

INDEX

No	Contents	Page No
	Preface	1
	THE NECESSARY TO CREATE AN INDICATOR SET HARMONIZED BETWEEN VIETNAM, FAO AND ASEAN	2
	Chapter 1: THE STUDY TO FIND AN INDICATOR SET HARMONIZED BETWEEN VIETNAM AND INTERNATIONAL COMMUNITY IN FOREST RESOURCES MONITORING & ASSESSMENT (MAR)	4
I.	METHODOLOGY FOR HARMONIZATION BETWEEN VIETNAM, ASEAN AND FAO	4
1.1	The current state of information in Vietnam	4
1.1.1	<i>The 2006 indicator set of MARD</i>	4
1.1.2	<i>FOMIS indicator set</i>	5
1.1.3	<i>ASEAN indicator set</i>	8
1.2	FAO's requests	13
1.3	Method of harmonization	14
1.3.1	<i>Review of indicators of existing systems</i>	14
1.3.2	<i>The proposed indicators are really necessary</i>	14
1.3.3	<i>Indicators are proposed to be based on existing data or to facilitate data synthesis</i>	14
1.3.4	<i>Do not collect new data but only analyze and extend existing data to meet global forest resource assessment needs.</i>	14
1.3.5	<i>The proposed indicators need to be logically related</i>	14
II.	MECANISM FOR HARMONIZATION BETWEEN FAO, ASEAN AND VIETNAM	15
2.1	Equivalent conversion	15
2.2	Processing for conversion	16
2.3	Collection of additional information to meet FAO requests	16
III.	PROPOSAL OF VIETNAM INDICATOR SET	17
	Chapter 2. RESEARCHING AND DEVELOPING THE STRUCTURE SYSTEM OF INFORMATION MANAGEMENT, USED FOR MONITORING AND ASSESSING FOREST RESOURCES	24
I.	THE INFLUENCE AMONG ASSESSMENT CRITERIA OF FOREST RESOURCE	24
II.	DEMAND OF THE INPUT DATA AND THE MAIN RESULTS OF EACH CRITERIA GROUP	26

2.1	Criteria group of forest status	26
2.2	Distributed forest according to function	26
2.3	Distributed forest according to management owner	26
2.4	Group of forest development factors	27
2.5	The area of loss forest	27
2.6	Forest exploitation	27
2.7	Income from forest	27
2.8	Investing in forestry	28
2.9	Labor and manpower training in forestry	28
2.10	Forestry policy	28
III.	DATA SOURCE FOR ESTABLISHING THE TABLES IN FOREST RESOURCE ASSESSMENT ACCORDANCE WITH FRA	29
3.1	Table groups of forest status	29
3.2	Tables of forest management and the effects on forest resource	30
3.3	Tables of forest development, income from forest	30
3.4	Tables of legal limitation, the social of forestwork	31
IV.	THE STRUCTURE OF INFORMATION MANAGEMENT, USED FOR FOREST RESOURCE MONITORING AND ASSESSMENT	31
4.1	Report system and information exchange of forestry	31
4.2	The structure of information management, used for forest resource assessment	32
	Chapter 3. HARMONIZATION RESEARCH THE CRITERIA GROUP OF FOREST SITUATION AMONG VIET NAM, FAO AND ASEAN	33
I.	POSITION OF FOREST SITUATION IN RESEARCHING FOREST RESOURCES	33
II.	CRITERIA GROUP OF FOREST SITUATION ACCORDING TO ORGANIZATIONS	33
2.1	Criteria group of forest situation according to FAO	33
2.2	Criteria group of forest state follows ASEAN	34
2.3	Criteria group of forest situation follows Viet Nam	35
2.4	Criteria group harmonization of forest situation among Viet Nam, FAO and ASEAN	37
III.	HARMONIZATION IN BUILDING INDICATORS OF FOREST SITUATION	38
3.1	Building table 1: area of forest and other wooded land	38
3.2	Building table 2: Forest functions	39
3.3	Building table 3: Classifying forests according to the forest characteristic	39

3.4.	Building table 4: New planted forest and replanted forests	42
3.5.	Building table 5: Growing stock	42
3.6.	Building table 6: Biomass stock	43
3.7.	Building table 7: Carbon stock	44
	Chapter 4. Proposed solutions to identify lacking targets IN THE ASSESSMENT OF NATIONAL Forest Resources	46
I.	The biomass of dead plant in the forest	46
1.1	Dead plant is a part of forest ecology system	46
1.2	Number of plots used to calculate the biomass of dead trees in forest ecosystem	47
1.3	Calculation results of the biomass dead wood in forest	48
1.3.1	<i>The calculation result of dead trees</i>	48
1.3.2	<i>The results of the biomass of dead trees</i>	49
II.	Biomass on the land with trees outside forests	50
III.	THE METHODS TO CALCULATE THE BIOMASS OF FOREST AND CARBON STOCK	52
3.1	The research work on forest biomass in Vietnam	52
3.2	The research on the ability of forests to absorb carbon	53
3.3	Determination of total forest biomass	55
3.4	Determination the total amount of carbon stocks	56
3.5	Determination of Carbon stocks in forest	56
	Chapter 5. LABOR STATISTICS AND TRAINING HUMAN RESOURCES IN THE FOREST	57
I.	LABOUR STATISTICS METHODS IN FORESTRY	57
1.1.1	Current status of labor statistics in forestry	57
1.1.2	Proposed statistical method, reported in forestry labors	60
II.	HUMAN RESOURCES TRAINING IN THE FOREST SECTOR	60
2.1	Assessing the status of training system in forestry sector	60
2.1.1	Undergraduate and postgraduate training	60
2.1.2	Professional intermediate training	60
2.1.3	<i>Vocational training</i>	60
2.1.4	General assessment	61
2.2	Proposed statistical methods, reporting and training in forestry labors	63

**MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
FORESTRY INVENTORY AND PLANNING INSTITUTE**

**National Programme of Vietnam on
Monitoring, Assessment, and Reporting on Forests
under the Project
Strengthening Monitoring, Assessment, and Reporting
(MAR)
on Sustainable Forest Management (SFM) in Asia
(GCP/INT/988/JPN)**

**Organisation: Forestry Inventory and Planning Institute,
Ministry of Agriculture and Rural Development (MARD) of
Vietnam**

**Co-Organisation: - Forest Department of MARD
 - Forest Protection Department**

Duration: from June 2009 to December 2010

Hanoi, October 2010

Preface

National forest resource is an important part not only for ecology environment but also for providing huge product and million man-day of local people who live in the forest and near forest area. In Vietnam, forest land covers about 50% of natural area, relating to about 25 millions local people.

Currently, we are trying to reduce negative affects from climate change. Therefore, role of forest is more significant. FAO has been globally assessed forest resource every five year for the status of forest resource and forest protection and development.

Vietnam has participated in the FRA since 1995. However, the set of indicators is not fully collected and matched to the international level.

Under the support of MAR project, we have implemented some activities as belows:

- Analysis of Vietnam indicators, comparison between these indicators and international indicators, ASEAN indicators, recommendations for a set of suitable indicators.
- Analysis of lack indicators and recommendations for the collection.
- Recommendations for collection of forest labour and capacity building.

We do hope that new indicators and its collection will be gradually apply in Vietnam for addressing the international indicators.

We highly appreciate the support from MAR project, experts, colleagues for this study.

THE NECESSARY TO CREATE AN INDICATOR SET HARMONIZED BETWEEN VIETNAM, FAO AND ASEAN

Nowadays, the world is facing with the global warming, the global climate change caused by carbon emission, deforestation and forest degradation. The world's efforts aimed at reducing carbon emission volume from factories and forest development have been supported by many countries. Degradation prevention on existing forest areas and forest development on unforested areas are effective solutions contributing not only to the environmental aspect but also to the social aspect such as creating jobs, improving incomes of people in the mountainous areas, promoting poverty reduction and hunger elimination. Monitoring forest resource changes to propose suitable forest development policies and solutions is a continuous, regular and common process in many countries, especially in developing countries having tropical and/or sub-tropical climate.

Since 1990's, the Vietnamese government has allowed Forest Inventory and Planning Institute (FIPI) to carry out the Program for Inventory, Assessment and Monitoring of National Forest Resource Changes. The program is implemented one every 5 years, and the results are published and used for planning forestry sector strategy as well as state macro plans. The program is implementing continuously and is currently in Cycle 4.

Besides information on forest resources provided by the FIPI program, there are also an indicator set formed in 2006 by Ministry of Agriculture and Rural Development (MARD) and the Forestry Sector Monitoring and Information system (FOMIS) for supervising major action plans in forestry sector such as the Vietnam Forestry Development Strategy 2006-2020, the Forestry Sector 5-year Action Plan 2006-2010, and the 5 Million Hectare Reforestation Program (also known as Program 661).

Through the collected indicators, activities, outcomes and impacts of policies in forestry sector have been supervised and assessed, and the tasks of management, planning and policy making in forestry sector have been improved. In a broader context, the indicators have contributed to the supervision and assessment of the implementation of National Socio-Economical Development Plan.

FOMIS reflects information in a broad extent, relating to many fields in forestry sector. Therefore, the collection of indicator data is complicated and costly. The Statistical Indicator System in Forestry Sector (a part of the Statistical Indicator System in ARD Sector) has a narrower extent, and is currently being used mainly for monitoring, assessment and reporting by forestry sector management agencies.

Since 1990, FAO has published data on forest resource changes one every 5 years. These data are important for assessing the decreasing of forest resources and work as basic for planning as well as organizing global activities aimed at reducing forest degradation. Countries and territories have used national inventory program to provide data to FAO for synthesis and publication.

The Vietnam's Program for Inventory, Assessment and Monitoring of National Forest Resource Changes and the forestry sector monitoring and assessment indicator set have been built based on Vietnam practical requirements. Therefore, when compared with FAO requests, some indicators have corresponding ones but some do not. The problem is: how to combine information provided by the program with information from other sources so that it can meet the domestic requirements and at the same time meet the international integration requirement. This is why we need to find a way to harmonize two requirements so that the implementation of the program will have

highest meaning: it meets not only the domestic requirements but also international requirements.

By harmonizing data between Vietnam and FAO, Vietnam does not only merely meet the requirements of global organizations but also see necessary information to be added to meet national information needs, and based on this information, Vietnam will have suitable solutions for collecting data. Therefore, harmonizing forest resource data between Vietnam and international community is not only to meet the global need but also be a necessary step of the nation itself. This is a necessary task and needs to be considered as a step in the roadmap of investigating, collecting and providing forest resource information in general and forestry sector information in particular.

Chapter 1
THE STUDY TO FIND AN INDICATOR SET HARMONIZED BETWEEN VIETNAM AND INTERNATIONAL COMMUNITY IN FOREST RESOURCES MONITORING & ASSESSMENT (MAR)

I. METHODOLOGY FOR HARMONIZATION BETWEEN VIETNAM, ASEAN AND FAO

1.1 The current state of information in Vietnam

1.1.1 The 2006 indicator set of MARD

In 2006, MARD has issued the Decision No. 71/2006/QĐ-BNN, dated on 14/9/2006 promulgating a statistical indicator system in ARD sector. This system includes 18 indicators which are used as basic for monitoring, evaluation and reporting in forestry sector. They are listed in the Table below:

Table 1.1. Forestry sector indicator system according to the 2006 statistical indicator system in ARD sector

No.	Indicator	Cycle	Leading agency collection and synthesis	Data source
1	Forest land use current status	Year	FPD	Sub-FPD
2	Existing forest areas	Year/ 5 year	FPD/ FIPI	Sub-FPD/ FIPI
3	Forest cover	Year	FPD	Sub-FPD
4	Area of damaged forests	Month	FPD	Sub-FPD
5	Forest protection force	Year	FPD	Sub-FPD
6	Rate of special-use forest area preserved	Year	FPD	Sub-FPD
7	List of endangered and rare animal and plant species	Year	FPD	Sub-FPD
8	Timber volume	5 year	DoF	FIPI
9	Area of afforestation	Month	DoF	Sub-DoF; DARD
10	Area of reforestation after harvesting	Month	DoF	Sub-DoF; DARD
11	Area of forest land for natural regeneration	Month	DoF	Sub-DoF; DARD
12	Area of land for natural regeneration and has already become forests	Month	DoF	Sub-DoF; DARD
13	No. of scattered forest trees	Quarter	DoF	Sub-DoF; DARD
14	Forest area under protection	Month	DoF	Sub-DoF; DARD

No.	Indicator	Cycle	Leading agency collection and synthesis	Data source
	and tending			
15	Outputs of timber and forest products harvested	6 month	DoF	Sub-DoF; DARD
16	Area of plantation forests completely harvested	Year	DoF	Sub-DoF; DARD
17	Volume, value of industrial processing wood and other forest products	6 month	DoF	Sub-DoF; DARD
18	Implementation value of silviculture investment funds	Year	DoF	Sub-DoF; DARD

The above indicators have been collected by specialized organizations as shown in column 4. These indicators concentrate on outcomes of activities aimed at monitoring the implementation of sector plans to direct production. Most of the indicators are collected in too narrow time frame (monthly, quarterly or yearly) so they are not suitable for forest resource assessment. Indicators related to assessment of forest resource changes include: 2; 3; 8; 15; 17; and 18. Besides, some other related indicators such as: owners, volume and value of NTFPs, forest policies etc. have not being collected yet. Accordingly, only some indicators in Decision No. 71/2006/QĐ-BNN can be used for national forest resource assessment and global synthesis.

1.1.2 FOMIS indicator set

The indicator set was built by Forestry Sector Support Program (FSSP) to serve the need of updating information for strategy building, plan making, forest policy adjusting and assessing the implementation of the forestry sector strategy and activities.

Table 1.2. Indicator Set in FOMIS

1. OVERALL OBJECTIVE INDICATORS	
1	Existing forest areas
2	Forest cover
3	Gross domestic product (GDP) contributions from the forestry sector
4	Poverty rate in provinces/cities having large area of forests
2. SPECIFIC OBJECTIVE INDICATORS	
2.1 Economic objectives indicators	
5	Gross production value of forestry sector
6	The structure of gross production value in forestry sector

7	Timber volume
8	Growth rate of investment funds in forestry sector
9	Profit from planting 1 ha of forest per year
2.2 Social objectives indicators	
10	No. of poor communes under Decree No. 135
11	Area of allocated and leased forestland
12	Average monthly income per capita in provinces/cities having large area of forests
13	Number of annual jobs in forestry (created by the Program 661 and wood processing sector)
2.3 Environmental objectives indicators	
14	No. of forest fauna and flora species that are rare or endangered (threatened with extinction)
15	Rate of forest cover by elevation and slope
16	Rate of crown cover and no. of forest layers in protection forest
17	Area of forestland threatened by desertification
3. PERFORMANCE INDICATORS	
3.1 Sustainable forest management and development program	
18	Area of land planned as forestland to 2010
19	Area of land for natural regeneration
20	Area of land planned for new forest plantation
21	Area of production forests
22	Area of annual newly planted forests
23	Area of annual forests re-planted after harvesting
24	Area of land for natural regeneration that has become forest
25	Area of non-timber forest products (NTFPs)
26	Number of scattered trees planted each year
27	Area of certified production forests
28	Area of forests that has approved plan for forest protection and development (forest management plan)
3.2 Forest protection, biodiversity conservation and environmental services development program	
29	Area of protection forests
30	Area of special-use forests
31	Area of forests under forest protection contracts

32	No. of forest rangers working at commune level
33	Area of damaged forests
34	No. of cases violating Forest Protection and Development Law
35	No. of villages having forest protection conventions
36	Total collected values of environmental services of forests
3.3 Forest products processing and trade program	
37	Volume of harvested timber
38	Volume of harvested NTFPs
39	Volume of harvested fuel wood
40	Gross output values of wood processing industry
41	Export value of forestry sector
42	Value of imported wood and wood materials
43	Productivity of main forest products from the processing industry
44	Areas (and gross outputs, if available) of agroforestry production in the forestland
45	Gross outputs of wood and NTFP of craft villages
46	Price indexes of main forest products
47	Total value of retail sale of forest products
3.4. Research, education, training, and forestry extension program	
48	No. of people working in forest science and technology
49	No. of seed species to be certified
50	No. of scientific research results post-tested and transferred or applied into production
51	No. of agro-forestry extension staff
52	No. of forestry students (in vocational, technician, high schools and universities) divided to: being studying, newly recruited and already graduated
53	No. of re-trained government staff working in forestry sector
54	No. of on-farm farmers to assess and benefit from forestry, agriculture and industrial extension activities
55	No. of farmers participated in voluntary forestry extension groups
3.5. Renovation of the forestry sector institutions, policies, planning and monitoring program	
56	No. of laborers in forestry-related economic and administrative agencies
57	No. of forest product processing enterprises, no. of laborers, total

	capital, and profits
58	No. of SFEs converted to forestry companies/ enterprises
59	Value of fixed assets of forestry production enterprises
60	No. of households working in forestry and management area
61	No. of forest farms, laborers and management area
62	Revenue of forest farms
63	No. of cooperatives participating in forest management/protection and management area
64	No. of village communities participating in forest management/ protection and management area
65	Total basic construction investment capital for the forestry sector
66	No. of ODA projects in forestry sector (signed, implemented)
67	Total value of FDI projects in forestry sector (signed, implemented)
68	Investment in forest science and technology
69	Outputs values for silvicultural investment
70	Expenditures on forest extension
71	No. of people in working age in rural areas
72	Expenditure on forest training, education

The FOMIS set has 72 indicators. However, during the process of collecting and processing initial data (for the 2005 inventory report) only 55 indicators had data in the format requested. Therefore, the 17 remaining indicators had been classified as “future indicators” as their data were either impossible to collect or were too general and from which data for the forestry sector could not be separately segregated out.

1.1.3 ASEAN indicator set

Table 1.3. ASEAN Indicator Set

1. Extent of Forests Resources	
1.1	Extent (area) and percentage of total land area under comprehensive land-use plans.
1.2	Extent (area) of forests committed to production and protection (including natural forests and plantations)
1.3	Extent (area) and percentage of total land area under each forest type for Permanent Forest Estate (PFE) and non- Permanent Forest Estate (non-PFE)
1.4	Percentage of PFE with boundaries physically demarcated for: (a) production forests; and (b) protection forests.

1.5	Changes in forested area in the PFE and non-PFE as a result of: (a) area formally converted to agriculture; (b) area formally converted to settlements and infrastructural development; (c) area formally converted for other purposes (d) area formally added; and (e) area converted illegally.
1.6	Forest condition of the PFE and non-PFE for: (a) area of primary forest; (b) area of managed primary forest; (c) area of degraded primary forest; (d) area of secondary forest; and (e) area of degraded forest lands.
2. Biodiversity	
2.1	Statistics of protected areas containing forests classified according to IUCN protected area.
2.2	Number and percentage of protected areas connected by biological corridors or 'stepping stones' for IUCN.
2.3	Existence and implementation of procedures to identify and protect endangered, rare and threatened species of forestdependent flora and fauna in the production PFE, protection PFE, and non-PFE.
2.4	Statistics of number of endangered, rare and threatened forestdependent species, including endemic species and those legally protected.
2.5	Report on measures for in situ and/or ex situ conservation of genetic variation within commercial, endangered, rare and threatened species of forest flora and fauna.
2.6	Existence and implementation of procedures for the protection and monitoring of biodiversity in production forests.
2.7	Extent (area) and percentage of production forest that has been set aside for biodiversity conservation.
3. Forest health and vitality	
3.1	Extent and nature of forest encroachment, degradation and disturbance caused by humans and the control procedures applied, for five human activities most damaging to the PFE and non-PFE.
3.2	Extent and nature of forest degradation and disturbance due to natural causes and the control procedures applied, for five natural causes most damaging to the PFE and non-PFE.
4. Production function of forests	
4.1	Extent (area) and percentage of forest in the PFE and non-PFE for which inventory and survey procedures have been used to define the quantity of the following main forest products: (a) industrial roundwood;

	(b) fuelwood; and (c) non-wood forest products.
4.2	Actual and sustainable harvest of wood and non-wood forest products, including total number of species harvested, in the PFE and non-PFE for: (a) industrial roundwood; (b) fuelwood; and (c) non-wood forest products.
4.3	Composition of five most important species or species' groups harvested in the PFE and non-PFE for product categories: (a) industrial roundwood (b) fuelwood and (c) non-wood forest products.
4.4	Total amount of carbon stored in forest stands in the PFE and non-PFE for: (a) above-ground (forest vegetation carbon stock); and (b) soil carbon stock.
4.5	Existence and implementation of: (a) forest harvesting/operational plans (within forest management plans); and (b) other harvesting permits (small-, medium- and large-scale permits without forest management plans).
4.6	Extent (area) of compartments/coupes harvested and the number of permits issued in the PFE and non-PFE according to: (a) harvesting/operational plans; and (b) any other harvesting/cutting permit.
4.7	Existence and implementation, including parties involved, of a log-tracking system or similar control mechanisms.
4.8	Long-term projections, strategies and plans for forest production, including expanded use of planted forest.
4.9	Availability of historical records on the extent, nature and management of forests.
4.10	Availability and implementation of silvicultural guidelines for timber and non-wood forest products.
4.11	Availability and implementation of harvesting guidelines for timber and non-wood forest products.
4.12	Area over which silvicultural and harvesting procedures are effectively implemented in the PFE and non-PFE.
5. Protection function of forests	
5.1	Extent (area) and percentage of total forest area (PFE and non-PFE) managed exclusively for the protection of soil and water.
5.2	Procedures to ensure the protection of downstream catchment values.
5.3	Procedures to protect soil productivity and water retention capacity within

	production forests.
5.4	Procedures for forest engineering, including: (a) forest road lay-out and construction; (b) drainage requirements; (c) conservation of buffer strips along streams and rivers; (d) protection of soils from compaction by harvesting machinery; and (e) protection of soil from erosion during harvesting operations.
5.5	Extent (area) and percentage of areas in the production PFE that have been defined as environmentally sensitive (e.g. very steep or erodible) and protected.
6. Socio-economical function of forests	
6.1	Value and percentage contribution of the forestry sector to Gross National Product (GNP) and Gross Domestic Product (GDP).
6.2	Value of domestically produced wood, non-wood forest products and environmental services.
6.3	Forest products' industry structure (number of companies, installed capacity and employment) and efficiency (log input and products output)
6.4	Existence and implementation of mechanisms for the equitable sharing of the costs and benefits of forest management.
6.5	Existence and implementation of conflict-resolution mechanisms for resolving disputes between forest stakeholders.
6.6	Statistics of number of people depending on forests for their livelihoods: (a) employed in forest operations; (b) employed in forest products' industry; (c) other indirect employment; and (d) subsistence.
6.7	Training, capacity-building and manpower development programmes for forest workers.
6.8	Existence and implementation of procedures to ensure the health and safety of forest workers.
6.9	Area of forests in the PFE and non-PFE upon which people are dependent for subsistence uses and traditional and customary lifestyles.
6.10	Number and extent (area) of forest sites available primarily for: (a) research and education; and (b) recreation
6.11	Number and extent (area) of important archaeological, cultural and spiritual sites identified and protected.
6.12	Extent to which tenure and use rights of communities and indigenous peoples over publicly owned forests are recognised and practised.
6.13	Extent to which indigenous knowledge is used in forest management planning

	and implementation.
6.14	Extent of involvement of indigenous peoples, local communities and other forest dwellers in forest management capacitybuilding, consultation processes, decision-making and implementation, including the basis for their involvement.
7. Forest law, policies and institution	
7.1	Existence and implementation of a framework of policies, laws and regulations to govern forest management
7.2	Extent (area) of forest tenure and ownership ⁷ for the following classes and categories: (a) PFE that belongs to the Public sector (b) PFE that belongs to the Private sector (c) PFE that belongs to Indigenous communities (d) Non-PFE that belongs to the Public sector (e) Non-PFE that belongs to the Private sector (f) Non-PFE that belongs to Indigenous communities
7.3	Amount of funding in forest management, administration, research and human resource development from: (a) government sources (b) international development partners (c) private sources.
7.4	Existence and implementation of economic instruments and other incentives to encourage sustainable forest management.
7.5	Structure, responsibility and staffing of institutions responsible for sustainable forest management.
7.6	Number of professional (degree holders) and technical personnel (diploma/certificate holders) and trained forest workers at all levels, both governmental and non-governmental, to perform and support forest management.
7.7	Existence of communication strategies and feedback mechanisms to increase awareness on sustainable forest management.
7.8	Existence of, and ability to apply, appropriate technology to practise sustainable forest management and the efficient utilisation and marketing of forest products.
7.9	Capacity and mechanisms for planning sustainable forest management and for periodic monitoring, evaluation and feedback on progress.
7.10	Mechanism for public participation ⁸ in forest management planning, decision-making, data collection, monitoring and assessment.
7.11	Timeliness of information to increase public awareness about forest policies, legislation and sustainable forest management practices.
7.12	Collaboration in research activities and information exchange.
7.13	Existence and number of forest management plans, and area covered, for

	production and protection forests in the PFE and non-PFE.
--	---

The ASEAN indicator set has 59 indicators in 7 groups. Most indicator set mentions pays attention to sustainable forest management. Many indicators in the ASEAN indicator set are only qualitative. When applying to ASEAN countries, many indicators are not collectable or the data are not available. Similar to the FOMIS indicator set, indicators for which data are not currently available are reserved for future use.

1.2 FAO's requests

Table 1.4. List of tables used for national forest resource assessment

1	Area of forest and other wooded land
2	Forest ownership and management rights
3	Forest designation and management
4	Forest characteristics
5	Forest establishment and reforestation
6	Growing stock
7	Biomass stock
8	Carbon stock
9	Forest fires
10	Other disturbances affecting forest health and vitality
11	Wood removals and value of removals
12	NTFP removals and value of removals
13	Employment in forestry sector
14	Policy and legal framework
15	Institutional framework
16	Education and research in forestry sector
17	Public revenue collection and expenditure

The above three indicator systems are proposed differently due to different objectives. The objective of indicators proposed by Vietnam, besides aiming at making statistics, monitoring and assessment, is to help monitoring activities in forestry sector for forest strategy implementation. ASEAN's indicators aim at directing countries in the region to monitor and assess the forestry sector, and, based on these guidelines each country will detail a suitable indicator set. In general, it can be seen that the indicator sets mentioned above are quite in agreement; they differ only in the order of arrangement and the level of details. All systems include: situation of forest resources, forest resource design and management, owners of forest resources, forest products, investment, socio-economical and environmental effectiveness of forests, and human resources for forest resource management including institutional frameworks, investment, and human resources.

From these facts, it is necessary to create a harmonized indicator system served for forest resource monitoring and assessment such that it can best inherit existing information sources to meet the need of global forest resource assessment and be used as basic for forestry sector management, national forest policy and strategy making.

1.3 Method of harmonization

1.3.1 Review of indicators of existing systems

The existing indicators differ at detailed levels as they are derived from different requirements for monitoring and assessment of forest resources and activities in forestry sector. Each indicator or each group of indicators needs to be reviewed and compared to use as basic for proposing the new indicator system. The new indicator set needs to meet all existing systems mentioned above so that the data can be inherited. However, this is not compulsory. If it is necessary to propose a new indicator, we need to know where the data can be obtained. Are these data available? How to convert them? ... It is necessary to set the table system in FRA 2010 as the target in order to consider and propose the indicator system for assessing global forest resource changes.

1.3.2 The proposed indicators are really necessary

The indicator set for monitoring and assessment of forest resource changes serves the sustainable forest resource management and development needs. Through assessment, national strategic solutions for the forest sector are proposed. Therefore, these indicators are really necessary and used not only for one agency but also for general use. The indicator set is proposed based on these requirements; indicators are not dependent on existing data but many indicators can be derived from existing data if necessary.

1.3.3 Indicators are proposed to be based on existing data or to facilitate data synthesis

Currently, there are many data on Vietnam forest resources but they are scattered. Therefore, one leading organization should be assigned the task of synthesizing data for forest resource assessment. Existing data basically meet the requirements of forest resource assessment, and do not need many efforts to collect. Based on requirements of the assessment table system, we propose indicators for assessment and methods for converting from existing data system as requested. The proposed indicator system needs to be in line with existing data or to facilitate data synthesis so that its feasibility can be ensured as making FRA reports for each country is not a new thing but is a synthesis process following a general structure to facilitate global synthesis.

1.3.4 Do not collect new data but only analyze and extend existing data to meet global forest resource assessment needs.

The development of forest resource monitoring and assessment system differs from country to country due to different socio-economical conditions and locations of forests. However, the tables must be consistent to make the global synthesis possible. Currently, data of many indicators needed to be filled in FRA tables are not available to meet this requirement. These indicators were proposed not for collecting new data but for extending from existing data. (*Details will be presented in section: mechanism for creating an indicator set harmonized between FAO and Vietnam*). For each indicator, existing data source and method of synthesis or extension need to be specified to be in line with general requirements.

1.3.5 The proposed indicators need to be logically related

The proposed indicator set for assessing forest resources needs to be logical related. The relationship between tables ensures that the data are consistent, auditable and serve as basic to build a management structure of information system for creating FRA tables

II. MECANISM FOR HARMONIZATION BETWEEN FAO, ASEAN AND VIETNAM

Vietnam has carried out monitoring and assessment of forest resource changes since 1991. This is a program which was self-planned and implemented taking into account experiences from other countries. Results of each 5-year period have provided quite rich data set about forest resources. However, requirements of new data from domestic as well as international organizations are increasing day by day. Therefore, the existing data alone cannot meet new requirements. Based on the current database and requirements for monitoring and assessment of forest resources, we propose the following three methods for harmonizing indicators between Vietnam, FAO, and ASEAN:

2.1. Equivalent conversion

Equivalent conversion is used for indicators which definitions from organizations are quite similar. Data of these indicators can be wholly converted from Vietnam's system to other systems without changing the nature of the data. The group of indicators that can be equivalently converted includes:

a) Forest areas

Before, according to the definition in 1984, an area classified as forest needs to have a cover of wooded trees $\geq 30\%$. Now, this definition has been changed. In accordance to Decree No. 34/2009/TT issued by MARD:

An ecological system will be classified as forest when the 3 following criteria are met:

*) Be an ecological system, in which the main component are wooded trees having height of the top layer > 5 m (except newly planted forests and special mangrove forests) and bamboo, having ability to provide timber, NTFPs and other indirect values such as environmental and scenic landscape protection.

- Newly planted tree areas need to have at least 1,000 trees/ha and height > 1.5 m for slow-growing species and > 3 m for fast-growing species to be considered as forests.

- Agricultural, aquacultural ecological systems having scattered perennial wooded trees; bamboo and oil palms are not classified as forests.

**) Tree cover of the main component of forest needs to be > 0.1 .

***) Area needs to be 0,5 ha at minimum, and the narrowest forest belt need to be at least 20 m in width and have at least three lines of trees.

Accordingly, since Vietnam definition of forest is equivalent to that of FAO so we can equivalently convert forest areas from Vietnam system to FRA system in section 1.1.

b) Protection forests are forests used mainly for water sources and soil protection, erosion prevention, desertification combating, natural disaster mitigation, climate moderation and environmental protection. The concept corresponds to FRA definition in section 3.2.2.

c) Special-use forests are used mainly for natural conservation, national ecological system models, forest fauna and flora genetic sources; scientific studies; conservation of historical/cultural sites, scenic landscapes; recreation, tourism, environment

protection. This concept corresponds to the FRA definition of Biodiversity Conservation Forests in section 3.2.2.

d) Production forests are used mainly for production of commercial timber and NTFPs associated with protection function such as environmental protection. This concept corresponds to FRA definition in section 3.2.2.

e) Natural forests: are forests being existed in nature or regenerated through natural regeneration. The concept corresponds to FRA definition in section 4.1.

f) Plantations: are forests planted by human using native or introduced species. The concept corresponds to FRA definition in section 4.1.

g) Rich forests: Forests which have virtually no significant intervention or the last significant intervention was long enough ago to have allowed the forests restoring to the initial composition, high canopy cover and growing stock $> 300\text{m}^3/\text{ha}$. This concept corresponds to FRA definition in section 4.2.2.

h) Growing stock is the total amount of wood in forests counted for every trees having $D1.3 \geq 8\text{cm}$. This concept corresponds to FAO definition in section 6.2.2

i) Definitions of round wood, fuel wood, and NTFP removals as well as value of forest products in Vietnam indicator system are correspond to those of FAO in sections 11.1 and 12.1.

j) Revenue and investment in forestry sector in Vietnam system correspond to those of FAO in section 17.1.

2.2. Processing for conversion

a) Areas of afforestation and reforestation

The Decree No. 34/2009/TT by MARD has clearly defined areas of afforestation and reforestation. However, in the existing data so far the area of planted forests includes both areas of afforestation and reforestation. This means that data for reforestation are not available and need to be processed to synthesize with other countries data for global synthesis.

We have data on wood removals from plantations. Average productivity of plantations is $60\text{m}^3/\text{ha}$. Therefore, we can calculate area of plantations that have been harvested. Most of harvested area of plantations is reforested after harvesting. Therefore, the subtraction of total planted forest area to area of reforestation will be the area of afforestation.

b) Total forest biomass

Forest biomass includes volume of stem over-bark, branches, leaves, flowers, seeds, tree roots in soil and litter on the ground. Vietnam has many types of forests: evergreen forests, deciduous/semi-deciduous forests, coniferous forests, bamboo forests, mangroves etc. Due to this diversity, there were not so many researches on total biomass. Total biomass is calculated by multiplying stem volume with an extension factor representing tropical forests, which has been studied by the authors in the appendices of guidelines for making FRA 2010 reports.

c) Carbon stock

This field has not studied in Vietnam yet. Carbon stock is calculated by multiplying total forest biomass with an extension factor representing for tropical forests, which has been studied by the authors in the appendices of guidelines for making FRA 2010 reports.

2.3. Collection of additional information to meet FAO requests

a) Employment in forestry sector

At present, data of this indicator are not available so they need to be collected because its meaning is important not only for the international community but also for the country as to plan policies related to mountainous areas and ethnic minorities.

b) Research and training in forestry sector

This indicator is interested by the state but the data of this indicator are currently not available so they need to be collected.

III. PROPOSAL OF VIETNAM INDICATOR SET

From above analyses, and taking into account Vietnam situations and the necessary of integration with international systems, a new indicator system for monitoring and assessment in Vietnam is proposed as follows:

Table 1.5. Propose indicator system for monitoring and assessment in Vietnam

No.	Proposed indicators	Other systems			
		MARD indicator system	FOMIS Indicator system	ASEAN indicator system	FAO requests
1	<i>Classified by forest status</i>				
1.1	Area of forests (detailed by each forest status)	2	1	1.6	1
1.2	Area of un-used mountainous land (divided into IA, IB, IC)	2			1
1.3	Area of unforested rocky mountain	2			1
1.4	Area of rubbers				1
1.5	No. of scattered trees				
1.6	Volume of wood forests	8	7		6
1.7	Volume of bamboo forests	8	7		6
1.8	Volume of rubber plantations				6
1.9	Total forest biomass				7
1.10	Total carbon stock			4.4	8
2	<i>Classified by forest functions</i>				
2.1	Protection forests		29	1.2; 5.1	3; 4
2.2	Biodiversity conservation forests	6	30	2.1; 2.2	3; 4
2.3	Production forests		21	1.2; 4.1	3; 4
2.4	Multi-use forests			2.7	3

No.	Proposed indicators	Other systems			
		MARD indicator system	FOMIS Indicator system	ASEAN indicator system	FAO requests
2.5	Others			6.9; 6.10; 6.11;	3
3	<i>Classified by forest owners</i>				
3.1	State		11; 64	7.2	2
3.2	Community		11;60;61;63	6.12; 7.2	2
3.3	Private sector			6.12; 7.2	2
3.4	Others				2
4	<i>Classified by forest development</i>				
4.1	Area of regeneration forests by natural regeneration or natural regeneration promotion	12	24		
4.2	Area of afforestation	9	22		5
4.3	Area of reforestation	10	23		5
4.4	No. of scattered trees	13	26		
5	<i>Area of damaged forests</i>				
5.1	Due to changing land use purposes (changed to construction land, agriculture land, resettled land, inland water bodies such as dams etc.)			1.5	10
5.2	Due to forest fires	4	33	3.1	9
5.3	Due to insects and diseases	4	33	3.2	9
5.4	Area of natural forests completely harvested			3.1	
6	<i>Forest harvesting</i>				
6.1	Wood from natural forests	15	37	4.2; 4.6	11
6.2	Wood from plantations	16	37	4.2; 4.6	11
6.3	Fuel-wood	15	39	4.2	11
6.4	NTFPs (details for each types)	15	38	4.2	12

No.	Proposed indicators	Other systems			
		MARD indicator system	FOMIS Indicator system	ASEAN indicator system	FAO requests
7	<i>Revenue from forest</i>				
7.1	Value of wood removals from natural forest		3	6.1	11; 17
7.2	Value of wood removals from plantations		3	6.1	11; 17
7.3	Value of fuel-wood		3	6.1	11; 17
7.4	Value of NTFPs (details for each types)		3	6.1	11; 17
7.5	Payment for environmental services		36	6.1	17
8	<i>Investment in forestry</i>				
8.1	Domestic investment (details: investment for management, investment for each activities)	18	8; 65; 68; 69; 70; 71	7.3	17
8.2	Foreign investment		8; 66; 67	7.3	17
9	<i>Employment in forestry sector</i>				
9.1	Employment in forestry sector management system, consultant services		51; 56	6.6; 7.6	13
9.2	Forestry employment working in state enterprises or organizations.			6.6	13
9.3	Forestry employment in house-holds, communities and other management organizations		13	6.6	13
9.4	Employment in forest protection	5		6.6	13
9.5	Employment in forestry researches (classified by educational levels)		48	6.6	16
10	<i>Policies and human resource training in</i>				

No.	Proposed indicators	Other systems			
		MARD indicator system	FOMIS Indicator system	ASEAN indicator system	FAO requests
	forestry sector				
10.1	Human resource training		52	6.7	16
10.2	Law and under-law documents			7.1	14
10.3	National forest strategy, programs, and projects			4.8	14

Accordingly, 46 indicators are needed for monitoring and assessment of Vietnam forest resources. Each is described in details in the table below:

Table 1.6. Indicator's description

No.	Proposed indicators	Description
1	By forest status	
1.1	Areas of forests (details for each forest status)	Classified by each forest type: evergreen, deciduous/semi-deciduous forests, bamboo, mangrove, rocky mountain; and by each forest status: rich, medium, poor, and regeneration
1.2	Area of un-used mountainous land	Details by statuses: IA, IB, IC
1.3	Area of unforested rocky mountain	
1.4	Area of rubber plantations	Details by owners: state, private companies, households.
1.5	No. of scattered trees	Counted by no. of trees
1.6	Volume of wooded forests	Classified by each forest type: evergreen, deciduous/semi-deciduous, bamboo, mangrove, rocky mountain; and by each forest status: rich, medium, poor, regeneration.
1.7	Volume of bamboo forests	Details by species, average diameter, no. of trees, weight.
1.8	Volume of rubber plantations	Details by owners: state, private companies, households.
1.9	Total forest biomass	Including above-ground biomass: stem, branches, leaves, flowers, seeds; below-ground biomass: tree roots with diameter > 2mm, and dead-wood biomass.
1.10	Total carbon stock	Including above-ground carbon: stem, branches, leaves, flowers, seeds; carbon in litter, below-ground carbon: tree roots with diameter > 2mm, carbon in dead

No.	Proposed indicators	Description
		wood.
2	<i>By forest functions</i>	
2.1	Protection forests	Including soil and water source preservation, environmental protection, national border protection, and coastal protection.
2.2	Biodiversity conservation forests	Details by national parks, natural conservation areas, cultural/historical forest sites.
2.3	Production forests	Details: Wooded production forests, bamboo production forests, special-product forests
2.4	Multi-use forests	
2.5	Other forests	Including: forests designated primarily for researches, scenic sites, conservation of religious/spiritual sites etc.
3	<i>By owners</i>	
3.1	State	Forest enterprises, management boards of protection and special-use forests
3.2	Community	Forests allocated to communities for management
3.3	House-holds	Forests allocated to house-holds for management
3.4	Others	Forests allocated to other entities such as polices, army, churches etc. for management
4	<i>Forest establishment</i>	
4.1	Regeneration by natural regeneration or natural regeneration promotion	Established mainly by natural regeneration
4.2	Afforestation	Forests planted on bared land and denuded hills.
4.3	Reforestation	Forests planted on forest land after complete harvesting or transferring low-quality forests to plantations
4.4	No. of scattered trees	Trees in public gardens, along roads, in office areas, schools, fences, house-holds, etc.
5	<i>Area of damaged forests</i>	
5.1	Due to changing land use purposes	Details: changes from forestland to construction land, agriculture land, resettled land, reservoirs of irrigation systems, hydro-electronic plants etc.)
5.2	Due to forest fires	No. of forest fires and area of forests affected by wildfires and planned fires.
5.3	Due to insects and diseases	No. of cases and area of forests affected by insects and others

No.	Proposed indicators	Description
5.4	Area of natural forest completely harvested	Including both legal and illegal (area of rotational cultivation land is not under this classification).
6	<i>Forest harvesting</i>	
6.1	Wood from natural forests	Including estimates of both legal and illegal wood removals
6.2	Wood from plantations	Volume of wood extracted from plantations
6.3	Fuel-wood	Fuel-wood extracted from natural forests, plantations and scattered trees.
6.4	NTFPs	Details for each type: Rattan, bamboo, rubber/latex/resin, medical herbs, honey, ornamental plants, wild meat, skins and hides etc.
7	<i>Revenue from forest</i>	
7.1	Value of wood removals from natural forest	
7.2	Value of wood removals from plantations	
7.3	Value of fuel-wood	
7.4	Value of NTFPs (details for each species)	Details for each type: Rattan, bamboo, rubber/latex/resin, medical herbs, honey, ornamental plants, wild meat, skins and hides etc.
7.5	Payment of environmental services	Revenue collection from services such as ecological tourism, irrigation, hydro-electricity, clean water etc.
8	<i>Investment in forestry sector</i>	
8.1	Domestic investment	Details: investment for management, investment for each activities: silviculture, research, training, basic survey etc.
8.2	Oversea investment	ODA projects, loans, foreign direct investment (FDI) funds
9	<i>Employment and human resources training in forestry sector</i>	
9.1	Employment in forestry sector management system, consultant services	Forestry employment in Ministerial Agencies, Departments, Sections or Units, in forest inventory and planning agencies.
9.2	Forestry employment working in state enterprises or organizations.	Employment in forest enterprises, management boards of protection and special-use forests
9.3	Forestry employment	Forestry employment paid by house-holds,

No.	Proposed indicators	Description
	in house-holds, communities and other management organizations	communities and other organizations.
9.4	Employment in forest protection	Forest protection force from the central level to the local level
9.5	Human resources training	Details of trainings by levels: technical workers, technicians, universities, masters, doctors
9.6	Employment in forest research (classified by educational levels)	Employment in forest institutes, universities, high schools and experimental units of forest corporation or forest company
10	<i>Policies in forestry sector</i>	
10.1	Law and other under-law documents	Law and under-law documents applied throughout country
10.2	Forest strategy, national programs and projects	

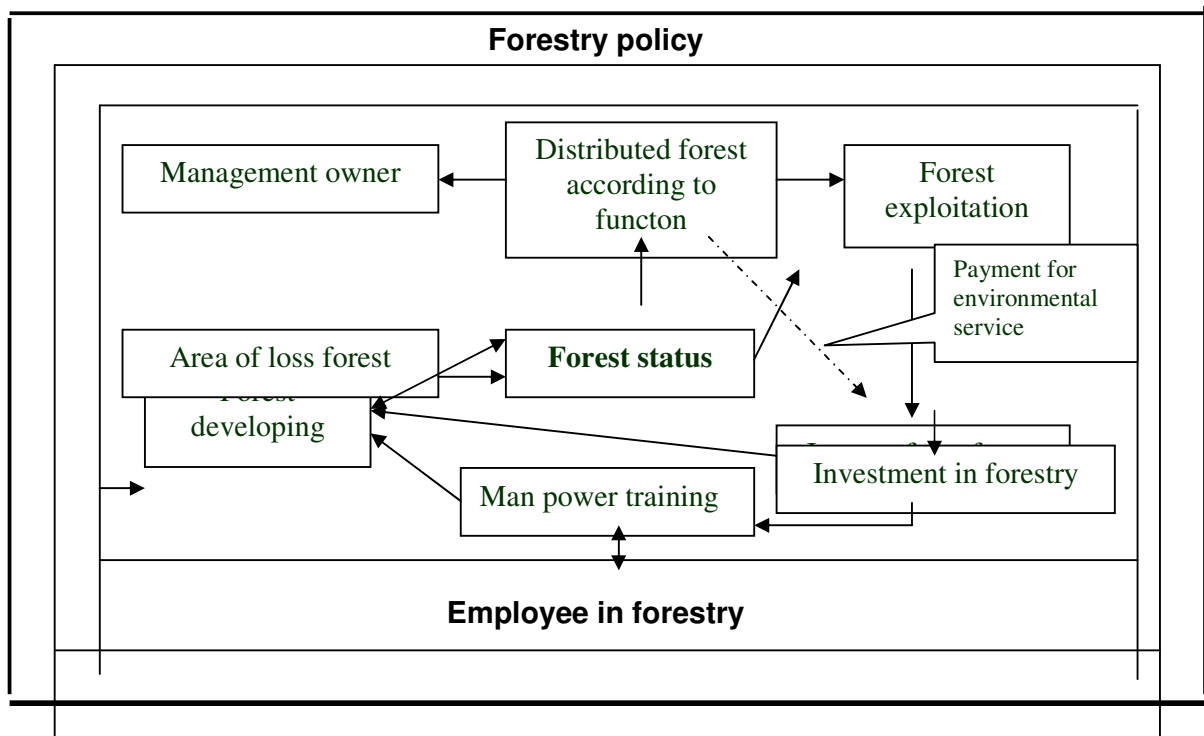
Chapter 2

RESEARCHING AND DEVELOPING THE STRUCTURE SYSTEM OF INFORMATION MANAGEMENT, USED FOR MONITORING AND ASSESSING FOREST RESOURCES

I. THE INFLUENCE AMONG ASSESSMENT CRITERIAS OF FOREST RESOURCE

The related factors to forest resource assessment are not only forest and forestry land, but also are issues synthesis relate to forestry, including forest and forest trees, forest management, labour, activities, investment, income,...to policy and training of human source. In those criteria, forest resource keeps the most important role. Forest resource is both the action object of forestry and product through the operation activities to develop forest. The forest quality and quantity are the important basis to decide the exploitation amount and income from forest. The present condition of forest is also the basis to determine forest function according to protection goals and production. Opened forest land is the basis to develop forest and orient the invesment demand for rising forestry. The forest scale according to function is the basis to decide management owner and it also have effect on attracting labour for forestry. The coverage of those criteria is the forestry policy of government. That policy decides the development speed of forest, investment ability, employee attraction, income from forest, and human source training. On the other hand, suggested policy bases on the status of forest and forest land. Therefore, we can say that the assessment criterias of forest resource always interlace, support, and interact each other, in there the criteria of forest resource plays a central role.

Diagram 1: the interaction between the assessment criteria groups of forest resource



According to chapter 1, the assessment of national forest source through 10 criteria groups. Each criteria has demand of input data, the input demand of many criteria is some related criteria and its impact, affecting to other criteria. There are some criteria affecting the same criteria both the input and output, for example: the status of forest (including opened forest land) is the basis to determine the speed, development scale of forest, but the change of forest area after impact also makes the status of forest change...the interaction between criteria is expressed as follows:

Diagram 2.1 The interaction between the assessment criteria of forest resource

No	The input factors	Criteria	Affected criteria
1	Remote sensing images, field survey system sapling plots, maps.	Forest status	The function of forest, management owner, forest development, the area of loss forest, forest exploitation, investment for forestry, forestry policy
2	Forest status, forestry policy	Distributed forest according to function	Forest exploitation, income from forest
3	Function of forest, forestry policy	Management owner	Employee in forestry
4	The present condition of forest, function of forest, investment in forestry, employee in forestry and forestry policy	Forest development	Forest status (the increase of forest area), income from forest.
5	Forest status, management owners	The area of loss forest	Forest status (changing of the area), forestry policy (adding and revise the policy)
6	The present condition of forest, function of forest, forest development, forestry policy	Forest exploitation	Income from forest, forestry labor, forestry policy (adding and correcting the policy)
7	Forest exploitation	Income from forest	Investment in forestry, employee in forestry, forestry policy
8	Forest status, income from forest, forestry policy	Investing in forestry	Forest development, employee in forestry
9	Forest status, management owners, investing in forestry, the system of training school in forestry	Labor and human resources training in forestry	Forest development, forestry policy
10	Forest status, social demand of forestry	Forestry policy	Forest development, distributed forest according function, forest exploitation, income from forest and labor in forestry

II. DEMAND OF THE INPUT DATA AND THE MAIN RESULTS OF EACH CRITERIA GROUP

2.1 Criteria group of forest status

Input	Treatment method	Result
<ul style="list-style-type: none"> - Remote sensing images - Datas from system sampling plots - Maps - Statistics on forest resources - Provincial reported figures - Reported figures of rubber 	<ul style="list-style-type: none"> - Remote sensing Image processing - Calculating the area of soils, forests - Calculating the average factors from system sampling plots - Calculating the forest growing stock - Calculating forest quality factors - Comparing data over time, increase-decrease calculation - Calculating the total of biomass stock - Calculating the Carbon stock 	<ul style="list-style-type: none"> - The area of forests types (detail for each forest status, rich forest, medium, poor, regeneration and plantation forest) - The area of opened land (divided by sub – state types Ia, Ib, Ic) - Rocky area without trees - Rubber area - Quantity of scattered plant - Growing stock of Timber forest - The rate of growing stock is divided by D1.3 class group. - The rate of growing stock is divided by commercial timber species - Growing stock of bamboo forest - Growing stock of rubber forest - Total of forest biomass stock - Carbon stock

2.2 Distributed forest according to function

Input	Treatment method	Result
<ul style="list-style-type: none"> - Map of designed forest according to function - Provincial reported figures 	<ul style="list-style-type: none"> Calculating the forest area according to function, summary, analysis 	<ul style="list-style-type: none"> - Protection forest - Bio-diversity conservation forest - Production forest - Multi function forest - Other types

2.3 Distributed forest according to management owner

Input	Treatment method	Result
<ul style="list-style-type: none"> - Map of designed forest according to function - Provincial reported data of distributing forest area according to function (protection, specific, production) - Provincial reported data of management owner 	<ul style="list-style-type: none"> Synthesis, analysis 	<ul style="list-style-type: none"> - State management: forestry companies, protection forest management boards - Allocated forest for community - Allocated forest for households - Other owners: forest management by police, military, church, school.

2.4 Group of forest development factors

Input	Treatment method	Result
<ul style="list-style-type: none"> - Statistics of the provinces: - Forest forming by natural regeneration and restoring - New planted area of forest - The area of replanted forest after clear cutting - Number of scattered trees 	Synthesis, analysis	<ul style="list-style-type: none"> - Area of forest by natural regeneration or promoting natural generation - New planted forest - Replanted forest - Scattered plants

2.5 The area of loss forest

Input	Treatment method	Result
<ul style="list-style-type: none"> - Forest statistics are changed the utilizing goal (transferring into land for construction, agriculture, re-settlement, wetland because of dam, lake, hydroelectricity..) - Forest fire - For pest - Learcutting for shifting cultivation 	Synthesis, analysis	<ul style="list-style-type: none"> - Loss forest by changing the utilizing goal - Forest fire - For pest - Learcutting for shifting cultivation in up land

2.6 Forest exploitation

Input	Treatment method	Result
Statistics of the provinces: <ul style="list-style-type: none"> - The area of natural forest selected exploitation - The area of planted forest for learcutting - The yield of exploited timber from natural forest - The yield of exploited timber from planting forest - Fire wood - NTFPs (detailed for each type) 	Synthesis, analysis	<ul style="list-style-type: none"> - Timber exploitation from natural forest - Timber exploitation from planted forest - Fire wood exploitation - NTFPs exploitation

2.7 Income from forest

Input	Treatment method	Result
<ul style="list-style-type: none"> - Timber exploitation from natural forest - Timber exploitation from planted forest - Fire wood exploitation 	Synthesis, analysis	<ul style="list-style-type: none"> - Value of exploited timber from natural forest - Value of exploited timber from planted forest - Value of fire wood

<ul style="list-style-type: none"> - NTFPs exploitation - The price of each forest product type - Statistic on cost paid for environmental service: electricity, tourism 		<ul style="list-style-type: none"> - NTFPs value - Payment for forest environmental service
---	--	---

2.8 Investing in forestry

Input	Treatment method	Result
<ul style="list-style-type: none"> - The investment capital of government - ODA capital through international project - Businesses themselves invest capital - Capital investment by local people - Payment for environmental service of involved offices 	Synthesis, analysis	<ul style="list-style-type: none"> - Management capital at levels Operation capital: forest development investment, forest protection management, forestry encouraging - Investment capital for basic survey - Investment capital for training - Investment capital for scientific research

2.9 Labor and manpower training in forestry

Input	Treatment method	Result
<ul style="list-style-type: none"> - Forest area according to management owner - Labor according to management owner - The training agencies of forestry manpower - Training manpower in forestry - Forest development policy 	Synthesis, analysis	<ul style="list-style-type: none"> - State management labor at levels - Labor in forest protection and management - Labor in the system of training schools - Labor in basic survey and scientific research - Labor in forestry companies - Forestry labor from households and community

2.10 Forestry policy

Input	Treatment method	Result
<ul style="list-style-type: none"> - Laws and by-laws relate to forestry - The programmes and national projects about forestry 	Synthesis, analysis	<ul style="list-style-type: none"> - Forest development policy - Policies attract investment, encourage the production in forestry - The programmes and national projects about forestry

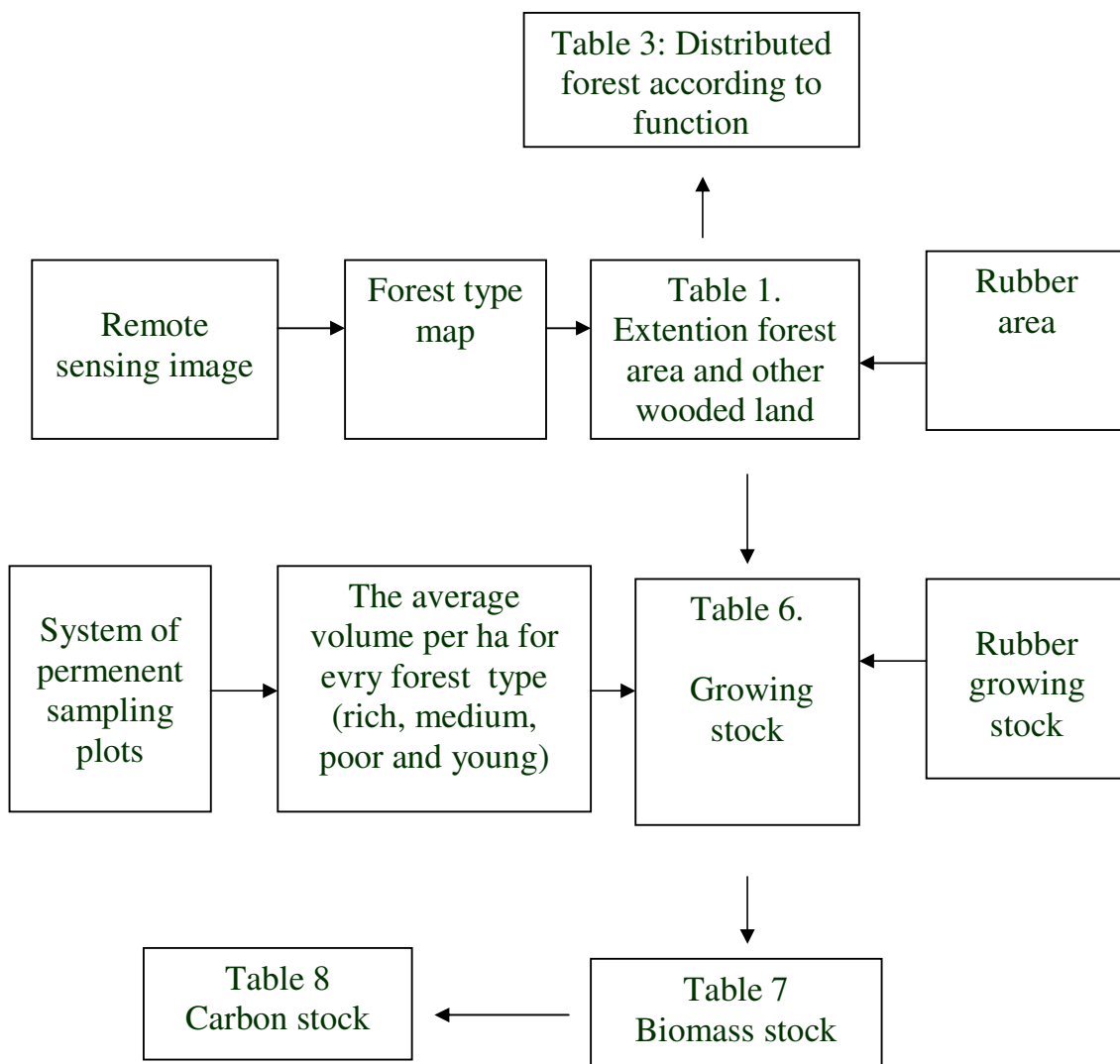
III. DATA SOURCE FOR ESTABLISHING THE TABLES IN FOREST RESOURCE ASSESSMENT ACCORDANCE WITH FRA

According to the requirement of global resource assessment, each nation needs to build the table system of forestry to global synthesis. That system is designed unification by the head quarter of FAO in Rome, and applied for all of nations. That table system is used for forest assessment in 2005 consisting of 15 tables, year 2010 includes 17 tables. The adding tables of 2010 are investment, manpower training for forestry

Building the table system based on data base of each nation. Each table has requirement of input data. In Viet Nam, at present the figures of forestry available at many offices (FIPI, forestry protection department, department of forestry) and state management offices, such as planning department, policy department, international co-operation department,... Sometimes this table is the input figure of back table : for example, growing stock is calculated from table of forest area, biomass stock synthesis table is calculated from growing stock table, carbon stock table is calculated from biomass stock table ... Basing on the relation between tables in FRA, data source from providing offices, the system of 17 FRA tables divided into groups as follows:

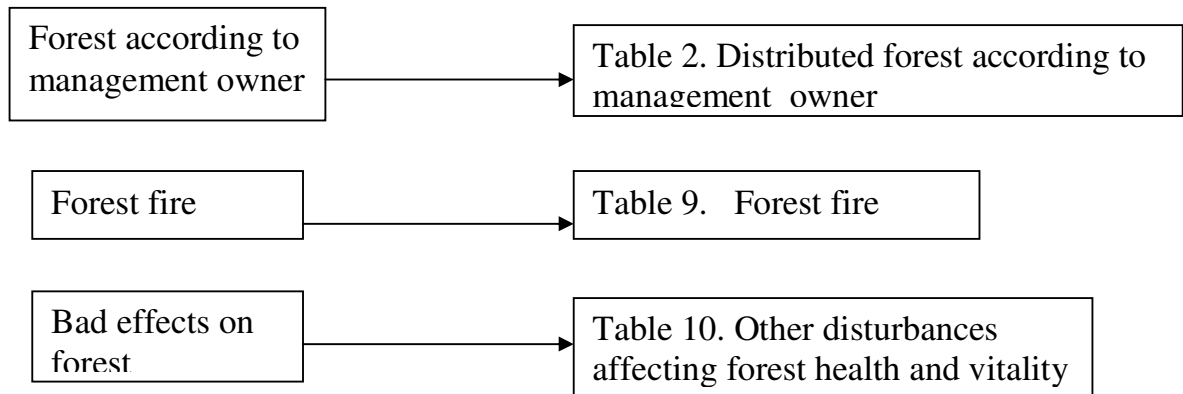
3.1 Table groups of forest status

The data source from assessment and survey programme of FIPI allows to calculate, treat, build the tables of forest status as follows:



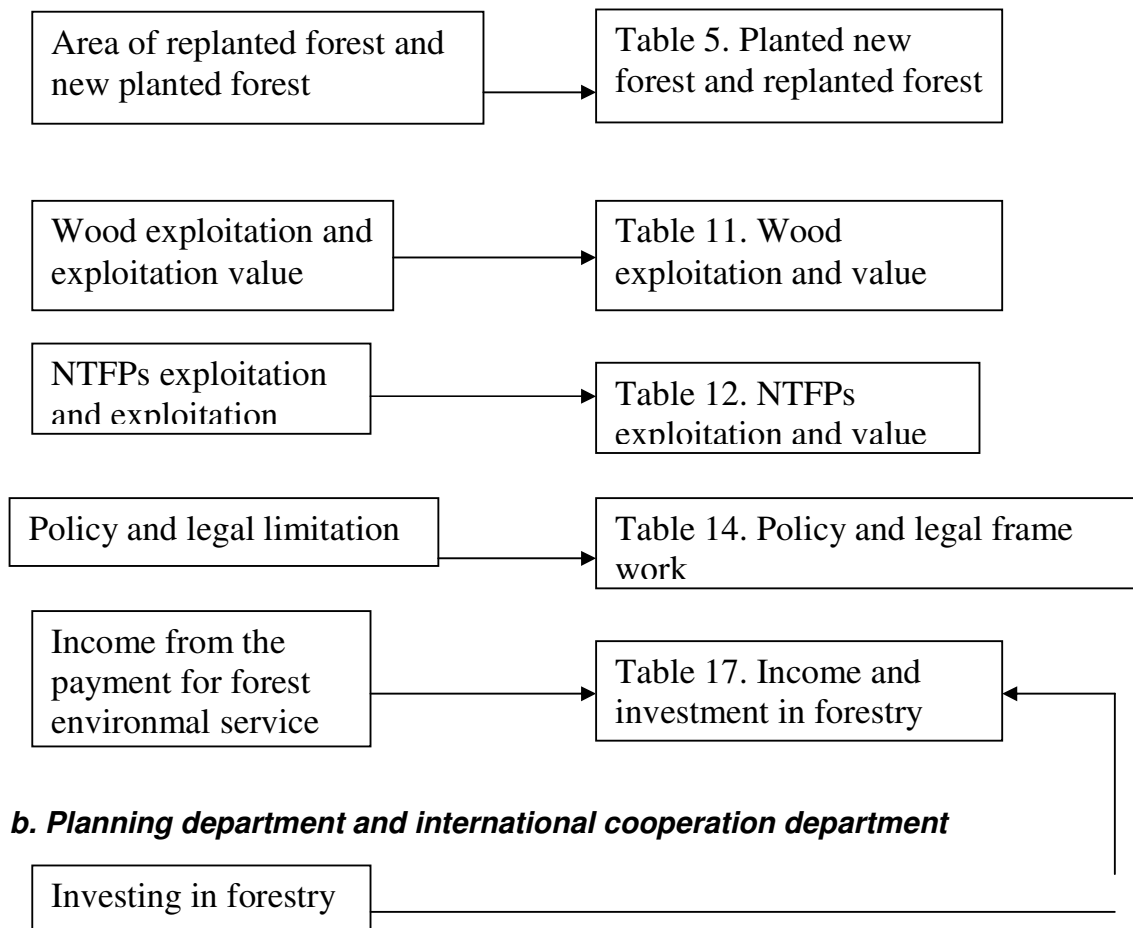
3.2 Tables of forest management and the effects on forest resource

Data source from the statistic reports of forestry department



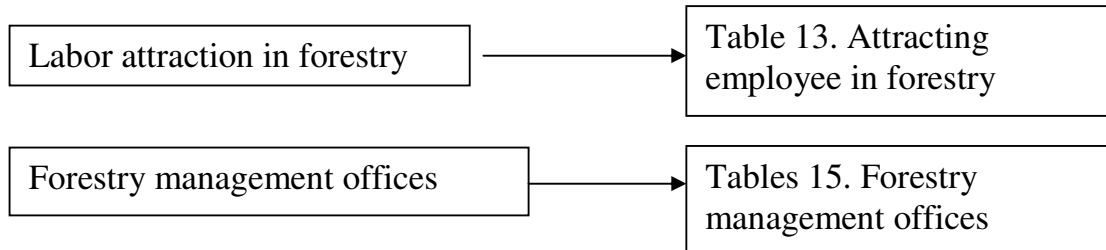
3.3 Tables of forest development, income from forest

a. Data source from the statistic reports of forestry department

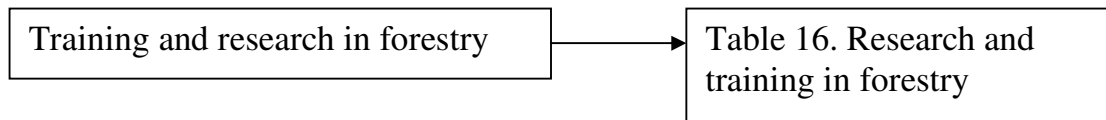


3.4. Tables of legal limitation, the social of forestwork

a. Organization department

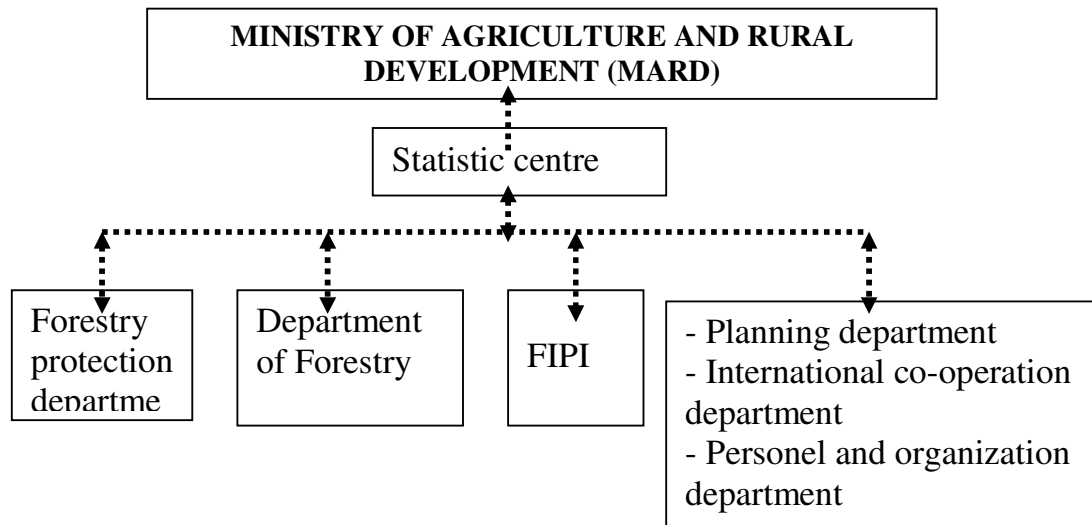


b. Legislation department



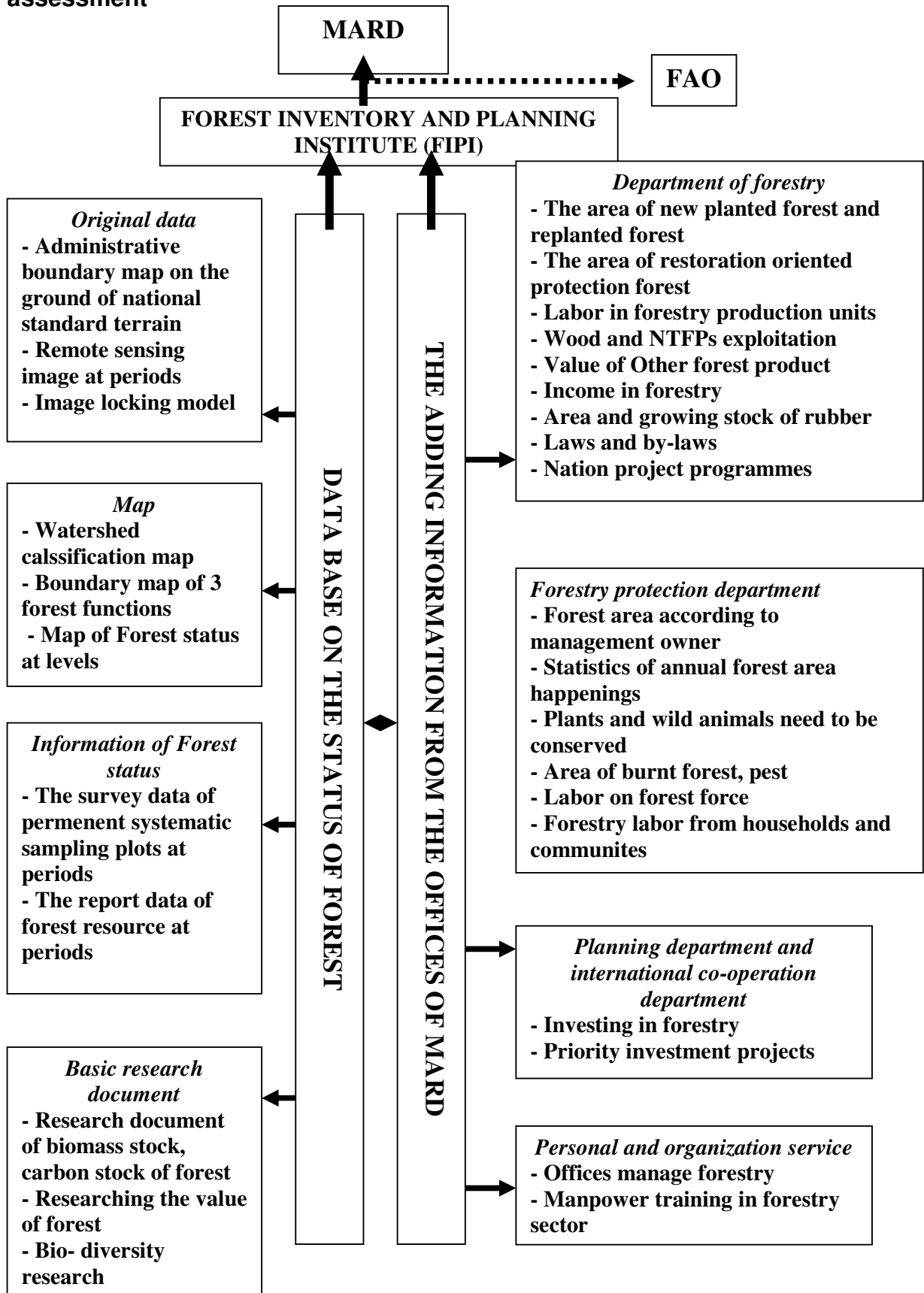
IV. THE STRUCTURE OF INFORMATION MANAGEMENT, USED FOR FOREST RESOURCE MONITORING AND ASSESSMENT

4.1. Report system and information exchange of forestry



According to the regulation, the organizations report and provide information for statistic centre of MARD, synthesis statistic centre and Ministry report, as well as provide information to national statistic general department to sum, build the statistic year book. Forestry Units and organizations have responsibility sharing information, service for report demand of MARD. From present data base, FIPI updates the adding informations to summary of forest resource survey, assessment monitoring programme and building FRA national report for times, 5 -year even (2005, 2010, 2015,..)

4.2. The structure of information management, used for forest resource assessment



Chapter 3

HARMONIZATION RESEARCH THE CRITERIA GROUP OF FOREST SITUATION AMONG VIET NAM, FAO AND ASEAN

I. POSITION OF FOREST SITUATION IN RESEARCHING FOREST RESOURCES

Forests are green lungs of the planet, they play important role in environmental protection. Forests limit soil erosion, keep water, balance climate, restrain the effect of windstorm, wave, and protect works. Forests are important places stored genetic sources of rare wild animals and plants. In Viet Nam, Forests have effect on the lives of around 25 million people living inside forests or nearby. The quantity and quality of forests play important role in the socio-economic of country. When we mention in forests, the first concern is the situation of forests.

The situation of forests is a full picture of forests and capable land to develop forests. Forest situation include natural forests, man-made forests, in there natural forest play most important role.

Forest situation decide the ability of environmental protection, disaster prevention, restriction of desertification process and soil erosion.

The situation of forests determines ability of preserving ecosystems, preserve genetic sources of animals and plants.

The situation of forests decides ability of providing forest product for the economy, including timbers and NTFPs.

Forest situation are important factors affecting to proposed policies of the government. Restricting exploitation and planting forests actively when forests are exhausted. Giving policies to encourage forest development and planting when the area of forests are reduced, and having active solutions to enrich, localize and restore forests when the quality of forests is decreased. Forests contribute to poverty reduction, hence forests are allocated for households and communities to manage, protect, develop and utilize.

In brief, the situation of forests is an important factor affecting to all of forestry activities, policy, and resources attraction to develop forest, including both labor and investment capital.

Although the criteria reflect of forest situation of organizations on the basis are united, there are still differences in detail because of different concept and proceeded point

II. CRITERIA GROUP OF FOREST SITUATION ACCORDING TO ORGANIZATIONS

2.1 Criteria group of forest situation according to FAO

The table system of FAO in FRA 2010 includes 17 tables, in there 7 tables of forest situation. The continued order number from table 1 to 8 (excepting table 2-distributed forest according to management owner). The goal of tables in FRA of FAO to manage general resources of nations, service for global synthesis, therefore they have high generalization. Viet Nam belongs to tropical and sub tropical zone, the complex forest state includes many ecosystems (evergreen forests, mangrove forests, deciduous broadleaf forests, needleleaf forests,...), there are many levels in an ecosystem (rich, poor, medium, young) hence if only stopping according to FAO's requirement, detail requirements of Viet Nam won't be satisfied. Therefore, indicators should be started

from detail according to Viet Nam and sum following FAO's requirement will be more accordant

Table 3.1. Table system of forest situation, service for assessing national forest resource from FAO

Table	Content
1	Forest area and other wooded land
3	Forest management and design follow function
4	Classifying forest according to characteristic of forest
5	New planted forest and replanted forest
6	Growing stock
7	Biomass stock
8	Carbon stock

2.2. Criteria group of forest state follows ASEAN

ASEAN's indicator set gives 58 indicators belong to 7 groups, there are 4 groups include 12 indicators of forest state. In forest state, beside some popular criteria such as area, Carbon stock, indicator set paid attention to forest use and planning according to national requirement and sustainable forest management. In criteria group of forest state, Indicators relate to bio-diversity and protection are more concerned.

Table 3.2. Criteria system of ASEAN

Extent (area) and percentage of total land area under comprehensive land-use plans.	
1. Forest resource development	
1.1	Area of contracted forests for production or protection (including natural forests and man-made forests)
1.2	Extent (area) and percentage of total land area under each forest type for Permanent Forest Estate (PFE) and non- Permanent Forest Estate (non-PFE)
1.3	Percentage of PFE with boundaries physically demarcated for: (a) production forests; and (b) protection forests.
1.4	Forest condition of the PFE and non-PFE for: (a) area of primary forest; (b) area of managed primary forest; (c) area of degraded primary forest; (d) area of secondary forest; and (e) area of degraded forest lands.
2. Diversity	
2.1	Statistics of protected areas containing forests classified according to IUCN protected area.

2.2	Number and percentage of protected areas connected by biological corridors or 'stepping stones' for IUCN.
2.3	Statistics of number of endangered, rare and threatened forestdependent species, including endemic species and those legally protected.
2.4	Existence and implementation of procedures for the protection and monitoring of biodiversity in production forests.
2.5	Extent (area) and percentage of production forest that has been set aside for biodiversity conservation.
3. Production function of forests	
3.1	Total Carbon stock of forests
4. Protection function of forests	
4.1	Extent (area) and percentage of total forest area (PFE and non-PFE) managed exclusively for the protection of soil and water.
4.2	Extent (area) and percentage of areas in the production PFE that have been defined as environmentally sensitive (e.g. very steep or erodible) and protected.

2.3 Criteria group of forest situation follows Viet Nam

In 2006, MARD had the decision, number 71/2006/QD-BNN, on September, 14th 2006 promulgating the statistical norm system of Agricultural and rural development department. There are 10 norms related to the situation of forest in the 18 norms to monitor, assess, report in forestry. This is the statistical norm system so that norms mainly express the operation result: planting forest, localizing, managing and protecting.....

Table 3.3. Forestry norm system follows statistical norm system of Agricultural and rural development department

No	Name of norm
1	The situation of forest land use
2	Area of existing forests
3	The coverage rate of forests
4	Rate of conserved special-use forest area
4	List of species are in danger or rare
5	Forest reserve
6	Area of concentrated new planted forests
7	Area of replanted forests after exploiting
8	Area of localized forests
9	Localized areas became forests
10	Forest area are protected and cultivated

FOMIS indicator set was built by forestry support programme to service for update information, basis to build strategy, plan, and correct forestry policies, monitor of strategy implementation as well as forestry activities

New indicator set includes 72 indicators arranged into 3 types and mainly concentrate on group of implementation indicator (from indicator 18 to indicator 72). FOMIS's indicators mainly collect information to monitor, assess the implementation of big programmes determined in forestry development strategy. Those are:

- + Sustainable forest development and management programme
- + Programme of protecting forests, preserving diversity and developing environmental services.
- + Forest product commerce and processing programme
- + Programme of research, training, education and forestry extension
- + Programme of innovating institution, policy, making plan and monitoring forestry

In those indicators, there are 15 indicators reflect the situation of forests

Table 3.4. Indicator system of forest state in FOMIS

1. Overall objectives	
1	Area of existing forests
2	The coverage of forests
2. Concrete objectives	
2.1 Economical objective	
3	Growing stock
2.2 Environmental objective	
4	The quantity of forest animals and plants are threatened extinction and at danger level
5	Area of allocated forests according to elevation and slope
6	Area of forestry lands are threatened desertification
3. Implementation indicators	
3.1. Sustainable forest development and management programme	
7	Areas speed up natural regeneration
8	Planning land to establish plantation forest
9	Area of production forests
10	Area of new planted forests concentrated in the year
11	Area of annual replanted forests after clear cutting
12	Natural regenerative areas became forests
3.2 Programme of protecting forests, preserving diversity and developing environmental services.	

13	Area of protection forests
14	Area of special – use forests
15	Area of protective contracted forests

2.4. Criteria group harmonization of forest situation among Viet Nam, FAO and ASEAN

Base on indicators reflecting the situation of forests built by organizations, to create an accordance each other, indicators should be expressed as follows:

Table 3.5. Criteria group harmonization of forest situation

No	Synthesis indicator	Detail indicator	FAO	ASEAN	VIET NAM
1	Area of forests and other wooded land	Area of forest types	x	x	x
		Area of other wooded land		x	x
		Area of Mangrove forests	x		x
		Rubber tree forest	x		x
3	Management and design according to function	Protection forests (watershed protection, protection againsts flying sand, coastal protection, environmental protection of industrial zones, urban environmental protection)	x	x	x
		Special – use forests (national parks, national conservation, ecosphere preservation zone, research forests, culture, religious, history forest)	x	x	x
		Production forests (planted forested, natural forests classified to forest types)	x		x
4	Classifying forests according to characteristic of forests	Primary forests	x		x
		Secondary forests			
		Evergreen broadleaf forests			x
		Deciduous broadleaf forests			x
		Dipterocap forests			x
		Mangrove forests	x		x
		Bamboo forests	x		x
Planted forests	x		x		
5	New planted	Rubber	x		x

No	Synthesis indicator	Detail indicator	FAO	ASEAN	VIET NAM
	forests and replanted forests	Area of new planted forests	x	x	x
		Area of replanted forests	x	x	x
6	Growing stock	Timber stock	x	x	x
		Rubber stock	x	x	x
		Bamboo stock	x	x	x
7	Biomass reserve	Rubber biomass stock	x		x
		Forest biomass stock	x		x
		Bamboo biomass stock	x		x
8	Carbon stock	Carbon in alive trees	x		x
		Carbon in dead trees	x		
		Carbon in the litter	x		
		Carbon under ground	x		

III. HARMONIZATION IN BUILDING INDICATORS OF FOREST SITUATION

3.1. Building table 1: area of forest and other wooded land

a. Determining forest area

Area of forest situation is determined through processing remote sensing image SPOT5 (resolution 2.5×2.5m) to build map of forest situation. From forest types map and GIS software, calculating forest area according to each block: timber forests (rich, medium, poor, young), bamboo forests, mixed timber-bamboo forests, plantation forests...

b. Statistic on forest area

Statistic on forest area for each province, synthesis follows ecological region and synthesis for nation (including wood forest and area of bamboo forest)

Statistic on wood forest and bamboo forest area at each province as follows:

Statistic on natural timber forests according to forest types (including rich forests, poor forests, medium and young forests). Statistic on timber forest area follows state (consists of species and age class level). Statistic on bamboo forest area according to types (big, medium and small diameter classes)

Statistic on forest area according to subspecies (including saltwater swamp forests, alkaline swamp forests, flooded forests (freshwater swamp forest), natural timber forests with evergreen broadleaf forests, natural timber forest with semi deciduous broadleaf forests, timber forest, speciality forest, needleleaf broadleaf natural forests, rubber, neohouzeauna forest, other bamboo forests, mixed timber-bamboo forests (main timber), mixed timber-bamboo forests (main bamboo).

Statistic the area for forests: natural timber forest, bamboo forest, mixed timber-bamboo forest, wetland forests, planted timber forest.

Statistic the area for forests: land mountain forests, rocky mountain forests, wetland forests

Statistic the area for main forests: primary forests, secondary forests

c. Open land area

Area of open land situation determined on satellite image SPOT5 (resolution 2.5 x 2.5) and further investigation outside, co-ordinating with other information sources.

Statistic the area of open land situation follows: open land with regeneration and scattered trees (calling IC land), open land with rehabilitation shrubs (calling IB land), open land without grass (calling IA land), rocky mountain without trees (calling ND land)

3.2 Building table 2: Forest functions

According to main use objective, VietNam's forests divided into 3 main types: special-use forests, protection forests and production forests

(1) Special-use forests divided into small categories: national parks, natural conservation zones (including 2 sub-categories: natural reservation zones, species-habitat conservation zones); landscape protection zones (including historical remain-cultural-beauty spot forests); forests for science research and scientific experiment research

(2) Protection forests divided according to protection objective: watershed protection forests; wind-break protection forests, flying sand-break protection forests; wave-break protection forests, sea-encroaching protection forests; environmental protection forests and environmental protection forests in industrial zones, urbans,..

(3) Production forests detailed to types: production forests are natural forests, production forests are planted forests, production forests are breed forests. In there, natural forests and planted forests divided into forest types to apply the suitable activities. Natural timber forests divided into types (including rich forests, medium forests, poor forests, young forests); Bamboo forests divided according to the types of tree species; planted timber forests divided state according to tree species and group of age level

3.3. Buiding table 3: Classifying forests according to the forest characteristic

According to forest origin, the forests of Viet Nam divided into 2 main types: primary forests (including natural forests), secondary forests (consists of natural forests and planted forests)

In each main divided into 3 sub-categories: land mountain forests, rocky mountain forests, wetland forests.

In there, land mountain forests and rocky mountain forests continued to divide into 3 sub categories: timber forests, bamboo forests, mixed timber-bamboo forests

Natural wetland forests divided into 3 sub-categories: saltwater swamp forests, freshwater swamp forests (flooded forests) and ankaline swamp forests.

Each sub-category divided into situation: the situation of high volume forests, the situation of medium volume forests and situation of low volume forests.

Natural timber forests divided into 5 small sub-categories: natural forests with evergreen broadleaf, natural forests with semi-deciduous broadleaf, natural forests with needleleaf, natural forests with mixed broadleaf-needleleaf.

Each sub-category divided into situation: the situation of high volume forests, the situation of medium volume forests and situation of low volume forests.

Planted forests divided into 3 sub-categories: timber forest, specialized forests, rubber tree forests.

Each one continues to be divided according to tree species and group of age level.

Bamboo forests divided into 5 sub-categories: neohouzeana forests, bamboo forests, nooding bamboo forests, other bamboo forests.

Each one divided into forest situation: big diameter forests with high volume, big diameter forests with medium volume, big diameter forests with low volume, small diameter forests with high volume, small diameter forests with medium volume, small diameter forests with low volume.

Mixed timber-bamboo forests divided into 2 sub-categories: Mixed timber-bamboo forests (main timber) divided into some type like timber forest, mixed timber-bamboo forests (main bamboo) divided into types like bamboo forests.

Reference system of Viet Nam's forest classification

A. PRIMARY FORESTS (natural forests divided the same to natural forest in secondary forests)

B. SECONDARY FORESTS

I. NATURAL FORESTS

1. Land mountain forests

1.1. Timber forest

1.1.1. Evergreen broadleaf natura forests

Evergreen broadleaf natural forests – high volume

Evergreen broadleaf natural forests – medium volume

Evergreen broadleaf natural forests – low volume

1.1.2. Deciduous broadleaf natural forests

Deciduous broadleaf natural forests-high volume

Deciduous broadleaf natural forests-medium volume

Deciduous broadleaf natural forests-low volume

1.1.3. Semi-deciduous broadleaf natural forests

Semi-deciduous broadleaf natural forests- high volume

Semi-deciduous broadleaf natural forests- medium volume

Semi-deciduous broadleaf natural forests- low volume

1.1.4. Needleleaf natural forests

Needleleaf natural forests-high volume

Needleleaf natural forests-medium volume

Needleleaf natural forests-low volume

1.1.5. Mixed needleleaf-broadleaf natural forests

Mixed needleleaf-broadleaf natural forests-high volume

Mixed needleleaf-broadleaf natural forests-medium volume

Mixed needleleaf-broadleaf natural forests-low volume

1.2 Bamboo forests

1.2.1. Dendrocalamus barbatus Hsue forests

Dendrocalamus barbatus Hsue forests-big diameter and high volume

Dendrocalamus barbatus Hsue forests-big diameter and medium

volume

Dendrocalamus barbatus Hsue forests-big diameter and low volume
Dendrocalamus barbatus Hsue forests-small diameter and high
volume
Dendrocalamus barbatus Hsue forests-small diameter and medium
volume
Dendrocalamus barbatus Hsue forests-small diameter and low
volume

1.2.2. *Debdrocalamus strictus* forests

Debdrocalamus strictus forests-big diameter and high volume
Debdrocalamus strictus forests-big diameter and medium volume
Debdrocalamus strictus forests-big diameter and low volume
Debdrocalamus strictus forests-small diameter and high volume
Debdrocalamus strictus forests-small diameter and medium volume
Debdrocalamus strictus forests-small diameter and low volume

1.2.3. Nooding bamboo forests

Nooding bamboo forests-big diameter and high volume
Nooding bamboo forests-big diameter and medium volume
Nooding bamboo forests-big diameter and low volume
Nooding bamboo forests-small diameter and high volume
Nooding bamboo forests-small diameter and medium volume
Nooding bamboo forests-small diameter and low volume

1.2.4. *Bambusa procera* forests

Bambusa procera forests-big diameter and high volume
Bambusa procera forests-big diameter and low volume
Bambusa procera forests-small diameter and high volume
Bambusa procera forests-small diameter and medium volume
Bambusa procera forests-small diameter and low volume

1.2.5 Other bamboo forests

Other bamboo forests-big diameter and high volume
Other bamboo forests -big diameter and medium volume
Other bamboo forests -big diameter and low volume
Other bamboo forests-small diameter and high volume
Other bamboo forests-small diameter and medium volume
Other bamboo forests-small diameter and low volume

1.3. Mixed bamboo-timber forests

1.3.1. Mixed bamboo-timber forests (main timber)

Mixed bamboo-timber forests-high volume
Mixed bamboo-timber forests-medium volume
Mixed bamboo-timber forests-low volume
Mixed bamboo-timber forests (main bamboo)
Bamboo forests-big diameter and high volume
Bamboo forests-big diameter and medium volume

- Bamboo forests-big diameter and low volume*
- Bamboo forests-small diameter and high volume*
- Bamboo forests-small diameter and medium volume*
- Bamboo forests-small diameter and low volume*
- 2. Rocky mountain forests (classified same to land mountain forests)*
- 3. Wetland forests*
 - 3.1. Saltwater swamp forests*
 - Saltwater swamp forests-high volume*
 - Saltwater swamp forests-medium volume*
 - Saltwater swamp forests-low volume*
 - 3.2. Brakishwater swamp forests*
 - Brakishwater swamp forests-high volume*
 - Brakishwater swamp forests-medium volume*
 - Brakishwater swamp forests-low volume*
 - 3.3. Freshwater swamp forests (flooded forests)*
 - Freshwater swamp forests-high volume*
 - Freshwater swamp forests-medium volume*
 - Freshwater swamp forests-low volume*
- II. PLANTED FORESTS**
 - 1. Timber forests (divided to species)*
 - Timber forestfs-high volume*
 - Timber forests-medium volume*
 - Timber forests-low volume*
 - 2. Specialized plantations (divided to species)*
 - 3. Rubber tree forests*

3.4. Building table 4: New planted forest and replanted forests

In table 04, statistic on planted forest area follows 2 types: new planted forests, replanted forests.

New planted forests set up through planting forests by seedlings established from seeds, hom, tissue or sow seeds on open land

Replanted forests set up through copicing and seed regeneration, planting forests by seedlings established from seeds, tissue, hom or sowing seeds on forestry land was lost forest for a short time (because of clear cutting, forest fires, pest,..)

Statistic on the area of new planted forests and replanted forests in Viet Nam on species and group of age level.

3.5. Building table 5: Growing stock

- a. Determining growing stock

Growing stock is the volume over-bark all of living trees in forest having diameter at 1.3 m location from ground ≥ 8 cm. Reserve includes the volume of trunk calculating from ground to the soar height of tree top, without branches

Calculating the reserve of timber forests based on forest area and the average volume of each forest type (including rich forests, medium forests, poor forests and young forest) on each province.

Calculating the average reserve of each forest state on each province based on collective data from 2 hectare field for a systematic permanent sampling plot on forestry land of a nation, with quantity 2100 plots in the programme of inventory, monitoring and assessing the nation-wide forest resource, cycle 5 years

Calculating standing volume according to following formulas:

$$m_{iotc} = \sum m_c$$

$$m_{tb/tt} = (\sum m_{iotc}/n) * s_i/10000$$

$$M_{tt} = S_{tt} * m_{tb/tt}$$

Explanation: - m_{iotc} means standing volume in sampling plot of forest type i
 - m_c means standing volume of tree number c in sampling plot
 - s_i means the area of sapling plot
 - $m_{tb/tt}$ means average standing volume per ha of forest type.
 - n means number of sapling plot in the same forest type.
 - S_{tt} means area in ha of one forest type

b. Statistic of standing volume

Statistic standing volume for each province, summing for region, nation (including the volume of wood forests and bamboo forests)

Statistic on the volume of wood forests and bamboo forests of each province as follows:

Statistic on the volume of natural wood forests follows state (including rich forests, medium forests, poor forests, young forest). Statistic on the volume of bamboo forests follows state (consists of big diameter forests with high volume, big diameter forests with medium volume, big diameter forests with low volume, small diameter forests with high volume, small diameter forests with medium volume, small diameter forests with low volume). Statistic on the reserve of planted forests according to state (including species and age level)

Statistic of forest reserve follows sub-types (consists of saltwater wetland forests, flooded forests, alkaline wetland forests, natural wood forests with evergreen broadleaf, natural wood forests with deciduous broadleaf, natural wood forests with semi-deciduous broadleaf, natural wood forests with needleleaf, natural wood forests with needleleaf broadleaf, wood plantations, speciality plantations, rubber tree forests, nodding bamboo forests, denrocalamus marmatus Hsue, dendrocalamus strictus forests, other bamboo forests, mixed timber-bamboo forests (main timber), mixed timber-bamboo forests (main bamboo)

Growing stock statistic for forest types: natural wood forests, bamboo forests, mixed timber-bamboo forests, wetland forests, wood plantations.

Growing stock statistic for forest types: land mountain forests, rocky mountain forest, wetland forests

Growing stock statistic for main forests: primary forests, secondary forests

3.6. Building table 6: Biomass stock

a. Determining biomass stock.

Calculating the biomass stock according to national growing stock, including biomass on the ground, underground, biomass in dead wood.

Calculating biomass stock according to following formulas:

$$MB_i = M_{kri} * K_i$$

Explanation:

MB_i means biomass stock of forest type i

M_{kri} means growing stock of forest type i

K_i means coefficient to converse from growing stock to biomass stock.

Calculating the biomass stock on the ground by multiplying standing volume of living wood with coefficient of moist tropical forest or coniferous forest (pine) determined. The chosen coefficient in FAO's guide document to calculate reserve of living biomass on the ground is 0.9 for Pine forests and 2.0 for moist tropical broadleaf forests, the reason is in Viet Nam coniferous forests include lots of species but pine plays 90% area of needle trees; broadleaf forests are moist tropical forests in Viet Nam..

Calculating reserve of dead biomass stock by multiplying volume of dead wood with coefficient of moist tropical forest or coniferous forest (pine) determined. At present, there isn't any figure of dead biomass reserve in Viet Nam because volume of dead wood uncount

Calculating the biomass stock under the ground by multiplying biomass on the ground with determined coefficient. The chosen coefficient in FAO's guide document to calculate biomass reserve underground is 0.275. Viet Nam applied coefficient of FAO because Viet Nam still uncount this one.

b. Statistic on biomass stock

Up to now, Viet Nam only caculated the reserve of living trees, therefore only biomass on the ground and underthe ground

Statistics on biomass stock on the ground include:

- (1) Biomass stock of broadleaf trees on the ground
- (2)Biomass stock of needleleaf trees on the ground

Statistics on biomass reserve under the ground include:

- (1) Biomass stock of broadleaf trees under the ground
- (2)Biomass stock of needleleaf trees under the ground

3.7. Building table 7: Carbon stock

a. Definitions:

Carbon on the ground is Carbon of whole living species on the ground, including: trunk, branch, bark, seed, stump, fruit and foliage.

Carbon under the ground is carbon of whole things of living root. Including the diameter of root bigger than 2mm

Carbon in the dead wood is Carbon in all of dead things, unstore rubbish. It sits and lies on the ground or inside land.

Carbon in the litter is carbon in all of dead things having diameter smaller than smallest diameter for dead wood (10cm), died in different state: dry, rotten.

Carbon inside the ground is Organic's Carbon inside mines, land (including peat) to determined depth through time chain

b. How to calculate Carbon stock

Statistics on forest area and national growing stock proclaimed annually by MARD. Applying coefficient according to the instruction of FRA with different forests in the world. Carrying out to choose forests' coefficients correspondence with present forests in Viet Nam. Applying the chosen coefficient for all of national broadleaf, needleleaf forests

Calculating carbonstock on the ground by multiplying the biomass on the ground with coefficient 0.47

Calculating carbonstock under the ground by multiplying biomass under the ground with coefficient 0.47

Calculating carbonstock in litter by multiplying forest area (unit: ha) with the coefficient of tropical moist forest is 5.2

Calculating carbonstock inside the ground by multiplying forest area (unit: ha) with the coefficient of tropical moist forest is 47

c. Statistic on Carbonstock

Statistic on Carbon stock on the ground

Statistic on Carbon stock under ground

Statistic on Carbon stock in rubbish

Statistic on Carbon stock inside the ground

Chapter 4

Proposed solutions to identify lacking targets IN THE ASSESSMENT OF NATIONAL Forest Resources

I. The biomass of dead plant in the forest

1.1 Dead plant is a part of forest ecology system.

Forest trees in general and each individual in the forest ecosystem as biological objects, each individual is born, growth, development, aging and death. When trees die, its will create humus decomposition of organic matter added to soil. Economically, the tree dies naturally in the forests have no value for the forestry sector. But the environmental aspect is very significant:

Dead trees is a source of stored carbon, organic matter in dead trees are resolving slowly and returned carbon to atmosphere.

Dead trees to improve the soil environment, increased humus content, improve the soil structure, increase soil porosity and provide a food source for microorganisms and insects in forest ecosystems.

Therefore, the tree dies naturally in the forest is indispensable when the carbon stocks of forest ecosystems.

In Vietnam, before joining the FRA are not interested in carbon stocks of tree death. When determining forest biomass reserves are only interested in live trees, so numbers of dead trees in the forest ecosystem was ignored.

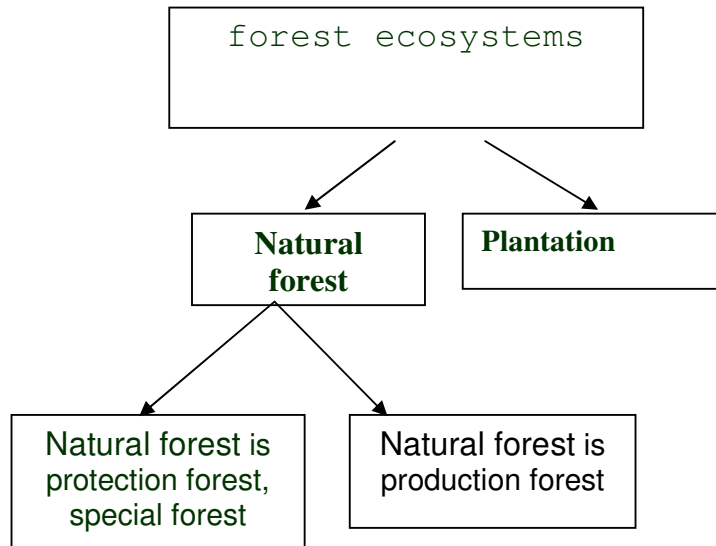
Dead trees are part of the ecosystem related to carbon stocks, climate change and is not missing component in the assessment of national forest resources and forest resources worldwide. Such reasons above we conduct to research on identifying reserves of dead trees in forest ecosystems as the basis for the calculation of carbon stocks.

Dead trees include the standing dead trees in the forest and dead trees lying on the ground dead.

The different forest ecosystems, the death rate of different crops. If species composition of main timbers are hardwood tree species is difficult to rot, although it is standing dead or dying, but a long decay. In contrast, softwood trees are biodegradable over time, so after death they decomposed immediately. The decomposed trunk of timber depends on the climate regime: If the climate is cold, dry, low humidity will hinder the development of fungi and insects, microorganisms destroy timber. If the heat, trunk is easy to be destroyed because it is a favorable environment for microbial, insect growth and development.

Program assessment, survey and monitoring of national forest resource in Vietnam was conducted from 1991, survey, collected data on sample plot is conducted five times a year. To reserve the dead trees we have gathered all the plots in an investigation of the plots cycle that collected the most (4200 sample plots).

In the forest ecosystem is inevitably a number of reserves of dead trees are different. The natural forest is different from plantations, in a natural forest ecosystem, the protection forest, the special forest is from production forest by special forest, protection forests are not exploited, mainly to protect the existing trees in accordance with the roles of nature are too old and will die. Meanwhile the natural production forests, forest trees are exploited by rotation. By the time of exploitation, the mature trees and over mature need to cut to meet the needs of providing forest products, so the number of old trees exist no more. With that logic, we conducted to divide survey plot 500 m² in the diagram below:



1.2. Number of plots used to calculate the biomass of dead trees in forest ecosystem

Order	Kind of forest	Number of sample plots 500m ²	Measurement areas (ha)
1	Natural forest	68.132	3.406
1.1	Protection forest, special forest	33.408	1.670
1.2	Production forest	34.724	1.736
2	Plantation	6.910	345

3. Calculation results of the biomass dead wood in forest

3.1 The calculation result of dead trees

<i>Diameter level D_{1,3}</i>	Target	Kind of forest			
		Natural forest			Plantation
		Average	Protection forest, special forest	Production forest	
Total/ha	<i>Number of trees/ha</i>	477.0	442.6	502.7	931
	<i>Number of dead trees/ha</i>	11.3	12.0	9.1	1.3
	<i>Percentage of dead trees (%)</i>	2.4	2.7	1.8	0.1
6cm – 30 cm	<i>Number of trees/ha</i>	414.0	368.3	450.6	905
	<i>Number of dead trees/ha</i>	9.7	9.1	7.6	1.0
	<i>Percentage of dead trees (%)</i>	2.3	2.5	1.7	0.1
31cm – 60 cm	<i>Number of trees/ha</i>	58.0	68.2	48.0	25
	<i>Number of dead trees/ha</i>	1.4	2.0	1.3	0.3
	<i>Percentage of dead trees (%)</i>	2.5	3.1	2.8	1.0
>60 cm	<i>Number of trees/ha</i>	5.0	6.1	4.1	0
	<i>Number of dead trees/ha</i>	0.2	0.2	0.1	0
	<i>Percentage of dead trees (%)</i>	3.0	3.3	2.6	0

1.3.2. The results of the biomass of dead trees

Diameter level D1,3	Target	Kind of forest			
		Natural forest			Plantation
		Average	Protection forest, special forest	Production forest	
Total/ha	<i>Stock (m³)/ha</i>	102	107	98	35
	<i>Stock of dead trees (m³)/ha</i>	2.2	2.4	1.7	0.8
	<i>Percentage of dead trees stock (%)</i>	2.2	2.2	1.8	2.2
6cm – 30 cm	<i>Stock (m³)/ha</i>	59.1	57.4	62.2	32.4
	<i>Stock of dead trees (m³)/ha</i>	1.0	1.0	1.0	0.6
	<i>Percentage of dead trees stock (%)</i>	1.7	1.7	1.6	1.9
31cm – 60 cm	<i>Stock (m³)/ha</i>	32.5	37.6	29.7	2.5
	<i>Stock of dead trees (m³)/ha</i>	0.7	0.8	0.6	0.1
	<i>Percentage of dead trees stock (%)</i>	2.2	2.3	1.9	5.8
>60 cm	<i>Stock (m³)/ha</i>	10.4	12.0	6.0	0
	<i>Stock of dead trees (m³)/ha</i>	0.5	0.6	0.1	0
	<i>Percentage of dead trees stock (%)</i>	4.5	4.8	2.2	0

With the calculated results above, the identification of dead plant biomass should be calculated on the basis of the average biomass of standing trees in the forest. The data is not much difference between nature forests and plantation (2.15 and 2.2) while nature forests account for a large proportion.

Collected data of dead tree was carried out on very big number plots but due to technical measures regulations, we only measured the dead trees in the forest, which is still standing. Lying dead trees and branches are left after harvesting are not measurable. Thus, although the data is accurate, but not enough so the rate of 2.2%

may actually reflect the dead trees in the forest. We suggest using the rate is 11% dead trees provided by the FAO to calculate biomass and carbon stocks for dead trees.

II. Biomass on the land with trees outside forests

Vietnam so far to now has not calculated biomass, number of trees on forest land without forests. According to standard classification status of national forest, the forest land without forest planning for the forest purpose include three sub - status:

Sub - status IA: Vacant land with grass, vegetation is grass, big grass, wild banana.

Sub - status IB: Vacant land with shrubs, vegetation composition is a woody shrub, woody vine. Although this vegetation has coverage > 0.1 but can not develop into forests by properties of these species only reach a maximum height < 3m.

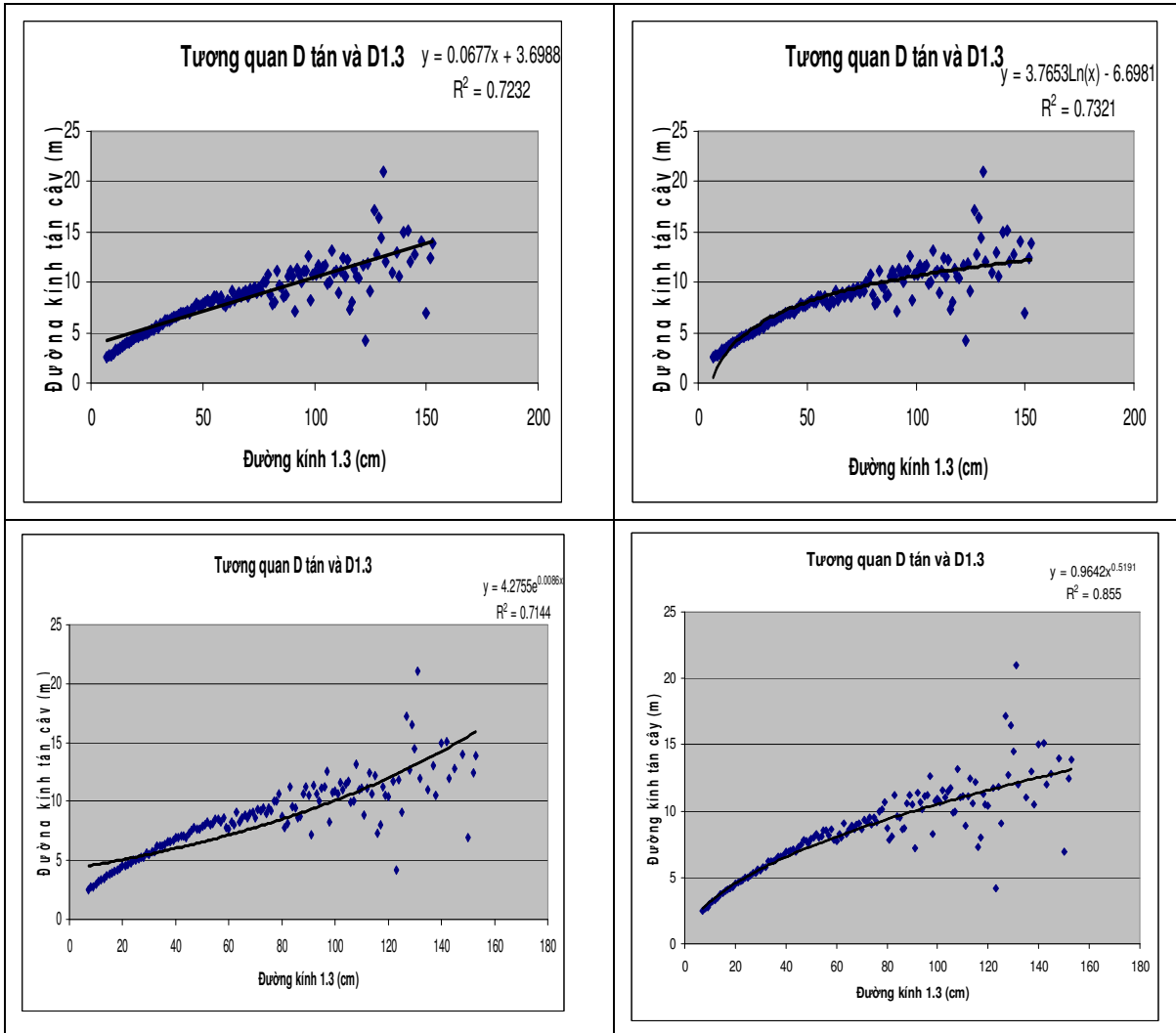
Sub - status IC: Vacant land with scattered trees – this is the period of pre-forming natural forest. Individual trees can be left in the process of exploitation, burn shifting to cultivation or natural regeneration after shifting cultivation process or the regeneration of trees on land without forest (even regeneration of trees from status IB). Individual tree height can reach $H > 5$ m, but the coverage is not enough 0,1. So may not create sub-situation is considered the sub-situation of forest ecosystems. Ability to provide, this object has no value, even though there is biomass, but it is very scattered and the species composition is most of the wood with quality is low, but the environmental sub-status is still significant meaning:

- Vegetation with low cover, but has initially formed a favorable environment for the regeneration of individual trees - important components of forest ecosystems.

- A component of reserving of biomass and carbon stocks, contributing to minimize the unfavorable factors of environment and ecology.

In the national forest inventory programme we collect data by the systematically sampling plots. IC type (other wooded land) is included to correct data. The IC plots are 43,742, which is equivalent of 2,167 ha.

Based on specific survey data of each individual in the ecological sample plot (100 plots = 200 ha with the 10,000 tree), the correlation equation between foliage diameter and diameter at 1.3 m is expressed as follow:



In the above equation, the correlation equation is the exponential nearest with $R^2=0.855$.

Use the correlation equation: $D_{\text{Foliage}} = 0.9642 \times D_{1.3}^{0.5191}$ to determine the coverage of object is scattered trees, the following table:

Order	D1.3 (Cm)	Number of trees	D Foliage (m)	S Foliage /tree (m ²)	Total S Foliage (m ²)
1	6-20	64.3	2.62	5.38	346.25
2	21-40	9	3.75	11.06	99.53
3	41-60	1.2	4.89	18.79	22.55
4	>60	0.3	5.61	24.68	7.40
Total		74.8			475.74

Through survey data, based on the correlation equation, the total area of foliage of the subject land with scattered trees is 475m² is equivalent coverage is

5%. Thus, the coverage of this object is only equal 50% of minimum coverage of vegetation is considered as the forest.

Biomass of status IC

Category	Total	6-20cm	21-40cm	41-60cm	>60cm
Number of trees/ha	74.91086	64.37916	8.96892	1.22304	0.33974
Biomass m ³ /ha	10.7163	3.60784	4.04648	1.94252	1.11946

Through calculations, suggest to get the average stocks for status IC was 10.7 m³/ha to calculate standing tree stocks, stocks of biomass and carbon stocks.

III. THE METHODS TO CALCULATE THE BIOMASS OF FOREST AND CARBON STOCK

3.1. The research work on forest biomass in Vietnam

The research of forest biomass in Vietnam began to be conducted in late 1980, although the research is scattered and not systematically, but also achieved initial results are very meaningful: Nguyen Hoang Tri (1986) with research “Contribute to research productivity and biomass the community – (*Rhizophora apiculata* B1)” in Ca Mau – Minh Hai applied method “sample tree” to research productivity, biomass, some forest communities (*Rhizophora apiculata*) in Coastal Minh Hai.

Ha van Tue (1994) still base on applying method “sample” của Newboul, P.J (1967) to research productivity, biomass, some forest communities for paper materials in the midland, in Vinh Phu province.

Research “Assessments of growth, development, biomass and productivity of (*Pinus keysia Royle ex Gordon*) in Da Lat city – Lam Dong province” of Le Hong Phuc (1996) has found the role of biomass growth, structural components of biomass of tree body growth rates between fresh biomass and dry biomass of body parts, twigs, leaves, roots, fall leaves amount, total biomass of individuals and communities of forest (*Pinus keysia Royle ex Gordon*)

Some other small research attention to determining the commercial value of carbon for forest as “Test to calculate monetary value of forest plantations in the clean development mechanism “ (Nguyen Ngoc Lung, Nguyen Tuong Van, 2004), “research biomass and carbon accumulation of some plantation status at Luot Mountain – Viet Nam forestry University “ (Nguyen Tuan Dung, 2005); Pham Quynh Anh, 2006), research capacity to absorb carbon and commercial value of forest (*Manglietia conifera*) monoculture, the same level age in Tuyen Quang....

So far to at the moment a some of major forest plant in our country as (*Acacia mangium*), (*Manglietia conifera*), (*Pinus massoniana*), (*Pinus kesiya*), (*Acacia hybrid*),... Research has set up table for soil level, the volume, the growth and yield of forest, as Vu Tien Hinh (1999 – 2000), Dao Cong Khanh

(1999 – 2001), Le Huy Cuong (1999), Vu Nham (1995),... These are the important basis for the deployment of biomass research and calculations of carbon uptake for various plantations in our country.

Vu Van Thong (1998) when the research basis for determining the biomass of individual tree and forest stand (*Accia auriculiformis*) in Thai Nguyen to solve some practical problems posed, notably research and build models to determine the biomass of (*Acacia melaleuca*), set up the tables of biomass lookup temporarily for the investigation and business of forest.

Hoang Van Duong (2000), has found the role of relationship among targets express size of trees, the relationship among fresh biomass and dry biomass of the componets of tree (*Acacia melaleuca*). Research set up the tables of biomass lookup and apply tables of biomass lookup individual tree and forest stand (*Acacia melaleuca*).

Dang Trung Tan (2001), has researched the biomass of Rhizophora forest, the results determined total of dry biomass of Rhizophora forest in Ca Mau province is 327 m³/ha, growth in average annual biomass is 9.500 kg/ha.

According to Nguyen Tuan Dung (2005), Plantation (*Pinus massoniana*) the pure species 20 age has total of fresh biomass (in tree and tree's other component fall down) is 321,7 – 495,4 ton/ha, equal in volume of dry biomass is 173,4 – 266,2 ton. (*Acacia melaleuca*) forest, the pure species 15 age has toal of fresh biomass (in tree and tree's other component fall) is 251,1 – 433,7 ton/ha, equal in volume of dry biomass is 132,2 – 223,4 ton/ha.

Vu Tuan Phuong (2006) when researched on the fresh biomass of shrubs, lawns

in Da Bac district – Hoa Binh province; Ha Trung district, Thach Thanh district, Ngoc Lac district – Thanh Hoa province showed the results: The fresh biomass changed very defferently among kinds of shrubs, lawns: Big grass has the highest fresh biomass, about 104 tons/ha, the second is shrubs is hight 2 – 3 m has the fresh biomass is 61 ton/ha. Kinds of grass: (*Lophatherum gracile*), (*Imperata cylindrica*) and (*Zoysia Tenuifolia*) has biomass change about 22 – 31 ton/ha. About dry biomass: High grass has the highest dry biomass, 40 tons/ha; shrubs is hight 2 – 3 m: 27 tons/ha; shrubs is hight under 2 m and (*Dieranopteris splendida*): 20 tons/ha; (*Lophatherum gracile*): 13 tons/ha; (*Imperata cylindrica*): 10 tons/ha; (*Zoysia Tenuifolia*): 8 tons/ha.

Nguyen Ngoc Lung and Nguyen Tuong Van (2004) used the tables of the growth and biomass table to calculate the biomass of forest. The result showed that: If calculated

Follow the tables of growth process (Nguyen Ngoc Lung, Dao Cong Khanh 1999) age - level III- cut age: 60 with D=40 cm, H=27,6 cm, G=48,3 m², M=586 m³/ha, percentage of volume of dry trees / fresh trees is big tree: 53,2%. Conversion factor from the trunk volume to the whole tree is 1,3736 (get from percentage a stable trunk is 72.8% compared with the whole tree when become mature age. Calculated the biomass of trees is absolutely dry: 586 x 0,532 = 311,75 ton. The biomass of entire forest: 311,75 x 1,3736 = 428,2 ton. If calculating follow the biomass table, the value is 434,2 ton. The accuracy between the table of growth

process and the table of yield is 1,4%, this is accuracy can be excepted.

Besides, some other researches on the forest biomass of Vien Ngoc Nam, Nguyen Duong Thuy (1991), research on the forest biomass Rhizophora in Can Gio district; Nguyen Van Be(1999), research on the forest biomass Rhizophora in Ben Tre province,...

3.2. The research on the ability of forests to absorb carbon

Ngo Dinh Que (2005) when research, build targets, targets afforestation under clean development mechanism (CDM) in Viet Nam has implemented to assessment ability of absorption CO₂ of some plantation in Viet Nam included: (*Pinus merkusii*), (*Acacia hybrid*), (*Acacia auriculiformis*), (*Acacia mangium*), (*Eucalyptus urophylla*); at the different level-age.

Calculation results show that CO₂ absorption capacity of the forest stand depending on forest productivity in that specific age. To accumulate about 100 tons CO₂/ha at age 16 – 17 years, (*Pinus massoniana*) and (*Pinus kesiya*) at age: 10 years, (*Acacia hybrid*) at age: 4 – 5 years, (*Acacia mangium*) at age: 5 – 6 years, (*Eucalyptus urophylla*) at age: 4 – 5 years. The results is significant as a basis for regional planning for planting, construction of forestry projects under the clean development mechanism.

Author has developed the regression equation correlation - linear between volume CO₂, absorbed annually with the timber yield and biological productivity, thereby calculating the real CO₂ absorption capacity in our country with five species above.

Nguyen Ngoc Lung, Nguyen Tuong Van has used the general formula of the photosynthesis process to calculate the conversion factor from dry biomass to CO₂ absorbed: 1.630/1. Shall be based on the growth and table biomass, authors calculated the 1 ha pine forest for 60 years in soil III-level contained 707.75 tons CO₂.

A common point of the research on carbon uptake by forests is most authors usually establish a relationship between the amount of carbon absorbed with baseline factors such as diameter, total of height , density, age, ... specifically as Nguyen Tuan Dung (2005) setup equations 2 species (*Pinus massoniana*) and (*Acacia auriculiformis*); Ngo Dinh Que (2005) has setup relationships for species (*Pinus merkusii*), (*Acacia hybrid*) (*Acacia auriculiformis*), (*Acacia mangium*), (*Eucalyptus urophylla*); Vu Tan Phuong (2006) setup relationship equations for (*Acacia hybrid*) (*Acacia auriculiformis*), (*Acacia mangium*), (*Eucalyptus urophylla*), (*Cinnamomum cassia*). These are the important basis for the rapid determination of carbon absorbed by forests in our country through a survey indicators simple, easy to measure.

Carbon absorption capacity of natural forests are also interested in research. Vu Tan Phuong (2006) has researched the carbon stocks in the status forests, said: a total rich forest has total of carbon stocks 694,9 – 733,9 tons CO₂/ha; Average forest 539,6 – 577,8 tons CO₂/ha; Poor forest 387,0 – 478,9 tons CO₂/ha; forest restoration 164,0 – 330,5 tons CO₂/ha and bamboo forest 116,5 – 277,1 tons CO₂/ha.

Pham Tuan Anh - Bao Huy (2007) When researching the CO₂ absorption capacity of Evergreen broad-leaved forests in Tuy Duc province– Dak Nong province approach for each species in natural forests as (*Anogeissus acuminata*), (*Combretum quadrangulare*),... results show that the percentage of accumulation carbon in the trunk compared with fresh weight ranged from 14,1 – 31,8%.

Research also has established a relationship between the CO₂ absorbed with the investigating factors of individual trees as a basis for forecasting CO₂ accumulation in the targets of forest stand (*Bao Huy, Pham Tuan Anh 2007*).

According to Hoang Xuan Ty (2004), if forest growth reach 15 m³/ha/year, total fresh biomass and organic matter of the forest will reach approximately 10 tons/ ha / year is equivalent to 15 tons CO₂/ha/year.

Vo Dai Hai and collaborators (2009) published research "biomass productivity and carbon absorption capacity of some main plantations in Vietnam." The results of the research on species: (*Pinus kesiya*), (*Acacia hybrid*) (*Acacia auriculiformis*), (*Eucalyptus urophylla*).

The research on carbon biomass is not much, focusing primarily on pure plantation. Research results has just stoped as products of topics and wasn't applied in the real. In Vietnam, there are various kinds of forests (Conifers, Deciduous broad – leaved forest, Evergreen broad-leaved forest, Swamp mangrove...) and many status forest due to the impact of human behavior.

Extensive research and official conclusion is not much about this problem. However, the domestic and foreign researchers have confirmed: Carbon absorption capacity of the flora in proportion to forest biomass.

3.3. Determination of total forest biomass

Because research results have not been standardized, so in the process of carbon stocks calculation we use the conversion factor in appendix, serving for the construction of national reports based on the research results of other country.

The definition of forest biomass

Above-ground biomass	Terrestrial biomass is the biomass of the alive trees and growing including the trunk, the tree from the ground, twigs, bark, seeds, fruit and foliage
Below-ground biomass	Below-ground biomass is the biomass of roots of alive tree. Including plant roots with a diameter smaller than 2 mm.
Dead wood	Biomass of dead trees, not contained in the litter layer, or standing, lying on the ground or in the soil. Dead wood, including dead trees lying on the ground, dead roots, dead stump of trees with a diameter greater than or equal to 10 cm, branches and tops, exploited, abandoned in the woods

Order	Components of forest biomass	Coefficient compared to standing tree stocks	The reference document of FAO	
			appendix	Table
1	Above-ground biomass	2.0	5	5.4
2	Below-ground biomass	0.55	5	5.5
3	Dead wood	0.11	5	5.5

3.4. Determination the total amount of carbon stocks

Definition the components of Carbon stocks in forest

Carbon on the ground is the carbon of all alive things on the ground, including trunk, stumps, twigs, bark, seeds, fruit and foliage.

Below-ground carbon is the carbon of all living organisms of roots. Including plant roots with a diameter bigger than 2 mm.

Carbon in dead wood is carbon in all non-living organisms, it is standing, lying on the ground or in soil with a diameter greater than or equal to 10 cm.

Carbon in the litter layer is carbon in all dead organisms with a diameter smaller than the smallest diameter for dead wood (eg: 10 cm), lying dead in the different staus.

Carbon in soil is organic carbon is in the mines, soil (including peat) to a depth determined by time period.

3.5. Determination of Carbon stocks in forest

Order	Components of forest biomass	Base data	Coefficient	The reference document
1	Above-ground carbon	Above-ground biomass (ton)	0.47 ton	According to the results of research by FAO and guidance
2	Below-ground carbon	Below -ground biomass (ton)	0.47 ton	
3	Dead wood	Dead wood - biomass (tấn)	2.12 ton	
4	Carbon in the litter layer	Forest area (1000 ha)	5.2 ton	

Order	Components of forest biomass	Base data	Coefficient	The reference document
5	Carbon in soil	Forest area (1000 ha)	47 ton	

Because research results in our country is limited, to total forest biomass and total carbon stocks, used the coefficients above to calculate. At the research results in country additional, is recognized it will use the results for the measurement to replace the current conversion coefficient.

Chapter 5

Labor Statistics AND TRAINING HUMAN RESOURCES IN THE FOREST

I. Labour statistic methods in forestry

According to the Forestry Development Strategy for 2006-2020 in Vietnam, Vietnam has a total natural area of about 33.12 million ha, in which area has forest is 12.61 million ha and about 6.16 million ha of barren hills are subject to agricultural and forestry production. Thus, the forestry sector has been implementing and managing activities on the largest land in all sectors of national economy. Forest land area mainly distributed in the hilly areas of the country, this is inhabited by 25 million people with many different ethnics, educational level, method of cultivation is low, living conditions are more difficult.

Forestry is a major technical and economic characteristics, including activities associated with the production of goods and services from forests as planting, exploitation, transportation, manufacturing and processing of forest products and provide environmental services related to forest. Forestry sector has important role in environmental protection, biodiversity conservation, poverty alleviation, especially for people is living in mountainous areas, contributing to social and defence – security stability.

Any production activities need also be social factors, capital, buildings, land, technology and human resources. The activities of forestry production is no exception, in which human resource factors play a decisive role to the survival and development of the forestry sector. Currently, in Vietnam and forestry production activities influence directly and incisiveness of the market economy and the development of science and technology. To ensure that the production activities of the forestry sector for sustainable development, identifying needs, human resource structure of social service activities for forestry production is an especially important significance.

To have basis to determine the structure, the amount of social labor, policy development, human resources training with high quality to service for the forestry sector production activities, need to work effectively on labor statistics.

1.1. Current status of labor statistics in forestry

Every year, the Ministry of Labour- Invalids and Social affairs survey, labor statistics and job: 1997; 1998, 2003, the Ministry of Labour- Invalids and Social affairs published statistics-labor, jobs in Vietnam. In labor statistics data and data of the provinces, territories and the country in number and structure of labors aged 15 or more regular activities by labor age, level of labor, education, professional and technical level, urban and rural.....Basic statistics on labor and employment be generalized in scope and national territories. Statistical methods used by the method of generalized multiplier (right number) is the inverse ratio based on average population figures last year in urban and rural areas of other provinces, territories and nationwide by the General Statistics Office provides.

About Agriculture and rural development: November 1st,1995, Prime Minister issued Decree No. 73/CP on the establishment of the Ministry of

Agriculture and Rural Development on the basis of integrating the Ministry of Agriculture and Food Industry, Ministry of Forestry and the Ministry of Water Resources. The Ministry has been allocated to the Plan Department and Planning department tasks organized collection, codified, revised and edited the book "Statistics in the Agriculture and Rural Development 1996-2000." The contents of a data set of survey topics related to agriculture and rural development: such as the census of agriculture and rural development, general land inventory, general forest inventory, census of population and housing in ..., the system targets of official reports of local and affiliated agency to in the field. These include data on population and labor. Rural population statistics are classified by age, by province: below labor age, of labor age, above labor age, population of labor age prescribed: women 15 to 55 years, Men 15 to 60 years.

Labor forestry in years 1995, 1996, 1997, 1998: Total number of forest labors of the country in 1995 was 71.845 people; in 1996 was 75.636 people, in 1997 was 88.047 people, in 1998 was 90.841 people.

Households by industry, including household forestry, statistics as 61 provinces, eight regions - up to date: October 1st, 2001.

Besides labor statistics of the department under the Ministry of Agriculture and Rural Development, including forestry.

Due to the above statistical methods of quality information on the labor served for the production activities of the forestry sector is very limited, less significant in the management and human resource development of the forestry sector, for example, determining the structure between unskilled and skilled labor is very difficult, because of the limited quality of information, so the assessment, policy development, human resource development in the forestry sector will be very limited, lack of initiative and efficiency limitations.

1.2. Proposed statistical method, reported in forestry labors

Basis of the proposed statistical methods, reporting in forestry labors

Statistical methods, reporting in forestry workers must ensure that targets in the system of national statistical indicators (Decision No. 43/2010/QĐ-TTg on June 2nd, 2010 of the Prime Minister on issuing system of national statistical indicators), effective from July 20th, 2010. In particular, specify the group number, name criteria; disaggregated primary criteria for statistical terms disclosed; implementation schedule, the agency responsible for collecting. Group of Labor criteria, employment and gender equality by the General Statistics Office and the Ministry of Labor, Invalids and Social Affairs is responsible to collect, synthesize. Ministry of Agriculture and Rural Development is responsible for collecting synthesis, groups of criteria: Fisheries, Agriculture, forestry sector statistics is forest area, forest area focuses on planting, care plantation area...

Therefore, statistical methods, reporting in forestry workers should perform a combination of the following methods:

- Inheritance method: inherit the results of research based on methods has done the statistical methods used by the method of generalized multiplier (right

number) of the General Department of Statistics, Ministry of Labour, Invalids and Social Affairs were used for labor-employment statistics in Vietnam.

- Expert methods: reference, using the top experts on statistics and other agencies related to statistics, the General Statistics Office, Computer Center ...

The method of elimination: using of labor statistics in the whole country, then subtract the remaining sectors of Agriculture and Rural Development, continues to minus Irrigation labour, agriculture labour, fisheries labour. The remaining of forestry labour , this method should not be used because the complex.

- Direct statistic Methods: Perform direct wave statistics, the province overall, central city, department and agencies involved in forestry follow sample table, specific criteria for investigation.

Summary: Statistical results on the basis of labor is carried out in the above methods, the distribution of, the following criteria:

- Total labor for the production of forestry activities in the area.
- Labor percentage for the production of forestry activities compared to total labor in the area.
- The structure of forestry labors by age (under the provisions of labor law).
- The structure of forestry labor by gender.
- Labor structure by level:
 - + Trained labor / total labor.
 - + Labor structure in groups of production activities in forestry (planting, tending and exploitation, processing, preservation and commercial services ...)

The average of income of labors in forestry production activities (planting, maintenance care, mining, processing and trade service ...).

The datas relating to forestry labor in the statistics may be under two levels: central and local levels..

Ministry of Agriculture and Rural Development performed the function of state management of sectors: agriculture, forestry, salt production, aquaculture, irrigation and rural development in the country, state management of services public services in the sectors under ministry' management. Therefore, the labor statistics at the national forest include state management agencies (the General Department, departments or centers), the business agencies (schools, institutes, national parks,) and forest enterprises under the Ministry, officials organization department shall integrate, statistics (form in Appendix 05 and 06). Department of Agriculture and Rural Development, which is pecialized department of the provincial People's Committee has the function of advising the provincial People's Committee in managing the local state of agriculture, forestry, salt production, fisheries, aquatic resources and rural development ...

Therefore, at the local, Department of Agriculture and Rural Development will be responsible for statistics, reports of forestry labor in the local and report to the Ministry of Agriculture and Rural Development (forms 3-5 in appendix).

II. HUMAN RESOURCES TRAINING IN THE FOREST SECTOR

2.1. Assessing the status of training system in forestry sector

2.1.1. Undergraduate and postgraduate training

- College training is performed from 2-3 years depending on the training profession for people graduated from high school or secondary diploma; from 1.5 - 2 years for people with secondary diploma and specialized;

- University training is done from 4-6 years depending on the profession of training for graduates of high school or secondary diploma; from 2,5 -4,0 years for have graduates of secondary and specialized; from 1,5 -2,0 years for graduates diploma of colleges and specialized;

- Master training is done from one to two years for graduates of the university.

- Doctoral training is done in four years for graduates of the university, two to three years for people who have a master's degree. In special cases, doctoral training time degree may be extended under the provisions of the Minister of Education and Training.

Currently, on a nationwide has 22 university, academy which training undergraduate and postgraduate in forestry sector, which has a specializing training in forestry is the Forestry University.

Universities in the forest blocks are training more than 14 different disciplines of the forestry sector to the total number of students recruited each year about 3,000 regular students, 500 students in office, about 500 postgraduates and 30 doctorals.

In general about the scale, number of students recruited into university on an annual forestry sector accounts for only about 0.5% of students nationwide system of government. Percentage of postgraduates and doctors in forestry at their annual recruitment in the lower again.

2.1.2. Professional intermediate training

Professional training is done from 3-4 years of study for graduates of secondary schools, from 1-2 years for people with high school diploma.

Professional intermediate training to train labors with knowledge and basic skills practice of a profession, able to work independently and have the creativity and application of technology to work.

Currently, there are 21 training places of professional intermediate and are mainly training of forestry sector, forest protection and encourage the agriculture - forestry. extension scale annual enrollment around 1,500 regular students and 500 students in office 500.

2.1.3. Vocational training

Vocational training is teaching and learning activities are to be provided with knowledge, skills and necessary career attitudes for trainees to find employment or self employment after completing the course. Vocational training has three levels is the primary training, intermediate and vocational training colleges. Vocational training includes formal and regular training.

Vocational goal is to train technical personnel directly in production and service practice capacities commensurate with the level of training, ethical, professional conscience and sense of discipline and industry working style, good health to create conditions for trainees upon graduation have the ability to find employment, self employment or education on a higher level to meet the requirements of industrialization and modernization of the country .

Elementary level vocational training to equip trainees with skills to practice a simply profession or the capacity of practice some of a professional job. Elementary level vocational programs is performed under a year for people are in need of vocational training, with education, health and education consistent with job needs.

Intermediate vocational training to equip trainees with the knowledge and capability to practice the work of a professional, able to work independently and apply techniques and technology to work. Vocational training program is an intermediate level of implementation for three years for people graduated from secondary school; from 1-2 years for peoples graduated high school.

Vocational college aims to equip trainees with the knowledge and capability to practice the work of a professional, able to work independently and organize work in teams, solve complex situations in fact, is able to apply techniques and technology to work. Vocational programs in the college level performed for 2-3 years for people graduated from high school; from 1,5-2 years for graduates of the intermediate level.

Forestry vocational training (vocational colleges and vocational intermediate) are primarily conducted in vocational training institutions under Ministry of Agriculture and Rural Development, the vocational training mainly: outsourcing - wood product design, wood carvings, Silviculture, Forestry Extension, Urban Forestry ... scale enrollment of 3,000 students annually.

2.1.4. General assessment

a) About the network of training institutions

School systems of human resources training in forestry in Vietnam are distributed throughout all regions of the country and under many different agencies. In particular, the schools under Ministry of Agriculture and Rural Development plays a key role in training human resources for national forest.

b) About teaching staff

At present, we have over 600 teachers directly involved in teaching at universities, of which about 60% have teachers are professors, associate professors and doctors, Masters. Along with the Forest Science Institute, which is the basis of scientific staff has the highest level of forestry in the country, contribute to training and scientific research in the field of forestry industry, contributing to the development of the forestry sector.

The group of teachers at colleges, professional secondary and vocational training in forestry at present about 500 people, including master's degree, doctor about 20% and mostly in two major silviculture and wood processing.

However, according to the teachers of the school has some shortcomings, such as the number and structure of teachers in some schools still deficiencies, especially lack of highly qualified teachers, teacher leading in the faculties and departments. Structure teachers are not synchronized, the shortage of teachers teaching in the new field or lack of subject teachers about new technologies. Language proficiency of some teachers is low.

c) About facilities

In recent years, with the investment of the state and especially from funding from the National Target Programme has supported training a lot in strengthening the machinery and equipment for practice of schools such as: nursery system, tissue culture rooms, stoves, wood processing line ... Still have not kept pace with the development of science and technology, but has met the basic training and practice, practice of the school students.

d) Enrollment in scale

Training scale of the institutions is increasing, an average of 50-10% per year, but the training scale of the forestry industry is hardly increased. Even the scale of forestry training at the University of Agriculture and Forestry has decreased. Quality of pupil, forest students input are often not high at the average level of the Ministry of Education and Training

Vocational forest is mainly concentrated in vocational schools under the Ministry of Agriculture and Rural Development, however the entrance facing many difficulties, due to less glamorous industries, rural labors tend to escape from rural areas.

The vocational nature of the industry and are in great demand for labors such as processing wood products also meet such situation, the school does not recruit students, processing enterprises lack of skilled labors, the main causes are:

- + The profession is not highly attractive for learners;;
- + Heavy condition labors, pollution and low income;
- + Seasonal nature job, unstable;
- + The regime and the interests of workers (Social, Health insurance...) is not guaranteed.

Reality shows that in many areas of wood processing enterprises, the number of workers is limited to state, enterprises were active in the labor force. Workers get a job very easily and also easily move the other business to get higher wages.

So they do not need the schools, just takes time and costs, just do not need to participate in short courses at the business, although business owners still pay wages during school.

Even in a business when short-term classes in place, businesses could not force workers to go to school, if pressed, workers will leave to other businesses.

2.2. Proposed statistical methods, reporting and training in forestry labors

By the training institutions directly under the different agencies (Ministries, provincial People's Committee ...), so the report, statistics on the number of forestry workers trained in Vietnam is very difficult. According to management responsibilities, the agencies in charge of the field of statistics and can only ask the schools under to report on the data as required.

Under the provisions of the Education Law, Law on Vocational Training, the Ministry of Education and Training is an agency approved training quotas, training levels: doctoral, masters, university, college and professional secondary. Ministry of Labour, Invalids and Social Affairs approved targets vocational training colleges, and vocational secondary and elementary occupations by the agencies (ministries, department and People's Committee, businesses ...) of vocational training institutions approved.

As a rule, to be approved norms, the institutions must report to the managing agency and the Ministry of Education and Training (for training from intermediate to professional doctoral) and the Ministry of Labour, Invalids and Society Affairs (for training) for teachers, facilities, training current scale, . in parallel with this report system, the management agency of training institutions also must report to the Ministry of Education and Training, Ministry of Labour, War Invalids and Social Affairs on the training data .

So, basically now in the country the Ministry of Education and Training, Ministry of Labour - Invalids and Social Affairs has a systematic, statistical training reports.

However, the exploitation of these data are used primarily for the management of the two ministries and the higher level if requiring and generally concentrated in the general data such as number of students at present, the number of graduates, number of students recruited, the number of female students, number of students belong to ethnic minorities...The data relating to each of training sector, to each region has not really been interested in and complete statistics. The sharing of the above data for the management sector for the central management agency the and local territories for almost having no.

To overcome the shortcomings of statistics, reports and training employees in general and in the training of forestry labors in particular need to develop statistical methods and reporting as follows:

For the training data

a) Statistical reporting numbers of enrollment, number of annual graduates of training institutions

- Ministry of Education and Training Statistics for the training level: intermediate professional, college, university, master's and doctoral degrees in the following criteria: training industry, type of training; nation; gender; place of birth.

- Ministry of Labour - Invalids and Social Affairs statistics show the level of training: vocational colleges, secondary and primary vocational training according to the following criteria: vocational training; type of training; ethnic; gender, place of birth. .

Forms: appendix table1, 2, 3 and 4..

The data above after synthesis to post the website of the two ministries. The statistics reported by the above method has the advantage of focusing the focal point, but the statistics gathered by the above criteria will also be a pressure on the two ministries.

b) Data on training of the school was put on the school's website

Most universities and colleges and some professional secondary schools and vocational schools currently have a website, so the school can provide information on the number of graduate students and studying in schools follow the lines on each page and the stakeholders can look up the information you need on the site of the school.

To implement, there should be mandatory provisions of the Ministry of Education and Training, Ministry of Labour, Invalids and Social Affairs for the provision of information of the school on the website.

Based on the Website from all the schools, departments will statistic manpower resources were trained in all levels every year.

APPENDIX

Table 1: The training institutions under Ministry of Agriculture Forestry and Rural Development

Order	Institutions	The recruitment scale for regular students annually
I	Doctor training	25
1	Forestry Science Institute (Ha Noi City) <ul style="list-style-type: none"> - Planting, breeding and forestry seed. - Survey - Planning of forest - Silviculture - Forest land - Forest protection - Mechanization technology of forestry and logging. - The process of mechanization of wood-processing, wood technology, wood materials industry. - Chemical technology of wood, cellulose and paper. 	10
2	Vietnam Forestry University (Ha Noi city) <ul style="list-style-type: none"> - Silviculture. - Genetics and forest tree breeding. - Survey - Planning of forest. - Technical machinery and forestry equipment 	15
II	Master training	350
1	Vietnam Forestry University (Ha Noi city) <ul style="list-style-type: none"> - Silviculture - Engineering and Agriculture - forestry mechanization equipment. - Engineering machinery, equipment and wood industry, paper. - Specialized management and protection of forest resources. - Economic agriculture 	
III	University training	1.000
1	Vietnam Forestry University (Ha Noi city) <ul style="list-style-type: none"> - Processing technology of forest products. - Design, manufacture of furniture wood and interior. - Silviculture. - Management of forest resources and environment - Management of natural resources - Urban forestry - Agroforestry - Biotechnology 	1.000

Order	Institutions	The recruitment scale for regular students annually
	<ul style="list-style-type: none"> - Forestry Economics - Forestry Mechanization - Social Forestry 	
IV	College training	175
1	Agroforestry college (Bac Giang city) - Silviculture.	75
2	Northeastern College of Agriculture and Forestry (Quang Ninh province) - Forestry	100
V	Intermediate professional training	700
1	Vietnam Forestry University (Ha Noi city) - Silviculture - Ranger - Promotion of agroforestry	250
2	Agroforestry college (Bac Giang city) - Silviculture.	50
3	Northeastern College of Agriculture and Forestry (Quang Ninh province) - Silviculture - Ranger - Promotion of agroforestry	200
4	Tay Nguyen Secondary Forest (Gia Lai province) - Silviculture - Ranger - Promotion of agroforestry	200
VI	Vocational	2.550
1	Vocational college of wood processing (Ha Nam province) - Processing, design wood furniture product - Wood Sculpture - Mosaic - Artificial wood	600
2	Northeast technology and Vocational College of Agriculture and Forestry (Lang Son province) - Processing, design wood product. - Wood Sculpture. - Silviculture - Promotion of agroforestry	550
3	Phu Tho technology and Vocational College of Agroforest - Processing, design wood product. - Wood Sculpture - Silviculture	400

Order	Institutions	The recruitment scale for regular students annually
	- Promotion of agroforestry	
4	Southeast technology and Vocational College of Agriculture and Forestry (Binh Duong province) - Processing, design wood product. - Wood Sculpture - Silviculture - Promotion of agroforestry - Urban forestry	350
5	South Central College of Vocational electricity engineering - Construction and Forestry (Binh Dinh province) - Processing, design wood product. - Promotion of agroforestry - Wood Sculpture - Silviculture - Urban forestry	300
6	Northeastern College of Agroforestry (Quang Ninh province) - Silviculture - Processing, design wood product.	200
7	Bac Ninh college of Vocational electricity engineering - Construction - Processing, design wood product.	50
8	Tam Diep college of Vocational, electricity engineering - Construction - Processing, design wood product. - Wood Sculpture	100

Table 2. The forestry training institutions under Ministry of Education and Training and the provincial People's Committee

Order	Institutions	The recruitment scale for regular students annually
I	Doctor training	6
1	Ho Chi Minh Agroforestry University - Silviculture	3
2	Thai Nguyen Agroforestry University - Silviculture	3
II	Master training	160
1	Ho Chi Minh Agroforestry University - Silviculture - Processing of forest products	50
2	Thai Nguyen Agroforestry University - Silviculture	30
3	Hue Agroforestry University - Silviculture	30
4	Tay Nguyen University - Silviculture	30
III	University training	1.330
1	Ho Chi Minh Agroforestry University - Agroforestry engineering - Processing of forest products - Forestry - Agroforestry - Management of forest resources. - Technical forestry information - Forestry economic	300
2	Thai Nguyen Agroforestry University - Forest products processing technologies - Forestry - Management of forest resources. - Agroforestry	300
3	Hue Agroforestry University - Forestry - Management of forest resources and environment - Processing of forest products	200
4	Tay Nguyen University (Dal Lak province) - Agroforestry Economic - Silviculture - Management of forest resources and	150

	environment	
6	Hung Vuong University (Phu Tho province) - Forestry	50
7	Thanh Tay University (Ha Noi city) - Forestry	100
8	Tay Bac University (Son La province) - Forestry - Management of forest resources and environment	180
9	An Giang University - Management of forest resources and environment	50
IV	College training	580
1	Hong Duc University (Thanh Hoa province) - Forestry	50
2	Son La College - Agroforestry	50
3	Quang Binh University - Agroforestry	50
4	Phu Yen University - Forestry	30
5	Tay Nguyen University - Silviculture - Management of forest resources and environment.	100
6	Nghe An economic and technical college - Forestry	100
7	Ha Tay community College - Forestry	50
8	Lai Chau community College - Silviculture	50
9	Kon Tum economic and technical college - Silviculture	50
10	Quang Nam economic and technical college - Forestry	50
V	Intermediate professional training	700
1	Phu Yen University	
2	Nghe An economic and technical college	
3	Kon Tum economic and technical college	
4	Quang Nam economic and technical college	
5	Phu Tho Agroforestry school	
6	Son La Agroforestry school	
7	Quang Nam Agroforestry school	
8	Yen Bai Agroforestry school	
9	Tuyen Quang economic and technical school	
10	Thanh Hoa Agroforestry school	

11	Ha Giang economic and technical school	
12	Dien Bien economic and technical school	
13	Cao Bang economic and technical school	
14	Hoa Binh economic and technical school	
15	Ha Tinh technical agriculture and rural	
16	development school	
17	Quang Binh Industry and Agriculture Secondary school	
18	in Quang Tri technical agriculture and rural development Ha Tinh economic school	
VI	Vocational	300
1	Dak Lak vocational ethnic youth school	
2	Hà Giang vocational school	
3	Lao Cai vocational school	
4	Thai Binh vocational secondary school for disable people	
5	Thanh Hoa Technical – technology school	

Table 3Managing agency: **LABOR STATISTICS REPORT 6 MONTHS of THE first YEAR / 6 MONTHS of LAST YEAR 20...**

Agency report: (Use for the organization of forestry production activities)

TT	Forestry production activities	Unit	Planting	care	Exploitation	Processing	Auxiliary	Total	Note
	Targets								
1	2	3	4	5	6	7	8	9	10
I	Total labors of agency	People							
II	Total labors in forestry production, including:	People							
2.1	- Women labor	People							
2.2	Labor aged from 15 to under 18 years (15 <18 years)	People							
2.3	Trained labors	People							
	- Technical worker	People							
	- College + University	People							
	Above - University	People							
III	Average income of a labor in the report	Million VND							
3.1	- Entire agency	Million VND							
3.2	- Labor's forestry production	Million VND							

Table 4

Local (Provincial People's Committee...)
Agency report:

STATISTICAL REPORT ON PRODUCTION FORESTRY LABORS
(Department of Labor, Invalid and Social Affair)

TT	Forestry production activities	Unit	Planting	care	Exploitation	Processing	Auxiliary	Total	Note
	Targets								
1	2	3	4	5	6	7	8	9	10
I	Total labors of agency	People							
II	Total labors in forestry production, including:	People							
2.1	- Women labor	People							
2.2	Labor aged from 15 to under 18 years (15 <18 years)	People							
2.3	Trained labors	People							
	- Technical worker	People							
	- College + University	People							
	Above - University	People							
III	Average income of a labor in the report	Million VND							
3.1	- Entire agency	Million VND							
3.2	- Labor's forestry production	Million VND							

Table 5

Managing agency:

Agency report:

STATISTICAL REPORT ON FORESTRY LABORS

(Use for sector management agencies)

TT	Chỉ tiêu	Unit	Agencies					Total	Note
			National Park...		
1	2	3	4	5	6	7	8	9	10
I	Total labors of agency	People							
II	Total labors in forestry production, including:	People							
2.1	- Women labor	People							
2.2	Labor aged from 15 to under 18 years (15 <18 years)	People							
2.3	Trained labors	People							
	- Technical worker	People							
	- College + University	People							
	Above - University	People							
III	Average income of a labor in the report	Million VND							
3.1	- Entire agency	Million VND							
3.2	- Labor's forestry production	Million VND							

School ...

Table 6: New Recruitment STATISTICS in year

Unit: people

Order	Training level	Targets for new recruitment	Total pupils were recruited to learn	Women	Ethnic minority	Number of pupils recruited by the object	
						High school graduation or equivalent	Secondary School graduation or equivalent
1	2	3	4	5	6	7	8
	Total						
A	Regular System						
I	Doctor						
1	Major ...						
2	Major ...						
II	Master						
1	Major ...						
2	Major ...						
III	University						
1	Major ...						
2	Major ...						
IV	College						
1	Major ...						
2	Major ...						
V	Professional secondary						
1	Major ...						
2	Major ...						
VI	Vocational College						
1	Career ...						
2	Career ...						

VII	Vocational secondary						
1	Career ...						
2	Career ...						
VIII	Primary career school and vocational short-term						
1	Career ...						
2	Career ...						
B	Combination working WITH learning systems						
I	University						
1	Major ...						
2	Major ...						
II	College						
1	Major ...						
2	Major ...						
III	Professional secondary						
1	Major ...						
2	Major ...						
C	Nomination system						
I	University						
1	Major ...						
2	Major ...						
II	College						
1	Major ...						
2	Major ...						
III	Professional						

	secondary						
1	Major ...						
2	Major ...						
D	Connectivity system						
I	University						
1	Major ...						
2	Major ...						
II	College						
1	Major ...						
2	Major ...						
III	Professional secondary						
1	Major ...						
2	Major ...						

2	Career ...								
VIII	Primary career school and vocational short-term								
1	Career ...								
2	Career ...								
B	Combination working WITH learning systems								
III	University								
1	Major ...								
2	Major ...								
IV	College								
1	Major ...								
2	Major ...								
V	Professional secondary								
1	Major ...								
2	Major ...								
C	Nomination system								
I	University								
1	Major ...								
2	Major ...								
II	College								
1	Major ...								
2	Major ...								
III	Professional secondary								
1	Major ...								

