest
1987	"Digital National Information	National Land Agency					Data do not include figures for the Northern Territories (Habomai Islands, Shikotan Island, Kunashiri Island and Etorofu Island)	Lakes, ponds and river areas
1990, 2000 (As of 1 October of each year)	"Nation-wide Survey on Land Area of Prefectures by Municipalities"	Geographical Survey Institute				Total national land area		

****Legend**: **NF**=Natural Forest; **PL**=Plantations; **OWL**=Other Wooded land; **FAC**=Forest Area Change; **TV**=Total Volume; **TB**=Total Biomass; **CV**=Commercial Value; **PA**=Protected Areas; **BD**=Biodiversity; **FO**=Forest Ownership; **WSP**=Wood Supply Potential; **NWGS**=Non-wood Goods and services; **TOF**=Trees outside of forest; **FF**=Forest Fires

Legend:

[1] Publication Year	Year in which the assessment was published
[2] Title	Title of the assessment
[3] Institution	Institution(s) responsible for the Assessment
[4] Ground Inventory Year(s)	Year or Interval of years during which the field inventory has been carried out
[5] Remote Sensing Data Year(s)	Year(s) of the Remote Sensing Images
[6] Remote Sensing Scale of Interpretation	Scale of Remote Sensing Images (e.g. 1:250,000)
[7] Estimation Level	Whether the Assessment was at National, Sub-national, District, Management Unit, etc. level
[8] Country Coverage (Full / Partial, %)	Amount of country area covered by the assessment (e.g. full, partial). If partial, indicated by % of total area.

National Forest Inventory Design

Forest inventory in Japan is based on the Forest Resources Monitoring Survey which is integrated with a National Forest Resource Database comprising sub-national inventories. The national forest is inventoried by the Governmental forest division while other forest lands are under the control of local governments and / or private sector and in general by sub-national administrative districts. Both National and sub-national level forest inventories are carried out with a frequency of 5 years.

The design adopted for the NFI in Japan is systematic sampling, a system that has been used since 1999. The systematic sampling design is applied to all forest types and is based on a ground grid of 4 x 4 kilometers, as shown in figure 3. A total number of 15,675 sample sites have been established, each one composed by three overlapping circle-shaped subplots of different radius aimed at recording different vegetation types and different tree Dbh. Details of the concentric subplots and related Dbh threshold is provided in figure 4.

Figure 3. Grid of sample plots

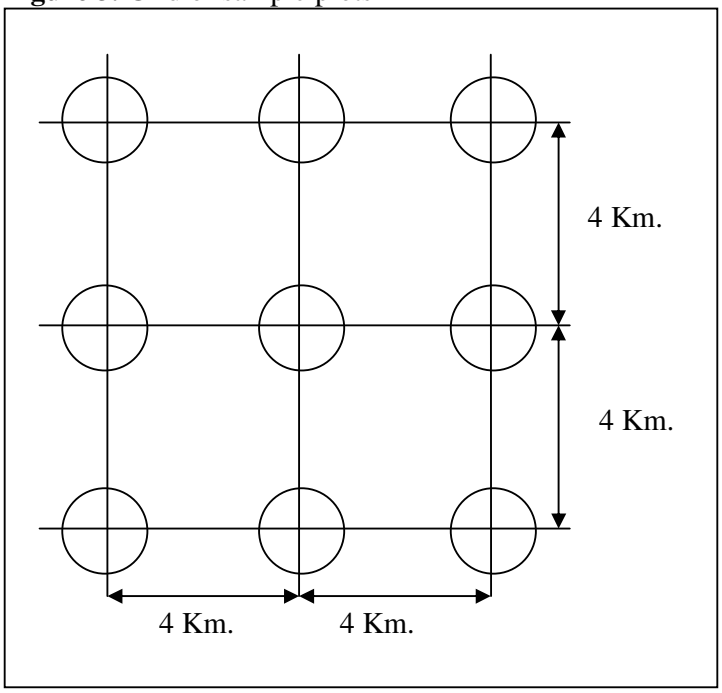
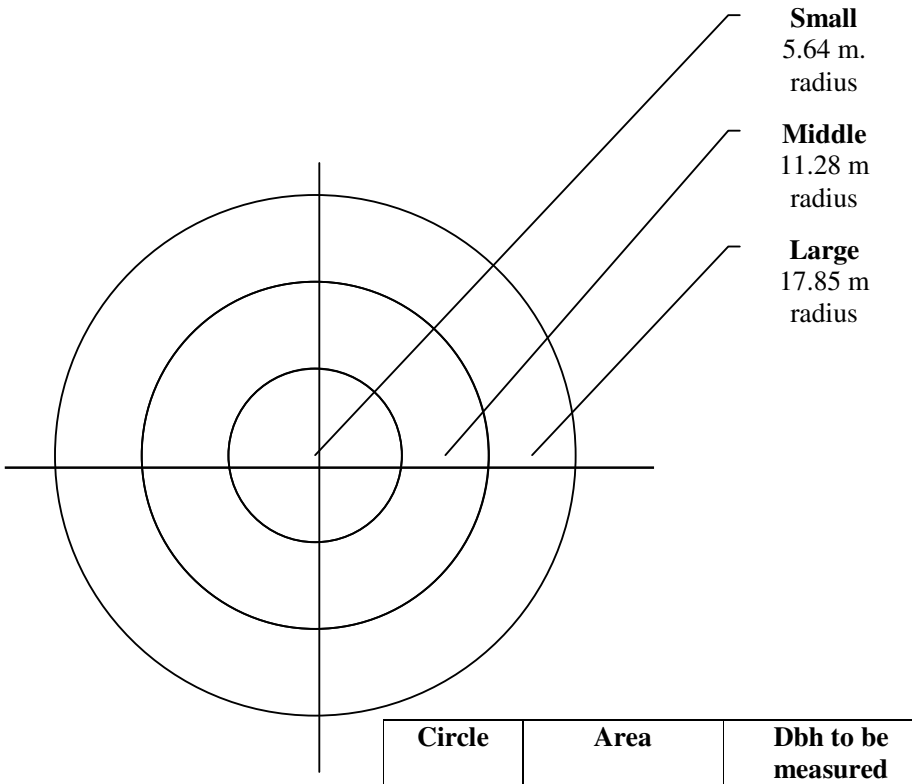


Figure 4. Sub plots sizes and minimum Dbh measured



Circle	Area	Dbh to be measured
Small	0,01 ha	1 cm
Middle	0,04 ha	5 cm
Large	0,1 ha	18 cm

Measurements

Permanent sample plots are maintained and all trees within the sample plot are measured and geo-referenced. The minimum Dbh recorded, in the smallest 0.01 ha sub-plot is 1 cm. With the purpose of estimating forest biomass, the amount of leaves and twigs per tree is estimated during plot measuring thus allowing the development of Biomass Expansion Factor (BEF) for each forest type.

Remote Sensing

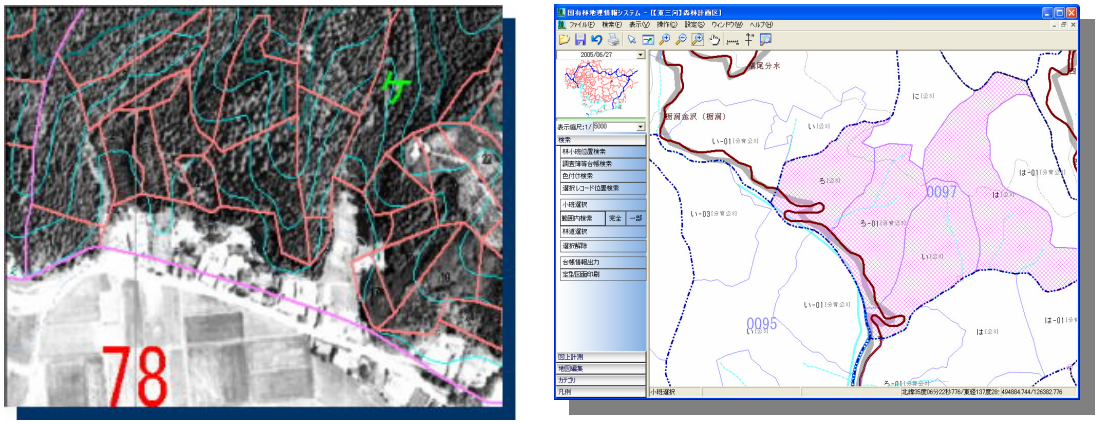
Remote Sensing has been used for NFI since the 1960's within the forest register system. During the latest NFI (2006) Remote Sensing Survey has been used with the purpose of identifying forest types and boundaries and estimating forest cover.

Forest register system

A system of Forest Registry is applied countrywide with over 30 million tracts. Each tract is classified according to a number of variables such as forest type (planted/natural), dominant species, age, ownership, site class, etc. The combination of registered information and RSS images on GIS is effective for local monitoring forest status, detecting removal and estimating

forest type. Forest area is therefore estimated with field survey and map measurement. Volume estimated with growth tables developed by species, region and site class, etc. Figures 5 shows screen-shots of the Forest Register System.

Figure 5. Screen-shots of the Forest Register System.



Content and Methodology of data collection in NFI

Geo-physical

Note: [N=National; SN=Sub-National; MU=Management Unit]

	N	SN	MU	Methodology
Geo-Coordinates	X			
Altitude	X			
Topography	X			Field Survey / map
Orientation (or Aspect)	X			Field Survey / Soil map
Slope	X			
Soil	X			
Geological structure	X			
Rainfall				

Bio-Physical

	N	SN	MU	Methodology
Number of trees	X			Field Survey
Diameter of trees	X			Field Survey
Height of trees	X			Field Survey
Length of stem				
Stump height	X			Field Survey
Age class	X			Field Survey
Twigs				
Bark				
Leaves				

Forest extent

	N	SN	MU	Methodology
Forest land area	X			Survey
Area of forest canopy/crown cover	X			Survey
Area under forest management	X			Survey
Area under formal forest management plan	X			Records
Area under sustainable forest management	X			Records
Forest area with certification				
Area under public owned forest	X			Survey
Area under private owned forest	X			Survey

Forest characteristics (Naturalness) and forest type

	N	SN	MU	Methodology
Primary forest	X			Survey
Modified natural forest				
Semi-natural forest	X			Survey / Aerial Photograph
Productive plantation	X			Survey / Aerial Photograph
Protective plantation	X			Survey / Records / Maps
Coniferous	X			Survey / Aerial Photograph
Broadleaved	X			Survey / Aerial Photograph
Mixed forest	X			Survey / Aerial Photograph
Forest area by dominant species (bamboo, mangroves, rubber)	X			Survey / Aerial Photograph
Forest area by ecological zone (tropical, subtropical, temperate, boreal, polar)				

Use (designated functions) of forests

	N	SN	MU	Methodology
Area of forest under production	X			Plans
Area of forest for protection of soil and water	X			Administrative designation
Area of forest for conservation of biodiversity	X			Plans
Area of forest for social services	X			Administrative designation
Area of forest for multiple purpose				
Forest area available for wood supply				
Forest area within protected areas	X			Administrative designation

Social Services

	N	SN	MU	Methodology
Area of forest managed for recreation	X			Records/Maps/Plans
Area of forest managed for tourism	X			Records/Maps/Plans
Area of forest used for education	X			Management (in national forest)
Area of forest managed for conservation of cultural/spiritual site	X			Plans/Administrative designation

Mapping of forest distribution

	N	SN	MU	Methodology
Distribution of forests	X			Remote sensing survey / Records
Forest Characteristics	X			Survey / Aerial photograph
Land use	X			Remote sensing survey / Aerial photograph
Administrative/political/legal boundaries	X			Maps
Designated functions of forests	X			Records / Plans
Other wooded land	X			Survey / Aerial photograph
Other land with tree cover	X			Survey / Aerial photograph
Other land	X			Maps / Records / Survey

Status of the forest and disturbances affecting forest health and vitality

	N	SN	MU	Methodology
Disturbance by insects	X			Survey
Disturbance by diseases	X			Survey / Plans
Disturbance by other biotic agents	X			Local Interviews / Survey
Disturbance by fire	X			Records / Local onterview
Disturbance caused by other abiotic factors	X			Remote sensing / Records

Biodiversity

	N	SN	MU	Methodology
Tree species	X			Field Survey
Shrub species	X			Field Survey
Herbs species	X			Field Survey
Endangered species	X			Expert knowledge / Reports
Critically endangered species	X			Expert knowledge / Reports
Vulnerable species	X			Expert knowledge / Reports
Native species	X			Local knowledge / Reports
Endemic species	X			Local knowledge / Reports
Introduced species	X			Expert knowledge

Beneficiaries of forest goods and services

	N	SN	MU	Methodology
By locality of user (e.g. indigenous/local/national)?				
By good/service (e.g. timber, fuelwood, NWFP, bamboo/rattan, water, etc) used by them				
By economic class of the beneficiaries (high, medium, low income)				
By level of dependency on forest (as percentage of total employment)				
By physical accessibility to the forest (distance from forest)				

Economic value

	N	SN	MU	Methodology
Removal of timber	X			Economic survey / Statistical analysis / Records
Removal of fuelwood	X			Economic survey / Statistical analysis / Records
Removal of other wood products				
Removal of wood products derived from forest under sustainable management				
Removal of wood products derived from forest plantations				
Removal of non wood forest products				
Annual allowable cuts/yields				
Social services				
Environmental services				
Employment				
Support to livelihood of communities				
Market price/cost of wood in forest				
Market price/cost of non wood forest products				
Estimate of value of social services				
Estimate of value of environmental services				
Estimate of value of employment				
Estimate of the contribution of forest sector to national economy				

Policy, legal and institutions (PLI) framework

	N	SN	MU	Methodology
Forest policy				
Forest legislation				
Forest administration				
Forest education and research				
Annual outlay, expenditure, investment in forestry sector				

Bibliographies and References for further reading

FAO 2005. Forest Resources Assessment 2005. Country Report- Japan, FRA_WP_027 http://www.fao.org/forestry/site/32245/en/

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