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FORESTRY STATISTICS

Report of the Seminar on Forestry Statistics in the Asia and Pacific Region

29 October - 2 November 1990

Bangkok, Thailand

Regional Office for Asia and the Pacific (RAPA)
Food and Agriculture Organization of the United Nations

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FOR COPIES WRITE TO: Regional Forest Resources Officer (Mr. M. Kashio)
FAO Regional Office for Asia and the Pacific
Maliwan Mansion, Phra Atit Road
Bangkok, Thailand

Contents

Part One

REPORT OF MEETING PRESENTATIONS

Report

INTRODUCTION

1. The Seminar was opened on Monday, 29 October 1990 by the FAO Deputy Regional Representative, Mr. H.Tsuchiya.
2. The Seminar was attended by 21 participants from 16 countries in the region namely: Bangladesh, China, Fiji, India, Indonesia, Republic of Korea, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, and Thailand.
3. The Seminar elected Mr. Lockman Bin M. Sirin (Malaysia) as chairman and Mr. Eka Raj Sharma (Nepal) as Vice-Chairman. Rapporteurs were Mr. Pe Thein (Myanmar), on Fuelwood Statistics, Mr. Eka Raj Sharma on Non-Wood Forest Products, Mr. Lockman Bin M. Sirin on Statistics on Production and Trade and Mr. W.R. M.S. Wickramasinghe (Sri Lanka) on Computers.
4. The full list of participants is given in Annex 1.

Objectives

5. The aim of the seminar was to examine the collection and dissemination of statistics on the forestry sector in the countries of the Asia-Pacific Region, to exchange information on methods and standards, to identify problem areas and to discuss approaches to overcoming these problems. The seminar prepared recommendations on several aspects for consideration by FAO, the Asia - Pacific Forestry Commission and the Governments of countries of the region.

Scope

6. The seminar considered the objectives in the collection of forestry sector statistics, their role in planning and the organization to collect, process and disseminate relevant statistical information. Each participating country presented a brief describing the state of forestry statistics in that country. The discussion concentrated on four main aspects, namely: fuelwood statistics, statistics on non-wood forest products, statistics on production and trade in forest products and the role of computers.

The programme of the seminar is given in Annex 2.

FUELWOOD STATISTICS

7. Discussion on the subject was introduced by Professor Neil Byron, Director, Centre for Forestry in Rural Development, Australian National University.
8. People use energy for food preparation, space heating, transport, communication and production of goods. The common types of energy used are electricity, natural gas, oil, coal, biomass, etc. Among the biomass energies, fuelwood is very important for cooking daily meals in most developing countries. It is also a main source of energy for some local industries such as for curing tobacco, firing brick-kilns, smoking rubber and fish and producing salt.
9. The term fuelwood covers firewood and wood for charcoal. It may include just main stems and branches, or a broader definition may also include tops, twigs, stumps, roots, barks, leaves and even fruits. It is a kind of solar energy transformed and stored in wood by the mother nature.
10. Fuelwood is usually the cheapest plant product in the world. But the scarcity of fuelwood mainly arising from the indiscriminate cutting, reducing supply and its of importance to communities as an energy source have lead to increasing fuelwood prices in many countries.
11. Rural people usually go into the forests and collect fuelwood for their own consumption. This amount of fuelwood may be called unrecorded or untraded production. But sometimes people sell the fuelwood on the market after paying revenue or royalty to the Forest Department. In this case, the Forest Department concerned records the traded amount of production in the country. To know the total amount of fuelwood consumption, the volume of unrecorded production must be estimated by sample surveys, not by pure guesswork.
12. There are thus many sources of fuelwood - recorded and unrecorded removals from reserved forests; private commercial woodlots, and in-

dividual private trees including fruit trees. In terms of data, only the first is precisely known. Likewise there are many uses of fuelwood: large and small industries; urban and rural households. For the last of these, it is most difficult to obtain precise estimates of quantities consumed.

13. Fuelwood consumption statistics will be partly true data and partly estimates (of varying precision) based on small or large samples, etc. Planners have to deal with these levels of inaccuracy and imprecision when handling fuelwood statistics. While fuelwood planning is one of the most imprecise kinds of study in the forestry field, the importance of fuelwood to the community and in forestry production warrants improved information.
14. The seminar recognised the following issues in fuelwood statistics,
    i. units of measurement
    ii. types of statistical coverage of production
    iii. precise statistics of supply and demand of fuelwood

Units of measurement

15. Quantities of fuelwood are commonly expressed in many different units - number, weight and volume. In FAO statistics, fuelwood and wood for charcoal are presented in volume of cubic metres, and charcoal in metric tons.

Types of statistical coverage

16. In most developing countries, there are two types of fuelwood production, i.e., recorded and unrecorded or traded and untraded. Together they give the estimated total for fuelwood statistics. These estimates will be very important for supply-demand or deficit-surplus studies of fuelwood. Statistical coverage should include all forms, sources and uses of fuelwood, that is both the official, recorded or commercial component and estimates of the unrecorded or untraded volume. The estimate should include the solid wood form from stem and large branches and the volume of other tree biomass consumed as fuel.

Precise statistics of supply and demand of fuelwood

17. For fuelwood planning, planners need estimates of the potential supply and consumption of fuelwood. These estimates may vary in accuracy and precision depending upon time and money available. The supply source may be trees around houses and farms, and nearby forests. The extraction distance may be as much as 30 miles (50 km) or beyond.
18. When estimating fuelwood demand, socio-economic sample surveys will be very useful. The sampling design and intensity will very much depend upon the time available, the financial situation and the degree of precision required. The types of data questionnaire used will vary with the objectives of the planners.

Recommendations

19. The seminar recommends that:
    i. The term fuelwood be defined to cover firewood and wood for charcoal. It should include fuelwood from mainstem and branches and other tree biomass – tops, twigs, stumps, roots, bark and leaves used for fuel.
    ii. All fuelwood statistics should be expressed in "solid" volume of cubic metres, instead of number, weight and "stacked" volume. Each country should convert its estimates of fuelwood production to solid cubic metres, using the most accurate local conversion factors available. The specific country conversion factors used should also be mentioned by the reporters. Wood for charcoal should be reported in "solid" wood-equivalent form of cubic metres. Charcoal should be reported in weight units – metric tons.
    iii. Fuelwood statistics should be expressed in two lines – one for recorded (traded) production (mainly stem wood and branches from forest reserves) and the other for unrecorded (untraded) production, which will include estimates of all other tree biomass from reserved forest and all fuelwood from private trees.
    iv. Fuelwood demand (consumption) and supply surveys should be carried out in fuelwood-deficit countries. This is an area where collaboration with international organizations such as FAO is appropriate. In particular the seminar noted the relevance of the work of the Regional Wood Energy Development Programme – GCP/RAS/131/NET in consultation with FAO.
    v. FAO should also prepare a new manual on fuelwood consumption sample surveys, based upon past experience in various regions of the

world. The surveys should be carried out periodically to monitor the surplus-deficit balance of fuelwood supply. These studies may be combined with census-survey teams or forestry extension service teams or other socio-economic survey teams so as to make the surveys time-and cost-efficient within the required precision frame.

vi. In order to obtain a comprehensive national coverage of all production and use of fuelwood, particularly outside reserve forests, fuelwood must be integrated in the mainstream of energy statistics. Forestry organizations should initiate collaboration with other concerned agencies, such as energy planning, agricultural and rural development agencies, to conduct surveys and coordinate the assembly of comprehensive statistics.

NON-WOOD FOREST PRODUCTS

20. This subject was introduced by Dr. Y. S. Rao, Regional Forestry Officer, RAPA by Mr. Peter H. May, Forestry Officer: Non-Wood Forest Products, FAO, Rome and by Mr. Shyam Sunder Someshawar, Karnataka, India.
21. The value of non-wood forest products has not been appreciated in forestry and rural development to the extent it should. Non-wood products are usually relegated to the status of minor forest products. Non-wood forest products play a prominent role in the livelihood of people in rural areas and contribute substantially to their earnings. In many areas, they are the resource base for several commercial products. In certain cases while the initial value of non-wood products may not be considerable, after processing the value added can get to be several times the original value. They contribute considerably to foreign exchange earnings. Non-wood forest products also a source of substantial direct and indirect employment.
22. Timber resources can be built up or replenished through plantations but the diverse items of non-wood forest products depend mainly on natural forests.
23. An understanding and appreciation of the value of non-wood forest products would go a long way to support arguments for conservation of the forest in general and tropical forests in particular. Furthermore, development of these resources in rural regions will help to reduce migration of the rural population to big cities.
24. It is however regrettable that, in spite of their value, non-wood forest products have not received proper attention, in part because of the lack of proper data and knowledge.
25. The seminar recommended adoption of the following broad definition: Non-wood forest products are the products other than timber, fuelwood, charcoal and wood used for handicrafts, derived from forests or trees or cultivated or existing forest land or derived from trees outside the forest. They include products such as, root, bark, leaves, flowers, fruits, seeds, floss, extracts, gum, resin, lac, grass, wild honey, canes, bamboo, medicinal and aromatic plants, wildlife products, etc. This definition excludes products mainly cultivated outside the forest which are normally included among agricultural products such as honey, rubber and oil palm. Nor does this definition attempt to embrace the very important production of grass and forage from trees for livestock while this may be a significant service function of the forest. The definition is confined to the direct non-wood products of the forest and, while recognising their importance, it does not include the indirect benefits from services of the forest such as soil and water conservation or recreation. Finally it excludes minerals extracted from forest land.
26. The need to protect and promote non-wood forest resources, within the prevalent planning system, has to be supported by a strong data base, which is currently lacking. At present, only items in the commercial circuit are reflected in statistics, while non-wood forest products utilized outside this sphere are unaccounted for. Their contribution to national GNP should also find a place in our systems of accounting. The seminar recommends that surveys be carried out to assess the contribution of NWFP.
27. It would be difficult to specify the items on which data on availability, utilization and value are to be collected on an international basis as this would depend on the importance of individual items in each country. Thus coverage should be decided at national level. Surveys could be periodical, with the period depending on the importance of the items concerned. The importance of the subject would suggest an initial survey of all the major non-wood forest product items in each

countries and a repeat of the surveys as often as possible, depending upon resources. The mode and intensity of survey must be left to each of the countries to decide. The information obtained will be of great use in managing these resources in a sustainable manner.

28. It is necessary that the information generated at the national level be exchanged with other countries to facilitate better utilization of the commodities, to facilitate support for conservation and developmental measures and to kindle the interest of international donor communities on the subject. This would also facilitate the assessment and evaluation of the situations prevalent in different countries at different points of time.
29. The seminar strongly urges the FAO not only to be the agency for collection and compilation of data at the international level but to be the focal point in generating interest in the member countries.
30. The seminar appreciates the value of the forests in soil and moisture conservation, mitigating the green house effect, production of oxygen, promotion of tourism and other recreational values but, in the absence of methodologies for quantifying and evaluating their values, limit the recommendation only to tangible non-wood forest products.
31. The seminar further noted that, considering the great value of non-wood forest products, which should be highlighted, FAO is organizing a Seminar on this subject in the region in 1991. It recommended that survey and assessment of non-wood forest products should be a subject on the agenda of that meeting.

FOREST PRODUCTS

32. The discussion was introduced by presentations by Mr. Philip Wardle, Senior Forestry Economist, FAO, Rome, Mr. Felice Padovani, Forest Officer, Statistics, FAO, Rome and Dr. Y. S. Rao, Regional Forestry Officer, RAPA.
33. The seminar emphasized the importance of collecting comprehensive statistics on the production and trade in forest products including both roundwood and primary manufactures. This data is essential for forestry or forest industry planning and monitoring for decision making at many levels in the sector.
34. In this context, it is recommended that countries aim to ensure that comprehensive information is secured on production and trade in the following main areas.

    ROUNDWOOD (subdivided between industrial roundwood and fuelwood)
    SAWNWOOD
    WOOD BASED PANELS
    PULP AND PAPER

35. It is recommended that countries adopt standard structure and definition in collecting and reporting this data. The Committee examined the structure and definitions of data as reported by FAO in the yearbook of forest products and recommended that these should be followed in national production and trade statistics for the sector.
36. The following specific considerations were discussed. The definition of sawnwood includes mouldings. It should however be recognised that the objective is to collect a statistic on the total production of sawnwood in its various forms without double counting. Thus where mouldings are manufactured in a separate mill, care has to be taken to ensure that sawnwood utilized is not counted twice.
37. It was noted that blockboard is included under plywood. In some circumstances it was considered that veneer plywood and blockboard should be recorded separately. One must be careful to include volume of veneer and blockboard utilized in flush doors in the total production. Again care should be taken not to double count basic products and end products.
38. In countries which record data on a fiscal year, data should be converted to the calendar year for international reporting or the fiscal year data will have to be taken as the best estimate of calendar year magnitude.
39. It was recommended that countries follow the example of several countries participating in the seminar and develop an annual publication forestry, forest industry and forest products trade statistics.
40. The Committee emphasised the need to assemble comprehensive coverage of forest production and trade statistics. This is an important need for national forest sector planning in order to ensure that a comprehensive picture of the activities of the sector is available. In many countries this requires that the statistics collected by the forestry ministry, by industry and by the trade ministry be brought

together. It is considered that this should be done by the office responsible for national planning for the forestry sector in the Forestry Ministry and the necessary linkages should be established to ensure that this is achieved.

41. The committee strongly supported the international collection and dissemination of forestry statistics by FAO. It was recommended that the linkage between the countries and FAO to achieve this should be strengthened. The Committee recommended the development of a network of correspondents made up of the offices responsible for forest sector statistics with direct communication of questionnaires and publications in parallel with communication through official channels.
42. Concerning units of measurement the committee stressed the importance of clear designation of units and careful use of conversion factors in converting from local measurement units to standard volume and weight units. The international standard units are cubic metres and metric tons. Where quantities of panel products are stated in surface area units they must be converted to volume in accordance with thickness. If they are not converted the thickness must be stated.

43. National and international forest product price statistics provide a valuable reference both for price trends over time and for indicating the comparative level of price. Such series were slow moving and are not intended nor should they be used for current market decision making.
44. The committee recommended that forest product price series should be collected on a regular basis maintaining consistent specifications and locations. The series should be selected to represent major species and grades produced. Series should also be included covering specialised species such as ebony, teak and sandalwood. It was desirable that international series show both national currency and US Dollar prices.

45. The committee recognised that in many areas of forestry statistics only partial coverage could be obtained from regularly maintained records. Important parts of the productive activity goes on in small enterprises and households which may not keep regular records and which do not report on a regular basis. It is important that coverage of this part of production is included in national statistics. As far as possible non recorded production should be measured by periodic sample surveys and estimates should be maintained. It is recommended that in national statistics separate data should be shown as follows:

RECORDED PRODUCTION
ESTIMATED PRODUCTION
TOTAL.

COMPUTERS

46. The discussion was introduced by a presentation and a workshop conducted by Mr. Felice Padovani of FAO, Rome and Mr. M. Kashio, RAPA.
47. The nature of work required by national forestry statistics requires computerization. At the first Seminar on Forestry Statistics held in FAO/RAPA, Bangkok, from 3 to 7 December 1984, it was considered that the introduction of micro-computers in national forestry statistics' offices was important from the improvement and speeding-up of data processing. Since then, the trend towards computerization in national forestry statistics has become a steady current, and to expand in various directions, taking advantage of a range of possibilities.
48. In this regard, the seminar submitted the following points for consideration.

The Status of Computerization in the Member Countries

49. The Group unanimously agreed that the use of computers can facilitate the collection, storage, processing and dissemination of statistical data.
50. It was recognized that, in some countries, computerization was already quite advanced with the establishment of forestry statistics centres based on a minicomputer system, installation of microcomputers in regional stations, networks, development of locally modified software and application programmes, etc. In other countries, the computerization of forestry statistics units has been officially endorsed.
51. The seminar recognized that commercial spreadsheet, database and statistical packages are the most commonly used software on the basis of the environment of PC-DOS or MS-DOS for statistics work. The majority of microcomputers are IBM or IBM compatible machines which can be easily supplied by local computer dealers. There are no

longer difficulties in purchasing hardware or software in the Asia-Pacific Region.

52. It was recognized that the rapid development of hardware and software requires careful observation of new trends. At central stations level, the use of microcomputers may reach the limitation of their capacities. This may require the replacement of present PCs with stronger and more flexible systems which can provide greater memory space, processing speed, capacities of communication and networking. The application of GIS may be of interest for some applications.
53. The seminar noted that FAO has initiated work on a framework and methodology for handling spatial data through GIS and data mapping in addition to the traditional tabulation of statistics data in order to improve presentation and global understanding.

Data Collection, Exchange and Reporting

54. The seminar requested that the FAO Forestry Statistics Questionnaires should be addressed to the national focal point well in advance of the deadline. The distribution of questionnaires with a floppy diskette was supported.
55. The seminar also recognized the importance of exchanges of data between member countries. Exchanges in computer readable form may greatly facilitate this process. In this connection, the Group encourages FAO to take the lead in adopting widely available software in a standard format in order to achieve effective exchange among participating countries.
56. In distributing questionnaires, surveys and statistics, the seminar recommended FAO to bear in mind the following strategies.
    i. Framework and definitions should be clear, concise and unambiguous.
    ii. Data should be provided for the users' needs.
    iii. Issuance of yearbooks should be timely and disseminated widely.

Recommendations to FAO

57. In order to facilitate the development and improve the effectiveness of national forestry statistics units, FAO should assist countries in installing appropriate computer hardware and software.
58. The seminar emphasized the importance of training of staff at all levels. In many countries, training of operators can be achieved by their own effort on the job. It is, however, recognized that training of programmers is a much more difficult task. In this regard, FAO should give priority to supporting the training of programmers.
59. The participants particularly expressed their appreciation of the opportunity to review progress and exchange experience and ideas provided by the seminar. The seminar recommended that this kind of exchange should be fostered through the maintenance of regular communications between member countries and that meetings with this purpose should be held on a regular basis.

Annex 1

List of Participants

Mr. Jamil Ahmed Chowdhury
Senior Research Officer
Bangladesh Forest Research Institute
Chittagong
Bangladesh, Tel: 031-212164, 212543
Cab: FORRES

Mr. Yang Xianghong
Deputy Chief of Statistics Division
Department of General Planning
Ministry of Forestry
Hepingli
Beijing 100714
China, Tel: 4213179
Tlx: 22237 CFEC CN
Cab: 2651

Ms. Dai Guangcui
Research Fellow
Institute of Forestry Economics
Cinese Academy of Forestry
Shengguzhuang, Andingmenwai
Beijing 100029
China, Tel: 4210476
Cab: 6085

Mr. Ram Swarup
Deputy Conservator of Forests
Ministry of Forest
P.O. Box 2218
Suva
Fiji, Tel: 301611
Fax: 301595

Dr. Sukhdev Thakur
Dy. Inspector General of Forest
Ministry of Environment and Forest
Paryavaran Bhavan
C.G.O. Complex
New Delhi-3
India, Tel: 362612
Cab: PARYAVARAN, New Delhi

Mr. Petrus Gunarso
Manggala Wanabakti Blok I/LT2
Jl. Gatot Subroto
Jakarta 10270
Indonesia, Tel: 5803212
Tlx: 45996 DEPHUT IA

Mr. Johannes-Bagio Widjanarko
Gd. Manggala Wanabakti Blok IV LT IV
Jal. Gatot Subroto Senayan
Jakarta – Pusat
Indonesia, Tel: 583038, 583048, 587090
Fax: 582451
Tlx: 46283 PHT DIR JKT

Mr. Cho Yon-Hwan
Section Chief
Forestry Statistics & Survey Section
Forestry Administration
#1, Chongryangri, Dongdaemun-ku
Seoul
Republic of Korea, Tel: 027 931-2270

Mr. Lockman Bin M. Sirin
Director of Forest Economics
Forestry Department Headquarters
Jalan Sultan Salahuddin
Kuala Lumpur
Malaysia, Tel: 2988244

Mr. Pe Thein
Assistant Director
Forest Department
Gyogon, Insein
Yangon
Myanmar, Tel: 63408

Mr. Eka Raj Sharma
Chief
Forest Survey and Statistics Division
Ministry of Forest and Soil Conservation
Babar Mahal
Kathmandu
Nepal, Tel: 224943, 222601

Mr. Mathura Das Rajbhandarr
Senior Inventory Officer
Forest Survey and Statistics Division
Ministry of Forest and Soil Conservation
Babar Mahal
Kathmandu
Nepal, Tel: 224943

Mr. Mohammad Amjad
Forest Economist
Pakistan Forest Institute
Peshawar
Pakistan, Tel: 42187
Cab: PAKFI, Peshawar

Mr. Kini Karawa
Senior Statistician
Department of Forests
P.O. Box 5055
Boroko
Papua New Guinea, Tel: 277800, 277818
Fax: 259943
Tlx: NE 22360

Ms. Dolores R. Catindig
Supervising Forest Management Specialist
Chief, Forestry Statistics Section
Forest Economics Division
Forest Management Bureau (FMB)
Visayas Avenue
Diliman, Quezon City
Philippines, Tel: 962141

Mr. Chris C. Turnbull
Principal Forest Officer (Planning)
Ministry of Forest Resources
Box 624
Honiara
Solomon Islands, Tel: 21521
Fax: (677)21245
Tlx: HQ 66306

Mr. M.P.A.U.S. Fernando
Deputy Conservator of Forests
Forest Department
Rajamalwatta Road
Battarmrilla
Sri Lanka, Tel: 94-01-566629
Fax: 94-1-580089

Mr. W.R.M.S. Wickramasinghe
Deputy Director Forestry Planning
Forestry Planning Unit
No. 7 Vajira Lane
Colombo 5
Sri Lanka, Tel:587031
Fax: 94-1-580089

Mr. Pairote Niwaswat
Forest Technician Level 6
Special Programme Sub-Division
Planning Division
Royal Forest Department
Phaholyothin Road
Bangkhen
Bangkok 10900
Thailand, Tel: 5794291, 5799533
Fax: 5798611

Mr. Sa-nguan Kakhong
Policy and Plan Analyst Level 17
Planning Division
Royal Forest Department
Phaholyothin Road
Bangkhen
Bangkok 10900
Thailand, Tel: 5799533
Fax: 5798611

Mr. Malaki Iakopo
Assistant Director Forestry
Department of Agriculture, Forests and
Fisheries
P.O. Box 1874
Apia
W. Samoa, Tel: 22561

Resource persons

Mr. Neil Byron
Director, Centre for Forestry in Rural Development
Australian National University
P.O. Box 4
Canberra City A.C.T.
Australia 2601, Tel: 61-6-2492579
Fax: 61-6-2490746
Cab: NATUNIV

Mr. Shyam Sunder Someshwar
Forestry Consultant
2989D 12th Main, Hal II Stage
Indiranagar, Bangalore
Karnataka
India, Tel: 543142

FAO Secretariat

Mr. P.A. Wardle
Senior Forestry Economist
Statistics and Economic Analysis Group
Policy and Planning Service
Forestry Department
FAO, Rome, Italy

Mr. F. Padovani
Forestry Officer (Statistics)
Policy and Planning Service
Forestry Department
FAO, Rome, Italy

Mr. Peter H. May
Forestry officer (Non-Wood Forest Products)
Forest Products Division
Forestry Department
FAO, Rome, Italy

Mr. N. Kitamura
Forestry Planning Officer
Policy and Planning Service
Forestry Department
FAO, Rome, Italy

Mr. H. Tsuchiya
Officer-in-Charge and Deputy Regional Representative
RAPA, Bangkok, Thailand

Dr. Y.S. Rao
Regional Forestry Officer
RAPA, Bangkok, Thailand

Mr. M. Kashio
Regional Forest Resources Officer
RAPA, Bangkok, Thailand

Mr. T. Marghescu
Forestry Officer (Operation)
RAPA, Bangkok, Thailand

Mr. M. Larsson
Associate Professional Officer
Forest Resources Assessment 1990
RAPA, Bangkok, Thailand

Mr. R.S. Gujral
Senior Technical Advisor
GCP/RAS/131/NET
RAPA, Bangkok, Thailand

Mr. C.P. Veer
Rural Sociologist/Communication Specialist
GCP/RAS/131/NET
RAPA, Bangkok, Thailand

Dr. Aroon Chomcharn
Wood Energy Conversion Specialist
GCP/RAS/131/NET
RAPA, Bangkok, Thailand

Mr. Nico Van Der Werf
Associate Professional Officer (Agroforestry)
GCP/RAS/131/NET
RAPA, Bangkok, Thailand

F.A.O.
Via delle Terme di Caracalla
Senior Forestry Economist
00100 Rome, Italy
Forestry Department
Cables: FOODAGRI, ROME
FAO, Rome, Italy
Telex: 610181 FAO I
Facsimile: 5797.3152, 5797.5137, 5797.5155, 5782610

Annex 2

Programme

INTRODUCTION

1. Objectives and functions of statistical information on the forestry sector.

COUNTRY REPORTS

2. Reports of participants on forestry statistics in their countries. Revision of historical data.

INFORMAL SECTOR PRODUCTS

3. Statistics on Fuelwood
4. Statistics on non-wood forest products
5. Survey methods

MODERN SECTOR PRODUCTS

6. Production and trade statistics of industrial roundwood, sawnwood, panels, pulp and paper – Yearbook of Forest Products.
7. Capacity and price statistics

COMPUTERS IN FORESTRY STATISTICS

8. Demonstration – microcomputers

CONCLUSION

9. Summaries, evaluations and recommendations, including proposals for follow-up activities.

to a given country, to its local and central organization.

The big headings which are of significance in politics, to policy makers and to financial authorities are: level of the sector contribution to the economy, production, trade and investment, involvement of people, employment, and land use. Adequate data in these areas, which can be related to information on other sectors of the economy, must be available.

A major problem for forestry as for other activities is to obtain adequate information on its contribution to rural communities. Since in many countries activities not carried on in commercial markets are not recorded in the statistics, the most important forestry activity in the developing world – wood collection for fuel and material by rural households – is virtually without record. As an example to show the significance of this, the estimated total value added contributed by the forestry and forest industry sector in developing Africa amounts to about $ 7 000 million per annum (1980 values). $ 5 850 million of this is for fuelwood and unmanufactured roundwood used mainly by the rural community. The total of $ 7 000 makes nearly 5% of gross domestic product of the region. The recorded commercial activity valued at US$ 1 150 and 0.8% of GDP, is the only part of the sector contribution recognized; this of course leads to a gross underestimate and completely misses the vital contribution of forestry to community energy supplies and community wellbeing.

What sort of information has to be collected? The following pages provide some main headings and some detail which may be appropriate according to the circumstances of the country. Recognizing the prime importance of information on the sector's role for policy formation, a check-list of economic and social indicators is given first, and a check-list of basic data on policy and planning and control within the sector in second place.

DATA SOURCES AND STATISTICAL SYSTEMS

Traditionally forestry sector statistics are collected by forestry departments and encompass the field of activity that is the direct responsibility of the department. Collection of this information is of course a minimum requirement for the day-to-day operation of the department. Policy formation for the forestry sector and decision-making on investment and infrastructure-research, training, educational facilities and investment in tree planting programmes, forestry and forest industries and marketing development, tend to require information over a wider spectrum than is the direct responsibility of a single authority. This will mean collection of information beyond that obtained from operational records. This may require collection through special surveys of the forestry authority, through data systems and surveys of other government departments, and through the data collection made by private sector marketing and industry associations. A few examples illustrate the range of possibilities.

FOREST RESOURCES

The basic requirement of forest and land resource data for any forestry planning or decision-making does not need to be developed here. The possibility that the needed information will be generated most economically by collaboration with other survey organizations is perhaps wellknown. Certainly it will be unusual for the investment in large scale aerial photography or satellite data interpretation to be optimal if it is set up for the exclusive use of forest planning. In countries whose forestry is on a smaller scale it is likely that much of the needed survey information can be best obtained through systems set up for wider purposes.

The importance of woody biomas in energy production and the role of open woodland and setup in wood and biomas production and in many of functions of forest and other wooded land makes the inclusion of other wooded land and trees outside the forest of great importance in the complete assessment of forest and trees resources.

FOREST PRODUCTION

Information on forest production is frequently obtained through records of sale and licensing of timber removals. Sometimes there is also a formal control system relating to removals from private forests or a requirement for the return of records of delivery to mill. There is likely to remain a considerable volume of production for which no formal records exist. A major component of this will be production and consumption by families for their own use. To obtain information on this important area special surveys are necessary. In many countries fuelwood consumption surveys have been carried out by forest authorities either nationally or for particular sample localities. Current examples are surveys carried out with FAO assistance in Bangladesh, Mali, Upper

TABLE 1

A Summary Check List of Types of Information for Central Policy Information on the Forestry Sector

FORESTRY SECTOR AND NATIONAL INCOME	Value of Production – Value Added	(subdivided by forestry and individual industry*)
	Income from Employment	
	Value of Exports	
	Value of Imports	
	Investment	(subdivided by forestry and individual industry*)
FOREST PRODUCTS IN ENERGY SUPPLY		
POPULATION INVOLVEMENT IN FORESTRY	Employment	(subdivided by industry and including self-employed and work of family members)
	People with forestry holdings	
	People living in forests	(living from forest areas, shifting cultivators, forest graziers, hunters, collectors)
LAND USE	Land under forest	
	Forest area with environmental or protective role	
	Forest area with major pressure of other use	(shifting cultivation grazing)

*) Including inputed value of production within households or in unrecorded rural sector activity.

Volta and Zambia. Estimates of fuelwood consumption have also been obtained through household budget surveys and agricultural production surveys carried out by central statistics offices. Once appropriate questions have been devised, the use of such central surveys has the merit of large sample size, low additional cost of the data and regular updating of the information.

INDUSTRY

As has been mentioned, data on forest industries may be obtained through special surveys, required regular ruturns from industry or from industry association statistics. A special survey of the sawmill industry in India was recently completed with the support of an FAO project. Information on capacity, employment, material inputs, expenditure and investment may be available from central government census of industry.

TABLE 2

A Summary Check List of Forestry Sector Information Land Utilization and Forest Resources

1. TOTAL AREA	Inland Water	
	Land Area	
	Agricultural Land,	
	Forest and Other Wooded Land,	
	Other Land,	
2. FOREST AND TREE RESOURCES	Forest and other Wooded Land	by Species: Coniferous, Broadleaved, Bamboos
	Forest Fallows,	
	Trees Outside the Forest	by availability for productive use: Production, Protection
	Forest and other wooded land are subdivided:	Data are collected on area, volume of Timber and Biomas
3. FUNCTIONS OF FOREST AND OTHER WOODED LAND	Information is collected on the importance of specific functions of forests:	Wood production
		Environmental protection
		Water
		Grazing (range)
		Hunting
		Nature Conservation
		Recreation
		Other products than wood

These classes are defined in "Towards a Common Framework for World Forest Resource Assessment" – FAO 1989.

TABLE 3

A Summary Check List for Forestry Sector Information Production Trade Prices and Employment

1.	FOREST PRODUCTION Units Volume 000m³		
	Fuelwood Charcoal (mt)	Industrial Roundwood	
		Sawlogs and Veneer	
		Pulpwood	
		Other	
2.	PROCESSING INDUSTRY PRODUCTION Units Volume 000m³/mt		
	Sawnwood	Pulp	
	Panel Products	Wood Pulp	
		Pulp (non-wood based)	
	Veneer		
	Plywood	Paper and Paperboard	
	Particleboard (including non-wood based)		
	Fibreboard		
3.	FOREST PRODUCTS OTHER THAN WOOD		Examples: resins, gums, cork, tannin, honey, nuts; hunting-users and yield, fodder; recreation – user numbers.
4.	FOREST INDUSTRY CAPACITY		
		Number of Mills	Annual Production Capacity Units 000 m³/mt
	Sawmills		
	Panel Product Mills		
	Pulp Mills		
	Paper Mills		
	Other		
5.	TRADE IN FOREST PRODUCTS Units Volume 000m³/mt Value: Local Currency		
	Imports Exports		
	Volume Value Volume Value		
	Sawlogs and Veener Logs	Sawnwood	
	Pulpwood	Veneer	
	Other Industrial Roundwood	Plywood	
	Fuelwood	Particleboard	
	Charcoal	Fibreboard	
	Forest Products Other Than Wood	Pulp, Paper	
6.	PRICES		
7.	EMPLOYMENT Professional Technical and Vocational Labourers		
	Public Forest Administration		
	Privateateate Forests		
	Forest Industries and Logging		
	University and Research		

PEOPLE IN FORESTRY

Information on population in forest area, employment in forestry and forest industries and population dependent on the forest for income may be obtainable from national population censuses. Government forestry enterprise records and industry data may cover a large part of modern sector employment. Most difficult is to obtain information on the involvement of family labour in forestry work when it is for the family enterprise or for family consumption. Another major unknown is the population of families living in or dependent on the forest for goods and services, and land for grazing or shifting cultivation.

STUDIES OF FOREST SECTOR STATISTICAL SYSTEMS

Many countries have recognized the need and are working on improving forestry sector information systems. FAO has had field project activities specifically directed to assisting in the development of forestry sector statistical services in Malaysia, Brazil,

Paraguay, Mozambique, Nigeria, the Philippines and Indonesia in the last several years.

An informative review on the availability sources and adequacy of statistics for the forestry sector in one country is provided by the Report of the Review Committee on Forestry Statistics 1979 prepared for the Department of Statistics and Forest Service in New Zealand.

FAO AND FORESTRY STATISTICS

The objective of the FAO programme on international statistics of the forestry sector is to make relevant and objectively compiled international statistics available for all national and international agencies and to assist in the development of national statistical services for the sector.

The work done is of three main kinds:

(i) The collection and publication of information and trade, prices, industry capacity and forest resources. It is hoped to add the information on forest population and employment and the economic contribution of the sector to current series in the future.

(ii) The development and dissemination of standard approaches to the collection of forestry sector statistics. The questionnaire and enquiries are designed to be compatible with minimum national requirements and provide an appropriate framework for national collections. Standard classifications have been developed and with the assistance of advice of national authorities and appropriate international agencies have been revised over time. The classification and definition of forest products was published in conjunction with ECE in 1982 on FAO Forestry Paper 32 this is currently being revised to take account of the introduction of the Harmonised System and SITC REv. 3, before publishing a second edition. Such classifications provide a uniform basis for development of national statistical systems that will facilitate the international exchange of information on the sector.

(iii) Direct assistance is provided in the design of national statistical services and surveys of sector activities. The development of standard approaches to survey problems and the organization of training in statistical systems for the forestry sector are other ways in which the programme aims to support the development of sound national systems.

The following are the main annual publications:

Yearbook of Forest Products
Annuaire des Produits Forestiers
Anuario de Productos Forestales

Forest Products Prices
Prix des Produits Forestiers
Precios de Productos Forestales

Pulp and Paper Capacities
Capacités de la Pâte et du Papier
Capacidades de Pasta y Papel

FAO provides basic statistics on forestry for the following United Nations publications:

United Nations Statistical Yearbook
United Nations Yearbook of Industrial Statistics
United Nations Energy Statistics Yearbook
Unesco Statistical Yearbook
United Nations African Statistical Yearbook
Economic Commission for Western Asia and FAO – Agriculture and Development

The FAO Monthly Bulletin of Statistics includes forest product prices series of international significance. The Timber Bulletin for Europe is prepared by the Joint FAO/ECE Secretariat of the Timber Committee of the Economic Commission for Europe. It includes data on production and trade and prices of forest products for the member countries of the commission and is published twice yearly. "Monthly Prices for Forest Products" is a quarterly supplement to the Timber Bulletin for Europe. The FAO "Monthly Bulletin Tropical Forest Products in World Timber Trade" provides monthly data on detail of tropical timber trade flows.

Measurement of Forest Products

P. Wardle

In this session we shall discuss some of the problems of measurement of wood. Fuelwood may come in many forms – stacks, bundles, baskets, headloads. The conversion to solid volume and the assessment of energy content will be considered.

Industrial roundwood may be measured in the log, overbark or underbark. Different conventions of measurement are considered. Various rounding conventions are applied. When measured by weight, assessment of moisture content applies.

The measurement of sawnwood and wood based panels is simpler because the products are regular in shape. Some measurement and rounding conventions may apply.

Pulp is measured by weight – conventions of moisture content apply.

Paper is measured by weight.

Standard conversions to metric measure are attached, together with some approximate equivalents to forest measure and weight. Because of the particular importance of wood as a source of energy in African countries, a table of approximate conversions from volume and weight to units of energy content are included.

STANDARD CONVERSION FACTORS USED IN PREPARING TABLES OF PRODUCTION AND TRADE

COEFFICIENTS DE CONVERSION TYPES UTILISES POUR LA PREPARATION DES TABLEAUX DE LA PRODUCTION ET DU COMMERCE

COEFICIENTES DE CONVERSION CORRIENTES EMPLEADOS PARA PREPARAR LOS CUADROS DE PRODUCCION Y COMERCIO

Units Unites Unidades		Metric equivalent Equivalents en unites metriques Equivalentes en unidades metricas
1	inch – pouce – pulgada	= 25.4 millimetres – millimetres – milimetros
1	square foot – pied carre – pie cuadrado	= 0.0929 square metre – metre carre – metro cuadrado
1	cubic foot – pied cube – pie cubico	= 0.02832 cubic metre – metre cube – metro cubico
1	short ton – tonne courte – tonelada cora	= 0.9072 metric ton – tonne metrique – tonelada metrica
1	long ton – tonne longue – tonelada larga	= 1 016 metric ton – tonne metrique – tonelada metrica

Forest Products Measures
Mesures pout les produits forestiers
Medidas de productos forestales

Product and unit Produits et unites Productos y unidades	Cubic metres Metres Cubes Metros cubicos	Cubic feet Pies Cubes Pies Cubicos	1 000 board feet Pieds Planches Pies Madereros	standard (Petrograd)
ROUNDWOOD-BOIS ROND-MADERA EN ROLLO				
1 hoppus cubic foot – 1 pied cube hoppus – 1 pie cubico hoppus	0.03605	1.273		
1 ton of 5 hoppus cubic feet – 1 tonne de 50 pieds cubes hoppus – 1 tonelada de 50 pies cubicos hoppus	1.8027	63.66		
1 cunit	283 16	100		
1 cord[1] – 1 corde[1] – 1 cuerda[1]	3 625	128		
1 stere[1] – 1 stere[1] – 1 estero[1]	1	35 315		
1 fathom[1]	6 1164	216		
SAWNWOOD – SCIAGES – MADERA ASERRADA				
1 standard (Petrograd)	4 672	165	1 98	1
1 000 board super feet[2] – 1 000 pieds planches superficiels[2] – 1 000 pies madereros superficiales[2]	236	83.33	1	0.505
1 ton of 50 cubic feet – 1 tonne de 50 pieds cubes – 1 tonelada de 50 pies cubicos	1 416	50	0 6	0.303
PANELS – PANNEAUX – TABLEROS				
1 000 square metres (1 millimetre thickness) 1 000 mètres carrés (1 millimetre d'épaisseur) 1 000 metros cuadrados (1 milimetro de espesor)	1	35 315		
1 000 square feet (1.8 inch thickness) 1 000 pieds carrés (1.8 de pouce d'épaisseur) 1 000 pies cuadrados (1.8 de pulpaca de espesor)	0 295	10 417		

Fuelwood and Charcoal Energy Equivalents

	MTCE	GIGA-JOULES (10^9)	GIGA-CALORIES (10^9)	TOE
1 mt Anthracite	1.0	31.4	7.0	0.70
1 mt Coal	1.0	31.4	7.0	0.70
1 mt Lignite	0.67	21.6	4.8	0.48
1 mt Coke (BR)	0.81	28.5	7.0	0.70
1 mt Gasoline	1.50	44.0	10.5	1.05
1 mt Charcoal	0.99	28.9	6.9	0.69
1 mt Wood (20-30 mc)	0.5	14.3	3.5	0.35
1 mt Wood (Green)	0.35	10.0	2.5	0.25
1 m^3 Fuelwood (Solid 20-30%)	0.33	9.4	2.6	0.26
1 m^3 Fuelwood (Solid 0% mc)	0.43	14.0	3.4	0.34
1 m^3 Fuelwood (Solid Green)		7.2	1.8	0.18
1 m^3 Fuelwood (piled)	0.18	5.0	1.2	0.12
1 mt Bagasse (30%)	0.50	14.3	3.5	0.35
1 mt Dung Cakes	0.30	8.6	2.1	0.21
1 mt Ethyl Alcohol	0.94	27.6	6.6	0.66
1 mt Sawdust	0.39	11.1	2.7	0.27
1 mt Crude Oil	1.46	42.7	10.2	1.00

Note: 1 mt Crude Oil = 7.30 bb (barrels) MTCE = Metric ton coal equivalent
1 MTCE = 0.68 Crude Oil TOE = Metric ton oil equivalent
1 MTCE = 5 barrels Crude Oil bb = barrels mc = moisture content
1 m^3 Fuelwood (0.33) = 1.6 bb Crude Oil mt = metric ton m^3= cubic metre

Approximate equivalents for forest measures
Equivalents approximatifs des mesures pour les produits forestiers
Equivalentes aproximados de las medidas de productos forestales

Products and unit Produits et unités Productos y unidades	Cubic metres Metres cubes Metros cubicos	Cubic feet Pieds cubes Pies cubicos
	Solid volume without barks Volume solide sans écorce Volumen sólido sin corteza	
SAWLOGS – VENEER LOGS – GRUMES, SCIAGE + PLACAGE – TROZAS, ASERRAR + CHAPAS		
1 000 board super feet – 1 000 pieds planches superfiels – 1 000 pies madereros/superficiales	4.53	160
PULPWOOD – BOIS DE TRITURATION – MADERA PARA PULPA		
1 stere – 1 stere – 1 estereo	0.72	25.4
1 cord – 1 corde – 1 cuerda	2.55	90
PITPROPS – BOIS DE MINE – MADERA PARA MINAS		
1 piled cubic fathom – 1 fathom (pied cube empile) – 1 fathom (pie cubico hacinado)	4.28	151.1
1 cord – 1 corde – 1 cuerda	2.416	85.3
FUELWOOD – BOIS DE CHAUFFAGE – LEÑA		
1 stere – 1 stere – 1 estereo	0.65	23
1 cord – 1 corde – 1 cuerca	2.12	74.9
1 000 stacked cubic feet – 1000 pieds cubes empiles – 1 000 pies cubicos hacinados	18.41	650

Weight and Volume
Poids et volume
Peso y volumen

Product Produits Productos	Kg/CUM			CUM/MT		
	G	C	NC	G	C	NC
FUELWOOD – BOIS DE CHAUFFAGE – LEÑA	725	625	750	1.38	1.60	1.33
CHARCOAL – CHARBON DE BOIS – CARBON VEG	167					
SAWLOGS – VENEER LOGS – GRUMES SCIAGE – PLACAGE – TROZAS, ASERRAR + CHAPAS						
Tropical – Tropicales			730			1.37
Other – Autres – Otras		700	800		1.43	1.25
PITPROPS – BOIS DE MINE – MADERA PARA MINAS	725	700	800	1.38	1.43	1.25
PULPWOOD – BOIES DE TRITURATION – MADERA PARA PULPA	675	650	750	1.48	1.54	1.33
OTHER INDUST. ROUNDWOOD – AUTRE BOIS ROND INDST – OTRAS MADERAS EN ROL INDUSTRIAL	750	700	800	1.33	1.43	1.25
SAWNWOOD – SCIAGES – MADERA ASERRADA		550	700		1.82	1.48
SLEEPERS – TRAVERSES – TRAVIESAS	780		1.28			
VENEER SHEETS – FEUILLES DE PLACAGE – 6 HOJAS DE CHAPA	750		1.33			
PLYWOOD – CONTREPLAQUE – MADERA TERCIADA	650		1.54			
PARTICLEBOARD – PANNEAUX DE PARTICULES – TABLEROS DE PARTICULAS	650		1.64			
FIBREBOARD COMPRESSED – PANNEAUX FIBRES DURS – TABLEROS FIBRA, PRENSADOS	950		1.053			
FIBREBOARD NON COMPRESSED – PANNEAUX FIBRES ISOLANTS – TABLEROS FIBRA NO PRENSADOS	250		4			

Note: G = General général
C = coniferous – coniferes – coniferas
NC = non-coniferous – non-coniferes – no-coniferas

Collection of Production Statistics

P. Wardle

INTRODUCTION

When we refer to production we are concerned with the transformation of a raw material into a product; that is the change from raw material into processed product. In the forest products industry there are many stages of production and each stage generates products – or intermediate products. The first stage of production, harvesting in the forest, produces logs. These are delivered to the sawmill where they are manufactured into sawnwood. Sawnwood delivered to the furniture factory is manufactured into furniture. Logs and sawnwood may be described as intermediate products, while furniture is the final product. In forest products statistics we are dealing with the direct products of the forest – logs and sawnwood. Statistics of production are the statistics on the quantity of these products produced.

DEFINITION OF PRODUCTION

The production volume is the volume of the product delivered by the producer to the user or to the location for sale. This includes the volume delivered to stock for later sale or use.

ROUNDWOOD PRODUCTION

Roundwood production is the process of harvesting or cutting of tree and cutting it into specific roundwood dimensions for delivery to place of utilization or further sale which may be the household, enterprise or market, for use as fuelwood, wood for charcoal for processing into sawnwood veneer or chips or other uses or for use unprocessed. This is the volume despatched from the forest or received for use or onward sale (stocks and stock change). Specified products include fuelwood, industrial roundwood including logs, pulpwood, other industrial roundwood – pitprops, poles, posts.

CHARCOAL PRODUCTION

The volume (weight) of charcoal produced for delivery includes commercial production of charcoal for sale, household production and production for own use by industry and production by industry from wood residues.

SAWNWOOD PRODUCTION

This is the volume of sawnwood produced by sawmills, portable sawmills, pit sawyers for delivery to users or for further sale. Users may be integrated mills, households, or other users.

VENEER (MARKET VENEER)

The volume of veneer produced by veneer mills for delivery to users other than veneer produced for integrated production of plywood (international statistics exclude veneer utilised within the country for plywood manufacture, whether in the same enterprise or sold as market veneer to another plywood enterprise).

PLYWOOD, PARTICLEBOARD, FIBREBOARD

Volume produced for delivery to users or further sale including volume for delivery to integrated further processing or manufacturing plants.

WOODPULP

Volume (weight) of pulp produced for delivery to users or further sale. The volume of pulp for utilization in an integrated paper or cellulose operation is included. The pulp produced for sale to other manufacturing units or the export is known as market pulp and is included.

PAPER

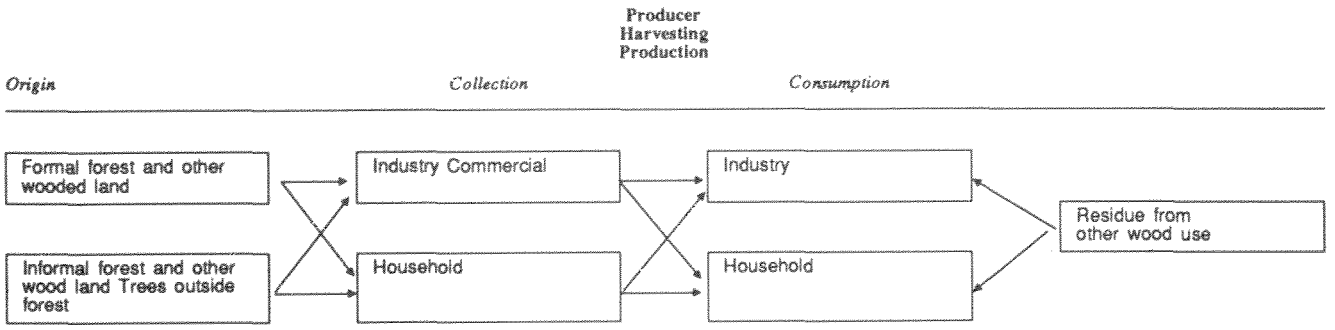
The volume of paper produced in the form of roles or sheets for delivery to users or further sale. The volume produced for delivery to integrated converting, coating or further processing plant is included.

PROBLEMS

Delivery to stock and shipment from stock. Risk of distortion due to difference P and S. Double counting primary product and final product.

Veneer	– plywood
Sawnwood	– wood manufacturing as moulding furniture
Paper	– paper manufacture

FIGURE 1
Fuelwood Production



CONSIDERATION OF PARTICULAR PRODUCTS

Fuelwood

Figure 1 illustrates the problems of recording and measurement of fuelwood production at point of harvesting through harvesting agent to point of consumption. All origins and all destinations are possible. Many of them may have no formal recording arrangements.

DEFINITION

Fuelwood

A narrow definition: fuelwood is roundwood (wood in the rough) from mainstem or branches to be used as energy source for cooking, heating, power production, kilns, drying or smoking installations for charcoal production. Delivered by producer to user or to market for later delivery to use as fuel. The term firewood is often used for fuelwood.

A broader definition: fuelwood as above but including wood and tree biomass other than main stem and branches used for energy source – including woody biomass from tops, small branches, twigs, stumps, roots as well as bark and leaves.

In practice in international statistics frequently based on consumption surveys, the volume of fuelwood includes roundwood from main stem and branches for use as energy source plus other tree biomass harvested from forest, other wooded land or trees outside the forest for use as energy source.

Wood as Energy Source

Wood as an energy source may also include processing residues, sawmill offcuts, edgings, peeler cores, sawdust shavings, bark removed in processing and waste wood recycled as fuel. This volume is not included in "Fuelwood".

Energy may also be generated from processing residues from wood using industry such as waste fibre and spent liquors of the pulp industry.

ESTIMATION OF FUELWOOD PRODUCTION

In some countries the production of fuelwood is measured by assessment of the volume harvested from the forest or the volume produced by commercial and industrial enterprises and by households.

More frequently it is assessed by survey of industrial and household consumers estimating production from consumption. Where wood using industry is of significant size, it is important to distinguish between (A) fuelwood delivered directly from the forest or from tree harvesting for use as energy source and (B) wood residues recovered from industrial processing and delivered for use as energy source either to industry or household.

CROSS REFERENCE

Surveys of household consumption (of wood for energy, surveys of consumption of wood for energy by industry, surveys of recovery of wood residues for energy use, studies of trends in use of wood for energy.

Indirect estimating via cooking, heating and industry use budgets.

INDUSTRIAL ROUNDWOOD

Composition: logs
pulpwood –chips
poles, posts, pitprops –other industrial wood

DEFINITION

Industrial roundwood is wood in the rough from the main stem (trunk) or branches of trees delivered for use as the raw material of production in wood using industry or for use by artisans or households as material for construction or manufacture of articles, implements, furniture. Included is wood in the rough for utilization in the unprocessed form as poles, posts, pitprops. Industrial roundwood may be further processed in the forest into chips or at an intermediate location before delivery to the consuming industry (pulp, particleboard, fibreboard). The roundwood input used to make chips is part of industrial roundwood.

Production is made up of sawlogs, pulpwood, other industrial roundwood such as pitprops, poles and posts.

DIRECT ASSESSMENT

In some countries production is assessed at the point of harvesting from the forest, in some at the point of delivery to user. The difficulty of accurate survey is greater when a large part of production comes from informal forest and trees outside the forest or where a large part of consumption is by small mills, artisans and households.

FIGURE 2
Industrial Roundwood Production Process

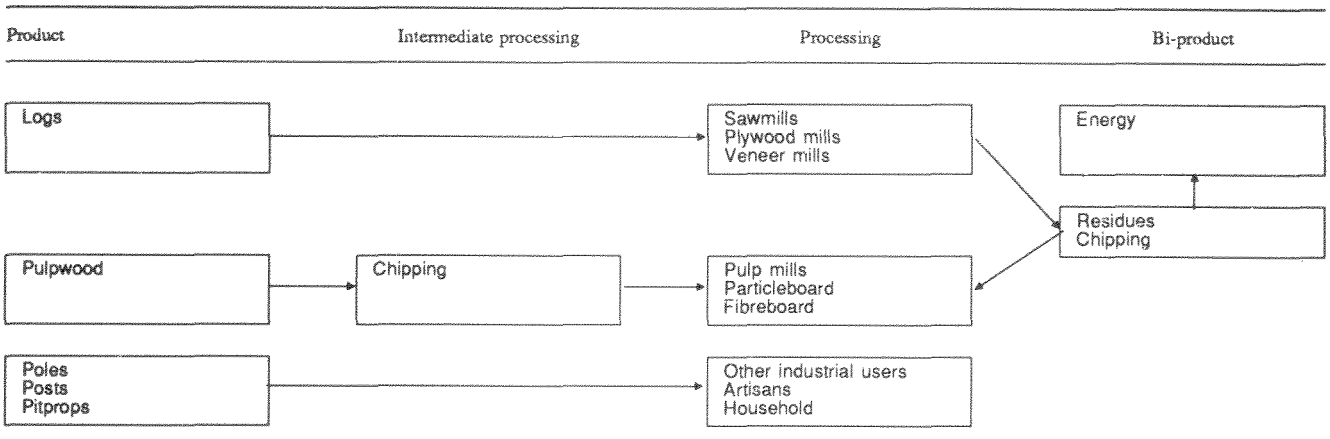
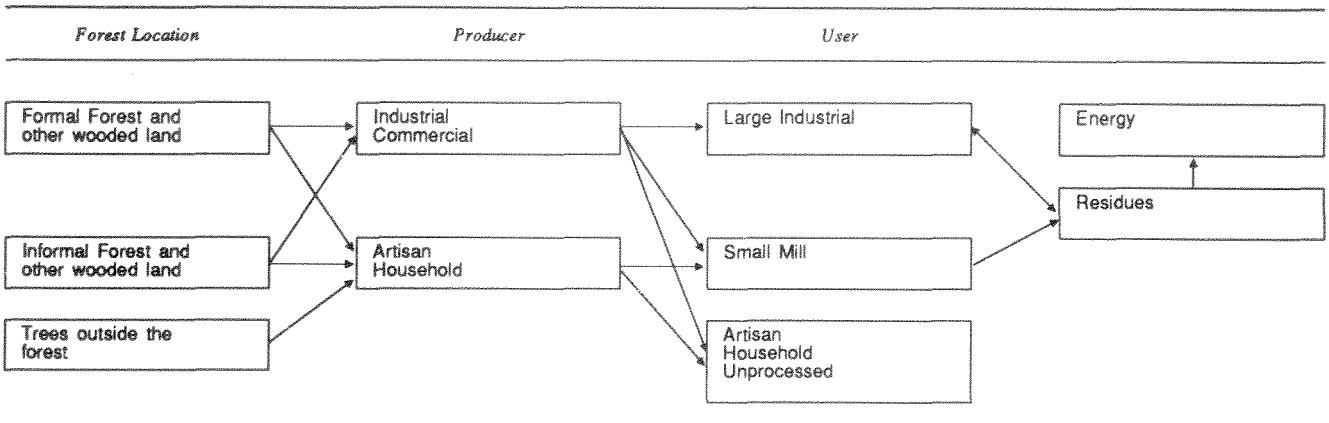


FIGURE 3
Diagram of Production and Delivery to User



INDIRECT ASSESSMENT

In certain cases it has been found easier to survey the production of end products, thus

Roundwood production = roundwood exports	
plus F	(sawnwood production)
plus G	(veneer production)
plus H	(plywood production)
plus K	(particleboard/fibreboard prod.)
plus J	(wood pulp production)
plus	other industrial round-wood prod.
plus	roundwood imports

Where F.G.H.K.J are recovery conversion factors.

Alternatively some combination of direct roundwood input and indirect assessment from product volume may be used.

It is important and interesting to identify the volume of waste or residues which is recovered in the manufacture of one product for recycling in the manufacture of another product. From the statistical point of view it is important not to double count the roundwood equivalent of those residues by crediting them both as input to the residue producing industry e.g. sawmilling, and to the residue consuming industry, e.g. particleboard. It is interesting because the degree of utilization of residues is an important indicator of efficiency in roundwood utilization and of the potential for further improvement.

SAWNWOOD

Definition

Wood, which has been sawn lengthwise (sometimes produced by a profile chipping process) exceeding 5 mm in thickness. It includes planks, beams, joists, boards, rafters, scantlings, laths, boxboards. The term "lumber" is sometimes used. It also includes sawn railway sleepers or railway ties. Sawnwood may be planed, finger jointed, tongue or grooved, or otherwise finished.

The production process

Sawnwood may be produced in large integrated mills, or in small mills, by portable mills, or by hand sawing or pit sawing. Production may be in public or privately-owned mills, or in small mills, on farms or in households, or by individual pit sawyers.

Log Input Source	Producers	Users
state forest	large sawmills	exports
	integrated mills	
		processing mills
• large private	small sawmills	artisans
• small private	portable mills	builders
Forest		
other wooded land	pit sawyers	households
trees outside the forest	imports	

Estimation of Sawnwood Production

i. Estimation of mill production volume

Ideally the volume of sawnwood produced is obtained from the records of producers. In many countries producers are registered and required to submit returns. Sometimes only larger producers are registered. For example, many statistical offices conduct a periodic industrial census but usually only covering large mills with more than a minimum number of employees (20-100). In most countries there is a large population of small mills. In many countries sawnwood is produced by pit sawyers, by hand sawing or household saw benches. Thus comprehensive coverage of the industry will require survey of returns from large sawmillers and survey of small mills and pit sawyers. Sawmilling may be carried out by state-owned mills. In some countries these are the main large mills. It must be remembered, however, that very significant volumes may be produced by large private mills and by the large number of small private mills or pit sawyers. These last two may constitute an important part of the supply, utilise significant quantities of roundwood and make an important contribution to the economy through product supply, employment and income generation.

Thus to obtain complete coverage of mill production volume it will be necessary to combine records of large producers with survey information on small producers and pit sawyers.

ii. Estimation from roundwood input

In some circumstances it may be possible to estimate sawnwood production from the volume of wood delivered to mills. This may be an accurate method when all the production and destination of logs from the forest is recorded, which may be the case for the production from state forests.

In most countries there are both state and private

forests and not all the production is recorded. A great deal of wood may be obtained from other wooded land and from trees outside the forest, so to use this method, it may be necessary to combine records of delivery from large producers with surveys to complete the coverage of small and informal producers.

Sawnwood production estimated by the use of estimates of log input requires also an estimation of the recovery in sawmilling in order to convert the log input volume into sawnwood output.

Sawnwood production = log input × C
(C is the recovery factor)

WOOD-BASED PANELS

Veneer, plywood, particleboard, fibreboard.

Definitions

Veneer. Thin layer or sheet of wood of uniform thickness, less than 5mm in thickness, produced by slicing, peeling and sometimes by sawing. Used for making plywood, for veneering furniture, for the veneer surface of other panels than plywood, for containers, chip baskets, match boxes, matches.

Plywood. A panel consisting of veneer sheets (plies) bonded together with the direction of grain in alternate plies, generally at right angles. Veneer plywood consists of three or more veneer sheets. Core plywood (industry blockboard) consists of veneer sheets with a core or certain layers of solid wood or other wood material such as particleboard.

Particleboard. Flat-pressed or moulded panels manufactured from particles of wood or other ligno-cellulosic materials bonded by a suitable, usually organic, binder in the presence of heat and pressure. They may also be manufactured by extruding the materials into a mould under heat and pressure. Extruded particleboard may be solid or with hollow cavities. The density of particleboards varies with the density of raw materials used and the binder, pressures and temperatures used in manufacture. They are usually in the range 0.6 to 0.8 g/cm^3.

Included in this group are such special types of particleboard as waferboard, oriented particleboard and thin particleboard. Wood wool boards or other boards with mineral binders are excluded.

Fibreboard. Sheet material usually exceeding 1.5 mm in thickness manufactured from fibres of wood or other ligno-cellulosic materials with the primary bond deriving from the felting of the fibres and their inherent adhesive properties. Bonding materials and/or additives may be added. This includes insulating board (or softboard) with a density usually not more than 0.35 g/cm^3, medium board produced by wet process with density up to 0.8 g/cm^3.

Estimating wood-based panels production

Factories producing wood-based panels are usually medium scale to large scale manufacturing plants and statistics on production are obtained from production records. In many countries reporting of basic statistics by the producing plants is mandatory and the data are assembled by forest authorities, industry ministries or central statistics offices. Where mandatory reporting is not available, the assessment may be by periodic survey or questionnaire enquiry. In some countries industry associations collect information on production.

As with sawnwood, there are the alternative possibilities of estimating wood-based panels production from surveys of wood input and recovery factors, or from surveys of product consumption.

PULP AND PAPER

Definitions

Wood Pulp. Pulp of wood and other ligno-cellulosic materials broken down into fibres by mechanical or chemical means so as to be suitable for the manufacture of paper, paperboard or products of dissolving pulp.

Pulp of Other Fibre. Included are pulps made of straw, bagasse, bamboo, reeds, cotton linters, flax.

Paper and Paperboard made from pulp or waste paper in rolls and sheets including newsprint, printing and writing paper, including other paper and paperboard, wrapping and packaging paper and paperboard, as well as household and sanitary paper.

Estimating pulp and paper production

Factories producing pulp and paper are usually medium to large scale manufacturing plants and statistics on production are obtained from production records. In many countries reporting of basic statistics is frequently the subject of national industry survey. In countries with a number of mills, statistics are frequently assembled by an industry association.

ORGANIZATION OF FORESTRY STATISTICS COLLECTION, PROCESSING AND DISSEMINATION

Philip Wardle

The importance of forest products to the society through the supply of wood for energy, for construction and industry and trade means that a wide cross section of the people and the economy is involved way beyond the reach of a single ministry or of the forestry department. However, the forestry ministry requires to have an overall view of the utilisation of the products and services in order to formulate sound policy and plans for the management of the forest resource.

To assemble the necessary information will require it to bring together forest production information, both of national forests and private, large and small, and trade information. Some of the information will be obtainable from routine records of state forest service and state enterprises. Some has to be collected through official enquiries or surveys. Some is collected through special returns by other departments such as industry or customs.

To get a comprehensive pciture, the forest activity may have to carry out special surveys or gain access to the results of other departments' surveys. It may have to use both official information and "informal" information, for example from private associations or non-mandatory enquiries.

The important requirement is hat in order to get a comprehensive overview of the sector that the forest authority establishes a system to bring together data from all appropriate sources and to assemble it in a standard overview of the sector. This must extend beyond the narrow data coverage of the authority's direct operation to include the information necessary to build up comprehensive coverage of both state, private and communal operations in the sector. It must bring together formal records and estimates to create a sense of the whole activity and its magnitudes.

Data structure, classification and definition of forest products in the FAO Yearbook of Forest Products questionnaire

F.Padovani

Information processing technology and knowledge is no longer a problem. Microcomputers are widely used in all kinds of offices by all sorts of people to assist their work or to enjoy as a hobby. Such phenomena started late in the 1970s in developed countries, spreading into developing countries at a rather faster speed. In the field of forestry, we have to consider the use of microcomputers to handle various kinds of forestry data and eventually integrate this with data coming from other disciplines, in order to create substantial statistical information support to decision-makers. This demonstration will introduce some aspects of computer application.

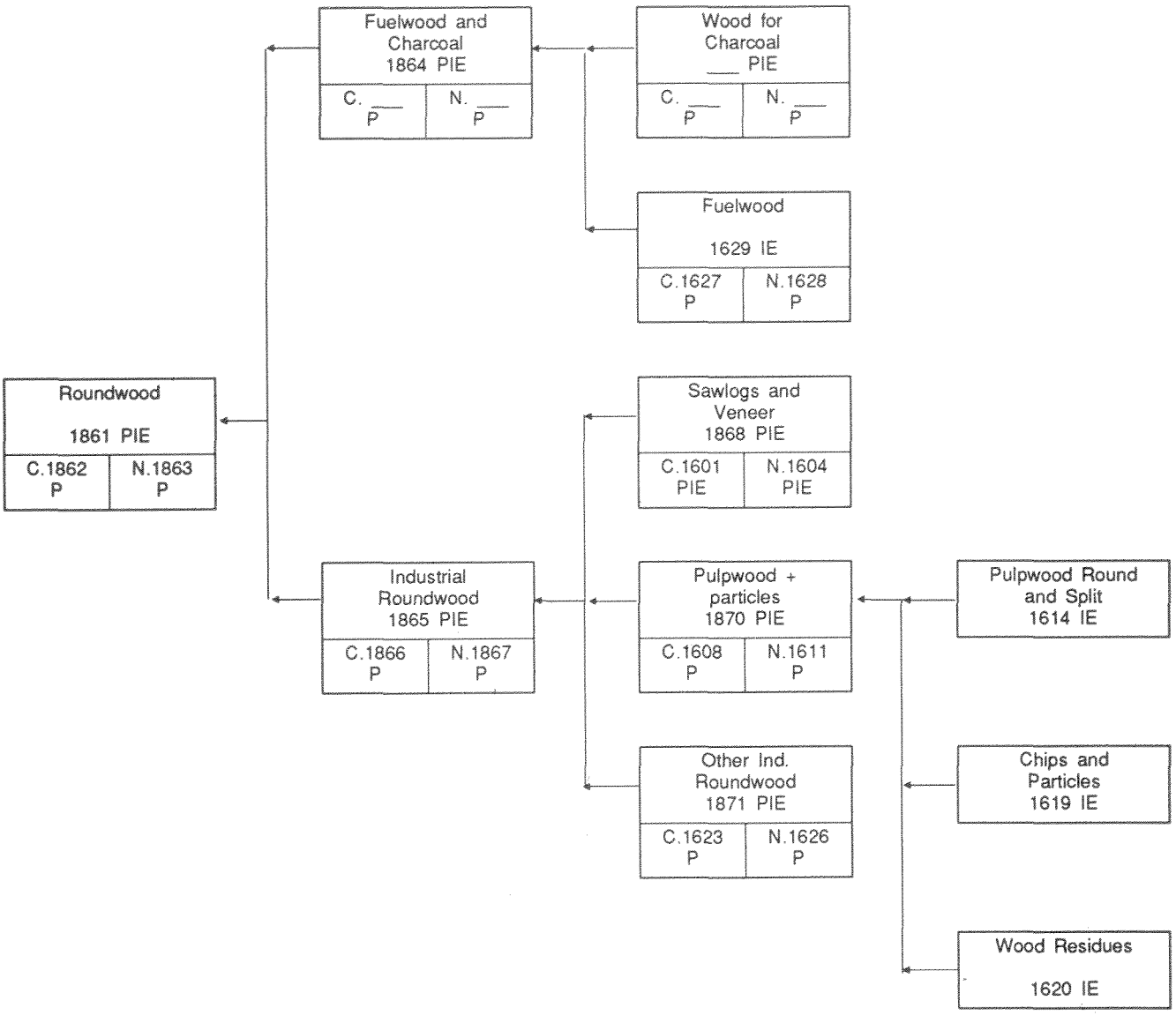
Special emphasis will be given to the role of data producers and data consumers and the tools (hardware and software) available to produce clean and reliable data, as well as how to make effective use, and prevent misuse, of statistical data.

The FAO Forestry Department data collection and data dissemination networks experience will be presented and how to implement effective collection use and dissemination networks of forestry statistics in your country will be discussed.

The data structure classification and definition of forest products in the FAO Yearbook of forest products is described.

Data structure

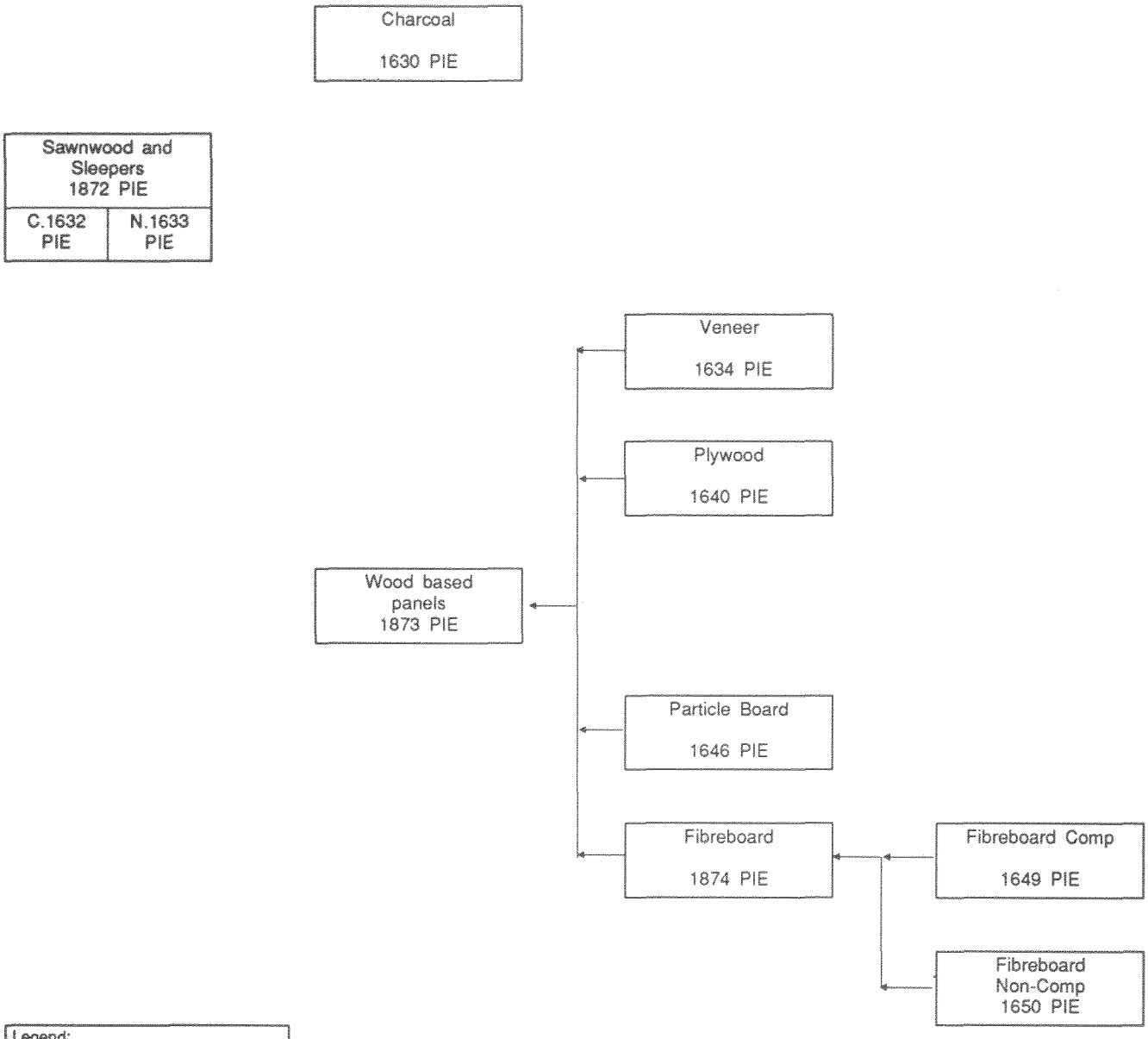
Removals of Roundwood



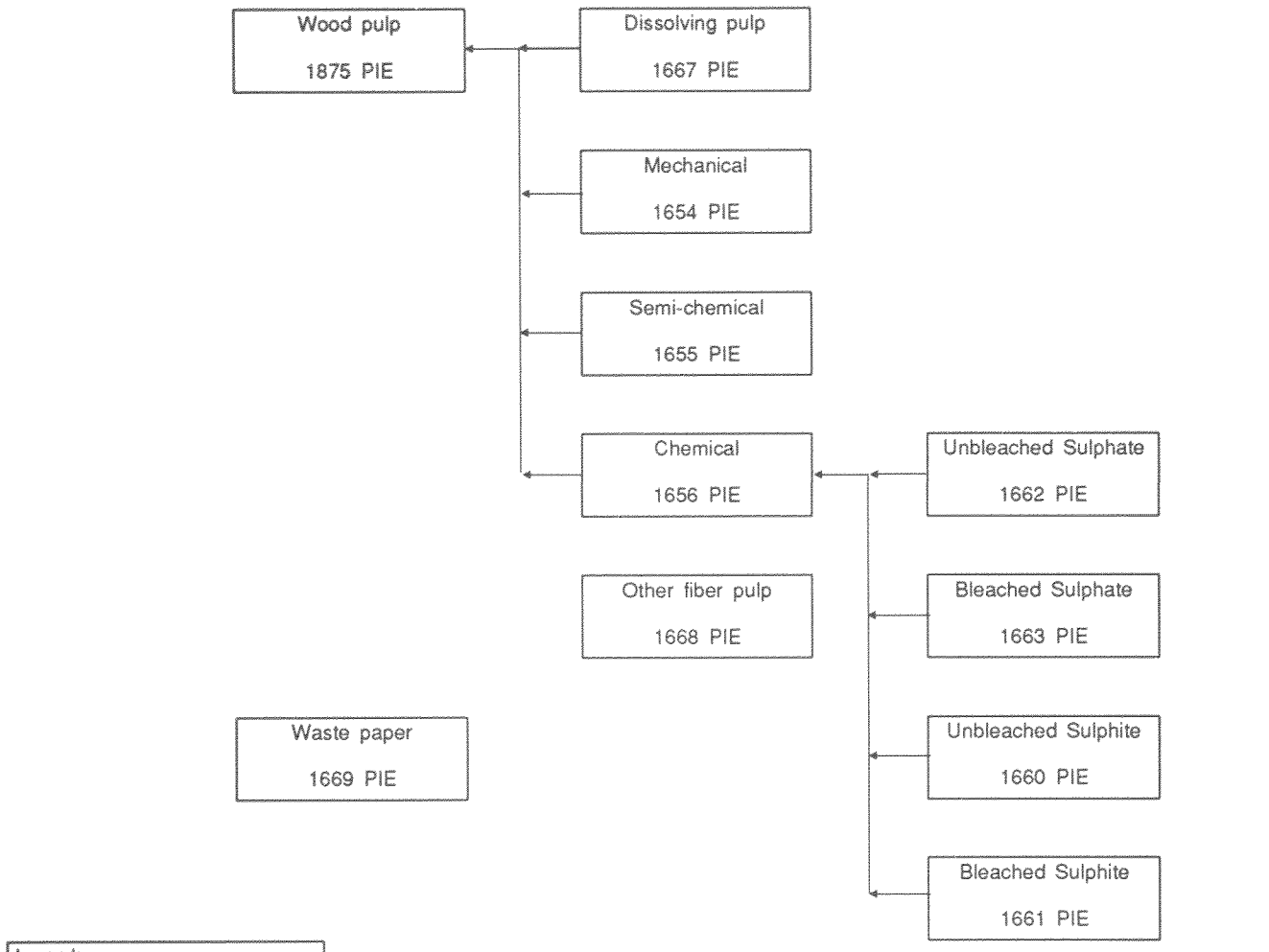
Legend:
C. = Coniferous
N. = Non-Coniferous
P = Production
I = Import
E = Export

NOTE: The four digit number is the Forest Product Code.

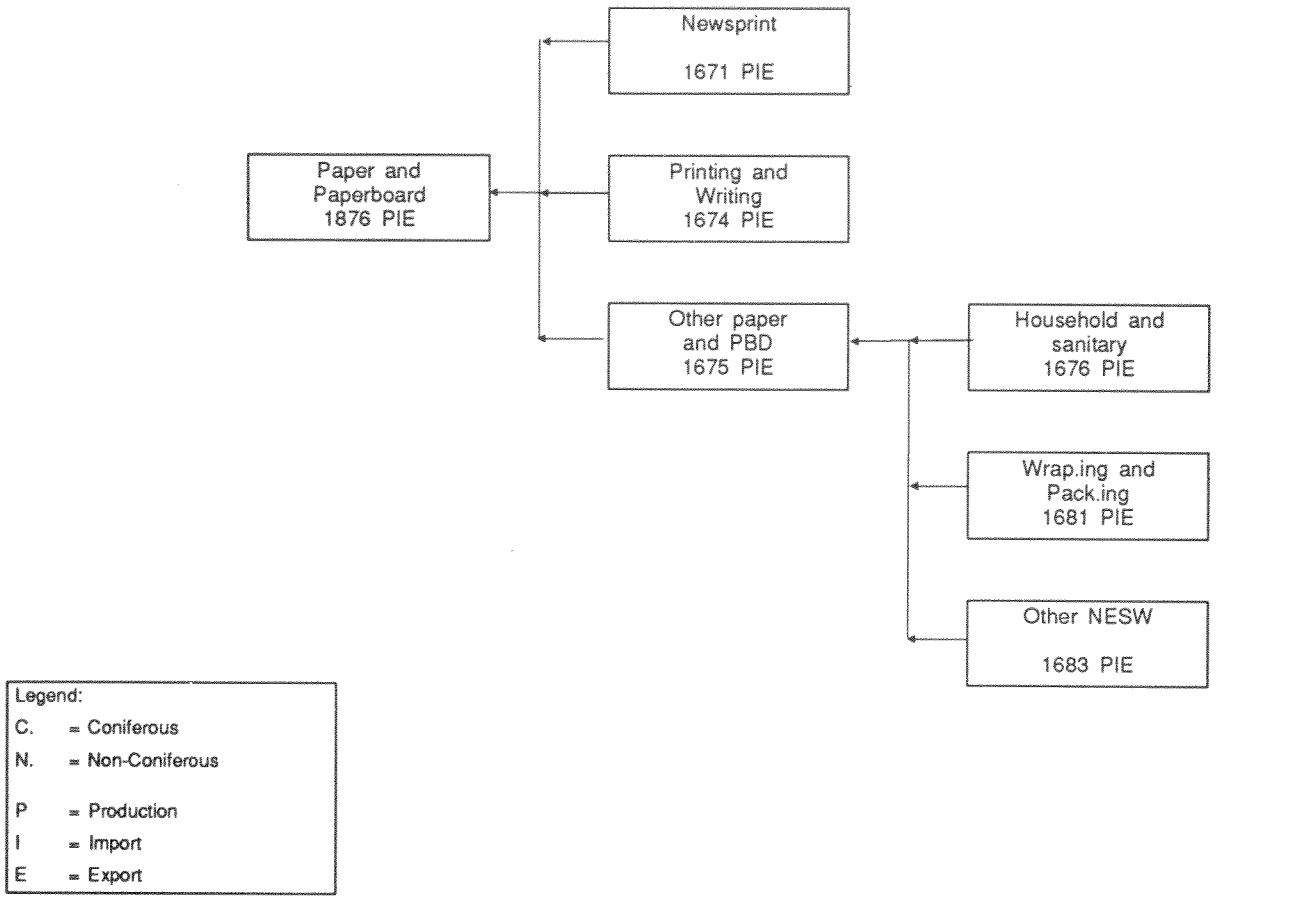
Processed Wood and Panel Product



NOTE: The four digit number is the Forest Product Code.

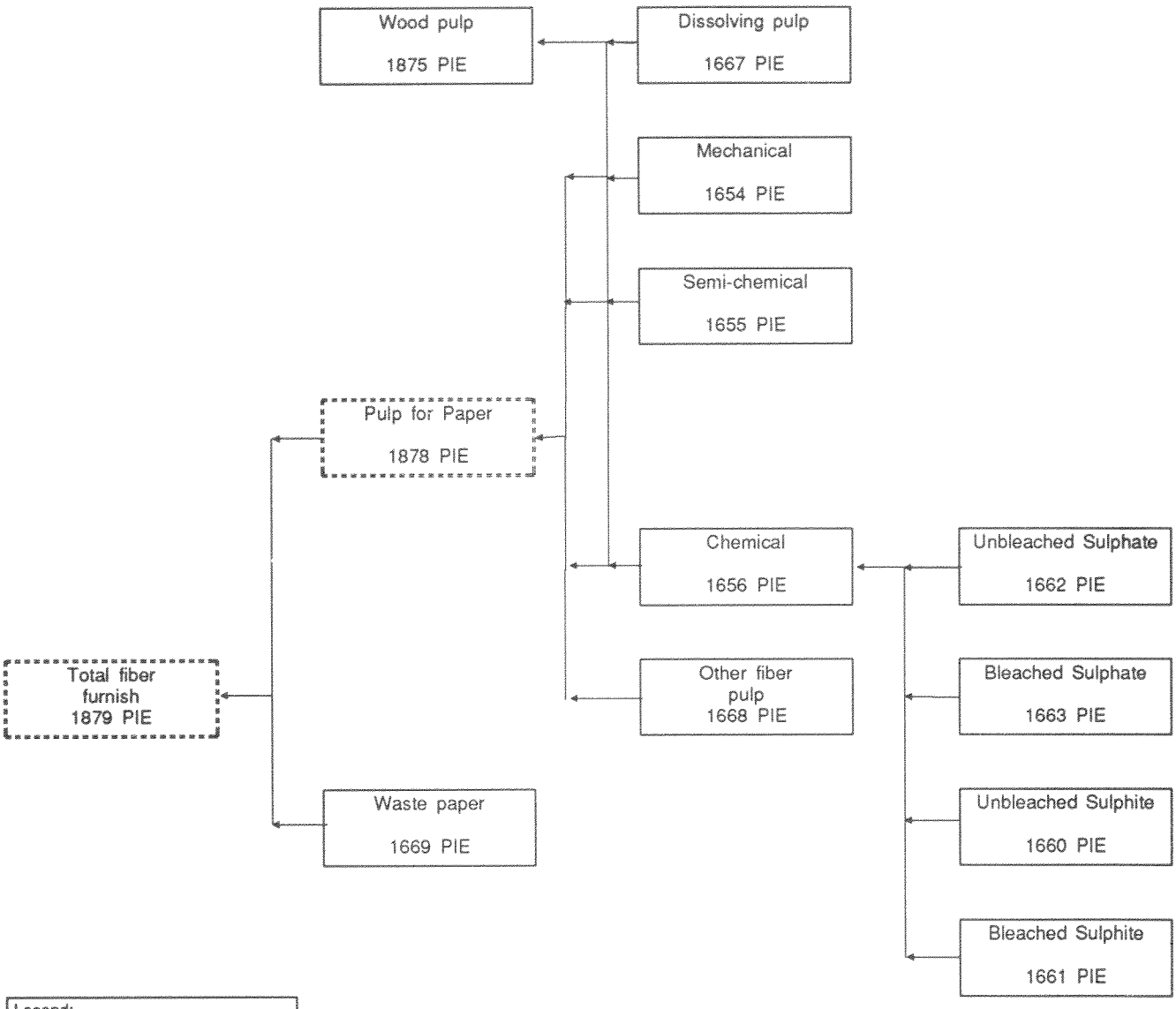


NOTE: The four digit number is the Forest Product Code.



NOTE: The four digit number is the Forest Product Code.

Derived data



NOTE: The four digit number is the Forest Product Code.

DEFINITIONS

Yearbook of Forest Products
Roundwood (1)

Code Heading	Definition

1861 ROUNDWOOD
1862 ROUNDWOOD (C)
1863 ROUNDWOOD (NC)

Wood in the rough. Wood in its natural state as felled, or otherwise harvested, with or without bark, round, split, roughly squared or other forms (e.g. roots, stumps, burls, etc.). It may also be impregnated (e.g. telegraph poles) or roughly shaped or pointed. It comprises all wood obtained from removals, i.e. the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses during the period - calendar year or forest year. Commodities included are sawlogs and veneer logs, pulpwood, other industrial roundwood (including pitprops) and fuelwood. The statistics include recorded volumes, as well as estimated unrecorded volumes as indicated in the notes. Statistics for trade include, as well as roundwood from removals, the estimated roundwood equivalent of chips and particles, wood residues and charcoal.

1864 FUELWOOD + CHARCOAL

The commodities included are fuelwood, coniferous and non-coniferous and the roundwood equivalent of charcoal [using a factor of 6.0 to convert from weight (MT) to solid volume units (CUM)].

1629 FUELWOOD
1627 FUELWOOD (C)
1628 FUELWOOD (NC)

Wood in the rough (from trunks and branches of trees) to be used as fuel for purposes such as cooking, heating or power production.

___ WOOD FOR CHARCOAL

Wood in the rough used for Charcoal production in pit kilns and portable ovens etc. (estimated from statistics for Charcoal using a factor of 6 to convert from weight (MT) to solid volume units (CUM)).

1865 INDUSTRIAL ROUNDWOOD
1866 INDUSTRIAL ROUNDWOOD (C)
1967 INDUSTRIAL ROUNDWOOD (NC)

The commodities included are sawlogs or veneer logs, pulpwood, other industrial roundwood and in the case of trade, chips and particles and wood residues.

1868 SAWLOGS + VENEER LOGS

These commodity aggregates include sawlogs and veneer logs coniferous and non-coniferous.

1601 SAWLOGS + VENEER LOGS (C)
1604 SAWLOGS + VENEER LOGS (NC)

Sawlogs, veneer logs and logs for sleepers. Logs whether or not roughly squared, to be sawn (or chipped) lengthwise for the manufacture of sawnwood or railway sleepers (ties). Single bolts and stave bolts are included. Logs for production of veneer, mainly by peeling or slicing. Match billets are included, as are special growth (burls, roots, etc.) used for veneers.

1870 PULPWOOD + PARTICLES
1608 PULPWOOD (C)
1611 PULPWOOD (NC)

Pulpwood, chips, particles and wood residues. In production the commodities included are pulpwood coniferous and non-coniferous. In trade the aggregate includes, in addition, chips or particles and wood residues.

1614 PULPWOOD (Round & Split)

Wood in the rough other than logs - for pulp, particleboard or fibreboard. Pulpwood may be barked or unbarked and may be in the form of roundwood or splitwood. In production, it may include the equivalent of wood chips made directly from roundwood.

1619 CHIPS + PARTICLES

Wood chips and particles
Wood that has been deliberately reduced to small pieces from wood in the rough or from industrial residues, suitable for pulping, for particleboard and fibreboard production, for fuelwood or for other purposes.

1620 WOOD RESIDUES

Miscellaneous wood residues
Wood residues which have not been reduced to small pieces. They consist principally of industrial residues, e.g. sawmill rejects, slabs, edgings and trimmings, veneer log cores, veneer rejects, sawdust, bark (excluding briquette) residues from carpentry and joinery production, etc.

1871 OTHER INDUST ROUNDWOOD
1623 OTHER INDUST ROUNDWOOD (C)
1626 OTHER INDUST ROUNDWOOD (NC)

Other industrial roundwood
Roundwood used for tanning, distillation, match blocks, gazogenes, poles, piling, posts, pitprops, etc.
Note: "OTHER INDUSTRIAL ROUNDWOOD" include pitprops.

(1) Figures are given in solid volume of roundwood (or roundwoo equivalent) without bark.

Sawnwood (2)

Code	Heading	Definition
1630	CHARCOAL	Wood carbonized by partial combustion or application of heat from an external source. It is used as a fuel or for other uses. Figures are given in weight (MT).
1872	SAWNWOOD + SLEEPERS	The aggregate includes sawnwood and sleepers, coniferous or non- coniferous.
1632	SAWNWOOD (C)	Sawnwood, unplaned, planed, grooved, tongued, etc., sawn lengthwise, or produced by a profile-chipping process (e.g. planks, beams, joists, boards, rafters, scantlings, laths, box-boards, "lumber", sleepers, etc.) and planed wood which may also be finger jointed, tongued or grooved, chamfered, rabbeted, V-jointed beaded, etc. Wood flooring is excluded. With few exceptions, sawnwood exceeds 5 mm. in thickness.
1633	SAWNWOOD (NC)	

(2) Figures are given in solid volume.

Yearbook of Forest Products
Wood-Based Panels (2)

Code	Heading	Definition
1873	WOOD-BASED PANELS	The aggregate includes the following commodities: veneer sheets, plywood, particleboard and fibreboard compressed or non-compressed.
1634	VENEER SHEETS	Thin sheets of wood of uniform thickness, rotary cut, sliced or sawn, for use in plywood, laminated construction, furniture, veneer containers, etc. in production the quantity given excludes veneer sheets used for plywood productions within the country.
1640	PLYWOOD	Plywood, veneer plywood, core plywood including veneered wood, blockboard, laminboard and batten board. Other plywood such as cellular board and composite plywood. Veneer plywood is plywood manufactured by bonding together more than two veneer sheets. The grain of alternate veneer sheets is crossed generally at right angles. Core plywood is plywood whose core (i.e. central layer, generally thicker than the other plies) is solid and consists of narrow boards, blocks or strips of wood placed side by side, which may or may not be glued together. (This item includes veneered wood in sheets or panels in which a thin veneer of wood is affixed to a base, usually of inferior wood, by gluing under pressure). Cellular board is a plywood with a core of cellular construction while composite plywood is a plywood with core or certain layers made of material other than solid wood or veneers.
1646	PARTICLEBOARD	A sheet material manufactured from small pieces of wood or other ligno-cellulosic materials (e.g. chip, flakes, splinter, strands, shreds, schives, etc.) agglomerated by use of an organic binder together with one or more of the following agents: heat, pressure, humidity, a catalyst, etc. (Flaxboard is included. Wood wool and other particleboards, with inorganic binders, are excluded.)
1874	FIBREBOARD	Fibreboard (fibre building board) The aggregate includes compressed and non-compressed fibreboard. A panel manufacture from fibres of wood or other ligno-cellulosic materials with the primary bond deriving from the felting of the fibres and their inherent adhesive properties. Bonding materials and/or additives may be added. It is usually flat pressed but may be moulded. (Similar products made from pieces of wood, wood flour or other ligno-cellulosic material with added binders are excluded - as are, for example, boards of gypsum or other mineral material).
1649	COMPRESSED FIBREBOARD	Compressed includes hardboard with a density greater than 0.40 g/cm^3.
1650	N. COMPRESSED FIBREBOARD	Non-compressed includes insulating board with density not more than 0.40 g/cm^3.

(2) Figures are given in solid volume.

Yearbook of Forest Products
Pulp (3)

Code Heading	Definition

1835 WOOD PULP
The following commodities are included in this aggregate: mechanical, semi-chemical, chemical and dissolving wood pulp.

1654 MECHANICAL WOOD PULP
Wood pulp obtained by grinding or milling the following into fibres: coniferous or non-coniferous rounds, quarters, billets, etc. or through refining coniferous or non-coniferous chips. Also called groundwood pulp and refiner pulp. It may be bleached or unbleached. It excludes exploded and defibrated pulp, and includes chemi- mechanical and thermo-mechanical pulp.

1655 SEMI-CHEMICAL WOOD PULP
Wood pulp, chemi-mechanical and semi-chemical. Wood pulp obtained by subjecting coniferous or non-coniferous wood to a series of mechanical and chemical treatments, none of which alone is sufficient to make the fibres separate readily. According to the order and importance of the treatment, such pulp is variously named: semi-chemical, chemi-groundwood, chemi-mechanical, etc. It may be bleached or unbleached.

1667 DISSOLVING WOOD PULP
Wood pulp, dissolving grades chemical pulp (sulphate, soda or sulphite) from coniferous or non-coniferous wood, or special quality, with a very high alpha-cellulose content (usually 90% and over), readily adaptable for uses other than paper making. These pulps are always bleached. They are used principally as a source of cellulose in the manufacture of products such a man-made fibres, cellulosic plastic materials, lacquers, explosives.

1656 CHEMICAL WOOD PULP
Sulphate (kraft) and soda and sulphite wood pulp except dissolving grades, bleached, semi-bleached and unbleached. Where detail is available, statistics for the following four component pulps are given.

1660 UNBLEACHED SULPHITE PULP
Wood pulp, sulphite, except dissolving grades. Wood pulp obtained by mechanically reducing coniferous or non-coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of a bi-sulphite cooking liquor. Bi-sulphites such as ammonium, calcium, magnesium and sodium are commonly used.
The class includes semi-bleached and unbleached pulps.

1661 BLEACHED SULPHITE PULP
Wood pulp, sulphite, except dissolving grades. Wood pulp obtained by mechanically reducing coniferous or non-coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of a bi-sulphite cooking liquor. Bi-sulphites such as ammonium, calcium, magnesium and sodium are commonly used.
The class includes bleached pulp.

1662 UNBLEACHED SULPHATE PULP
Wood pulp, sulphate (kraft) and soda, except dissolving grades. Wood pulp obtained by mechanically reducing coniferous or non- coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of sodium hydroxide cooking liquor (soda pulp) or a mixture of sodium hydroxide and sodium sulphite cooking liquor (sulphate pulp). The class includes semi-bleached and unbleached pulps.

1663 BLEACHED SULPHATE PULP
Wood pulp, sulphate (kraft) and soda, except dissolving grades. Wood pulp obtained by mechanically reducing coniferous or non- coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of sodium hydroxide cooking liquor (soda pulp) or a mixture of sodium hydroxide and sodium sulphite cooking liquor (sulphate pulp). The class includes bleached pulp.

1668 OTHER FIBRE PULP
Pulp of fibrous vegetable materials other than wood. Including straw, bamboo, bagasse, esparto, other reeds or grasses, cotton linters, flax, hemps, rags, other textile wastes. Used for the manufacture of paper, paperboard and fibreboard.

1669 WASTE PAPER
Paper and paperboard which has been used for its original purpose or residues from paper conversion, collected for re-use as a raw material for the manufacture of paper, paperboard, panels, moulded products, etc. and for wrapping, packing or other purposes, with or without further processing.

(3) Figures are given in weight (air-dry = 10% moisture)

Yearbook of Forest Products
Paper and Paperboard (4)

Code	Heading	Definition

1876 PAPER + PAPERBOARD
The following commodities are included in this aggregate: Newsprint, printing and writing paper, other paper and paperboard.

1671 NEWSPRINT
Uncoated paper, unsized (or only slightly sized), containing at least 60% mechanical wood pulp (percent of fibrous content), usually weighting not less that 40 g/square m and generally not more than 60 g/square m of the type used mainly for the printing of newspapers.

1674 PRINTING + WRITING PAPER
Other printing and writing paper.
Paper, except newsprint, suitable for printing and business purposes, writing, sketching, drawing, etc., made from a variety of pulp blends and with various finishes. Included are such papers as those used for books and magazines, wall paper base stock, box lining and covering calculator paper, rotonews, duplicating, tablet or biock, label, lithograph, banknote, tabulating card stock, bible or imitation bible, stationary, manifold onionskin, typewriter, poster, etc.

1675 OTHER PAPER + PAPERBOARD
Includes construction paper and paperboard, household and sanitary paper, special thin paper, wrapping and packaging paper and paperboard and other paper and paperboard not elsewhere specified. Where detail is available statistics for four categories composing the above are given as follows:

1676 HOUSEHOLD + SANITARY PAPER
Household and sanitary paper; special thin paper. Household and sanitary paper includes absorbent paper, creped or uncreped, sometimes embossed, made from bleached or unbleached chemical wood pulp, sometimes with a mixture of pulp from waste paper and mechanical pulp. Included are towelling, napkin, facial tissue, toilet tissue, wadding disposable tissues.

1681 WRAPG + PACKG PAPER + BOARD
Wrapping and packaging paper and paperboard.
Paper or paperboards included are the following: vegetable parchment, greaseproof and glassine paper. Papers made from pure chemical wood pulp or from mixture of chemical wood pulp, cotton fibre pulp, treated (e.g. highly hydrated or hard beaten) to render the resulting paper resistant to oil, grease and water. They are used primarily for packaging frozen, moist or greasy materials like butter, margarine, meat or fish, linerboard; paper or paperboard used as facing material on corrugated or solid paper or paperboard boxes and containers.
Fluting medium: paper or paperboard used as medium when combining paper and paperboard for conversion into a corrugated board.
Sack kraft paper: strong paper made from sulphate pulp and used in the manufacture of single, or multiwall, sacks.
Other kraft wrapping paper: all other wrapping and packaging papers made principally from sulphate pulp.
Folding boxboard: all types of paperboard used in the manufacture of folding boxes.
Other wrapping and packaging paper and paperboard.

1683 PAPER + PAPERBOARD NS
Other paper and paperboard not elsewhere specified. Includes: Kraft papers for waxing, asphalting, water proofing, laminating, impregnat-ing, spinning or twisting, gumming, etc., paper manufactured principally from furnishes other than sulphate pulp not included elsewhere, such as rope and jute paper, folder stock, blotting paper, filter paper, photographic sensitizing paper, etc. and paperboards not included elsewhere such as shoe board, gasket board, transformer board, press textile board, index pressboard, panel board (automative) trunk and suitcase board, matrix board.

Construction paper and paperboard:
Papers, paper felts and paper boards used in the construction of buildings and other structures for insulation, vapour real, roofing and flooring underlay, etc. They are made from fully refined material such as wood pulp, waste paper, other vegetable pulp and mineral fibre. Low thermal conductivity, moisture resistance, fire resistance permanency, insect and vermin resistance are desirable characteristics of these materials (excluded are papers, felts or boards impregnated, satured laminated or further manufactured in any way and fibreboard or fibre building board, in the form of insulating board, medium hardboard and hardboard).

Special thin paper: papers made for special purposes, their common characteristics being their relative thinness. They may be made from mechanical or chemical wood pulps, bleached or unbleached, but frequently from pulps containing flax, hemp or cotton fibre. Principal characteristics of some of these papers are: uniformity of surface and calliper, freedom from pinholes, strength close formation, opacity, low permeability, chemical purity - all related to special uses. Examples of types of paper included are: carbonizing tissue, condenser and capacitator paper, cigarette paper, lens tissue, pattern tissue, tea bag paper.

(4) Figures are given in weight.

Yearbook of Forest Products
Data Collected

Heading	Definition
PRODUCTION	The total production of primary products is reported, even though a portion may immediately be consumed in the production of another commodity (e.g. wood pulp, which may immediately be converted into paper as part of a continuous process). An exception is made in the case of veneer production, which excludes veneer sheets used for plywood production within the country.
IMPORTS (Quantity) IMPORTS (Value)	Products for domestic consumption or processing shipped into the country. "In-transit" shipments are excluded; in certain instances, imports for re-export may be included. Value are normally c.i.f..
EXPORTS (Quantity) EXPORTS (Value)	All quantities of domestic origin or manufacture shipped out of the country. As indicated above under "Imports", re-exports may be included. "In-transit shipments are excluded. Value are normally f.o.b.

Yearbook of Forest Products
Species

Heading	Definition
CONIFEROUS	All woods derived from trees classified botanically as Gymnospermae - e.g. fir (Ables), parana pine (Araucaria), deodar (Cedrus), ginkgo (Ginkgo), larch (Larix), spruce (Picea), pine, chir, kail (Pinus), etc. These are generally referred to as softwoods.
NON-CONIFEROUS	All wood derived from trees classified botanically as Angiospermae - e.g., maple (Acer), alder (Alnus), ebony (Diospyros), Beech (Fagus), lignum vitae (Guiaicum), poplar(Populus), oak (Quercus), sal (Shorea), teak (Tectona), casuarina (Casuarina), etc. These are generally referred to as broadleaved or hardwoods.

FAO Yearbook of Forest Products
Questionnaire 1989

Country: _____

CATEGORY	Unit x 1____	Production Quantity	IMPORT Quantity	IMPORT Value	EXPORT Quantity	EXPORT Value
ROUNDWOOD	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
FUELWOOD + CHARCOAL	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
WOOD FOR CHARCOAL	CUM	_____	_____	XXXXXXX	_____	XXXXXXX
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
FUELWOOD	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
INDUSTRIAL ROUNDWOOD	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
SAWLOGS + VENEER LOGS	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	_____	_____	_____	_____
Non-Coniferous	CUM	_____	_____	_____	_____	_____
PULPWOOD + PARTICLES	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
PULPWOOD (Round & Split)	CUM	XXXXXXXXX	_____	_____	_____	_____
CHIPS + PARTICLES	CUM	XXXXXXXXX	_____	_____	_____	_____
WOOD RESIDUES	CUM	XXXXXXXXX	_____	_____	_____	_____
OTHER INDUSTRIAL ROUNDWOOD	CUM	_____	_____	_____	_____	_____
Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
Non-Coniferous	CUM	_____	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX

FAO Yearbook of Forest Products
Questionnaire 1989

Country: _____

PROCESSED WOOD and PANELS PRODUCTS	Production		IMPORT		EXPORT	
	Unit x 1____	Quantity	Quantity	Value	Quantity	Value
CHARCOAL	MT					
SAWNWOOD + SLEEPERS	CUM					
Coniferous	CUM					
Non-Coniferous	CUM					
WOOD-BASED PANELS	CUM					
VENEER SHEETS	CUM					
PLYWOOD	CUM					
PARTICLEBOARD	CUM					
FIBREBOARD	CUM					
COMPRESSED	CUM					
NON-COMPRESSED	CUM					

FAO Yearbook of Forest Products
Questionnaire 1989

Country: _____

PULP AND PAPER PRODUCTS	Production		IMPORT		EXPORT	
	Unit x 1____	Quantity	Quantity	Value	Quantity	Value
WOOD PULP	MT					
MECHANICAL	MT					
SEMI-CHEMICAL	MT					
CHEMICAL	MT					
SULPHATE UNBLEACHED	MT					
SULPHATE BLEACHED	MT					
SULPHITE UNBLEACHED	MT					
SULPHITE BLEACHED	MT					
DISSOLVING PULP	MT					
OTHER FIBRE PULP	MT					
WASTE PAPER	MT					
PAPER + PAPERBOARD	MT					
NEWSPRINT	MT					
PRINTING + WRITING PAPER	MT					
OTHER PAPER + PAPERBOARD	MT					
HOUSEHOLD AND SANITARY PAPER	MT					
WRAPG + PACKG PAPER + BOARD	MT					
PAPER + PAPERBOARD NES	MT					

YEARBOOK OF FOREST PRODUCTS CLASSIFICATIONS

CATEGORY	FAO Code	Harmonized System revised	SITC rev. 3	SITC rev. 2
ROUNDWOOD	1861			
Coniferous	1862			
Non-Coniferous	1863			
FUELWOOD + CHARCOAL	1864			
Coniferous				
Non-Coniferous				
WOOD FOR CHARCOAL	–			
Coniferous				
Non-Coniferous				
FUELWOOD	1629	4401.10	245.01	245.01
Coniferous	1627			
Non-Coniferous	1628			
INDUSTRIAL ROUNDWOOD	1865			
Coniferous	1866			
Non-Coniferous	1867			
SAWLOGS + VENEER LOGS	1868	Ex:44.03	Ex:247	
Coniferous	1601	4403.20	Ex:247.4	247.1
Non-Coniferous	1604	*4403.30, Ex: *4403.90	Ex:247.5	247.2
PULPWOOD + PARTICLES	1870			
Coniferous	1608			
Non-Coniferous	1611			
PULPWOOD (Round & Split)	1614	Ex:44.03	Ex:247	246.01
CHIPS + PARTICLES	1619	*4401.20	246.1	246.02
WOOD RESIDUES	1620	4401.30	246.2	246.03
OTHER INDUSTRIAL ROUNDWOOD	1871	Ex:4403 & 4404	Ex:247	247.9
Coniferous	1623			
Non-Coniferous	1626			
CHARCOAL	1630	4402.00	245.02	245.02
SAWNWOOD + SLEEPERS	1872	4407 & 4406	248	
Coniferous	1632	4407.10, ex:44.06	248.2	248.2/248.1Ex
Non-coniferous	1633	*4407.20, *4407.90	248.4, Ex248.1	248.3/248.1Ex
WOOD BASED PANELS	1873			
VENEER SHEETS	1634	44.08	634.1	634.1
PLYWOOD	1640	44.12	634.3/4	634.2, 634.41
PARTICLEBOARD	1646	44.10	634.2	634.32
FIBREBOARD	1874	44.11	634.5	641.6
COMPRESSED	1649	*4411.10 & *4411.20	634.51/52	641.61
NON-COMPRESSED	1650	*4411.30	634.53/59	641.62
WOOD PULP	1875			
MECHANICAL	1654	47.01	251.2	251.2
SEMI-CHEMICAL	1655	47.05	251.91	251.91
CHEMICAL	1656	47.03, 47.04		
SULPHATE UNBLEACHED	1662	*4703.10	251.4	251.71
SULPHATE BLEACHED	1663	*4703.20	251.5	251.72
SULPHITE UNBLEACHED	1660	*4704.10	251.61	251.81
SULPHITE BLEACHED	1661	*4704.20	251.62	251.82
DISSOLVING PULP	1667	47.02	251.3	251.6
OTHER FIBRE PULP	1668	47.06	251.92	251.92
WASTE PAPER	1669	47.07	251.1	251.1
PAPER + PAPERBOARD	1876			
NEWSPRINT	1671	48.01	641.1	641.1
PRINTING + WRITING PAPER	1674	48.02 + 48.09	641.2/3	641.2/7/94
OTHER PAPER + PAPERBOARD	1675	48.03 + 48.14	641.4/9	Ex:641
HOUSEHOLD AND SAN. PAPER	1676	48.03	641.63	641.72
WRAPG + PACKG PAPER + BOARD	1681	48.04+.05+.06+.08+Ex:.10	Ex:641.4/5/6/7	Ex:641
PAPER + PAPERBOARD NES	1683	48.07+Ex:.10+.11+.12+.14	Ex:641.3/7/9	Ex:641

Forestry Statistics in FAO

Philip Wardle

INTRODUCTION

The programme in the area of forestry statistics has the function of collecting and disseminating basic information on the sector for all countries, promoting international standards in the collection of forestry statistics and fostering the development of essential statistical programmes within countries. In the area of analysis the programme has the function of providing an ongoing review of the performance and development of the forestry sector and providing an international perspective on the outlook for future development. The overall aim is to meet the needs of the international community and of individual countries for international information on the sector, essential for the formulation of sector policy, plans and investment programmes.

A current international priority is the provision of statistical and analytical information on the sector in support of the Tropical Forestry Action Plan.

COLLECTION AND DISSEMINATION OF STATISTICS IN THE FORESTRY SECTOR.

FAO is the only international organization collecting and disseminating statistical information on the forestry sector with comprehensive coverage of the sector and of all countries in the world.

A programme on forestry statistics and analytical studies has been carried out by FAO since its inception. The first Yearbook of Forest Product Statistics was published in 1947, the first Assessment of Forest Resources in 1948 and the first Regional Outlook Study, dealing with Europe, was published in 1953.

The basic statistics have been maintained and expanded in scope and published in the Yearbook of Forest Products. Additional series were added to cover pulp and paper capacities and wood-based panels capacities in the late 1960s. Forest Product Prices have been published on a regular basis since 1979.

Global, Regional and Sectorial Outlook Studies have been published periodically. These have been prepared in some cases in consultation with other international organizations e.g. Economic Commission for Africa (ECA) and on a regular basis with The Economic Commission for Europe (ECE). In recent years, the work has included collaboration with industry in the preparation particularly of outlook studies for the pulp and paper subsector.

FOREST RESOURCES ASSESSMENT

Forest resources appraisals on a global basis are a part of FAO's mandate. The first survey of forest resources was carried out in 1946 on the basis of questionnaires sent to all countries. Similar surveys provided information on world forests with 1953, 1958 and 1963 as reference years.

The last world-wide forest resources assessment was carried out with 1980 as the reference date. It was made of two parts: the FAO/ECE survey covering most developed countries, and the FAO/UNDP Tropical Forest Resources Assessment Project. This assessment was developed with a completely new approach.

The status and condition of the world's forests are a source of increasing concern to the international community. In keeping with its mandate FAO launched the current assessment for the reference year 1990 to provide current and objective information about the existing conditions of the world's forest resources. This information is needed by global and national level policy makers and scientists, and will support the Tropical Forestry Action Plan.

The work of the global assessment for 1990 is made of two main components: the survey of forest resources of the developed countries coordinated by the FAO/ECE Agriculture and Timber Division in Geneva, and assessment of the forest resources of the developing world, carried out by the Forest Resources Assessment 1990 Project at FAO Headquarters. There will also be a global synthesis of the results of these two assessments.

Principal Statistical Publications

The following are the main statistical publications:

- **The Yearbook of Forest Products** provides annual data on production volume and trade volume

and value for some 50 products and product aggregates, each edition covering 12 years.

- **Forest Product Prices** provides annual data for specified products and locations falling in 20 product groups from 70 countries. The data are also used to compile price indices.
- **Pulp and Paper Capacities** provides annually estimates of capacity and five-year forecasts of capacity development for the pulp and paper industry including product detail.
- **World Production Capacities for plywood, particleboard, and fibreboard** provides periodically estimates of capacity and production in these industries. The latest edition covers the five-year period to 1990.
- **The Monthly Bulletin of Tropical Forest Products in World Timber Trade** provides monthly data on the volume and value of imports of major consuming countries and exports of major producing countries as well as trading partner data. This is being further developed in conjunction with the International Tropical Timber Organization (ITTO).

Recent analytical publications include:

- **Forest Products World Outlook Projections** which reviews development of consumption and production of forest products from 1965-1986 and provides projections to the year 2000.
- **The Outlook for Pulp and Paper to 1995 (FAO 1986)** reviews consumption production and trade in pulp and paper and the perspective for development to 1995. An update for paper products prepared with assistance from the industry was published in 1990.

Dissemination

Apart from the publication of statistical series in the Yearbook, Capacity Surveys, Forest Product Prices and Forest Resource Assessments, there is a constant flow of requests for basic information from international organizations, national authorities, industry associations and governmental organizations, consultants and private companies. Forestry sector data is provided on a regular basis to UN Statistics Office, UNESCO, UNIDO, UNCTAD, ECE, ECA, ESCAP, ECWAS, World Bank, ADB, ITTO and World Resources Institute. Statistical publications are distributed on a regular basis to a network of forestry statistics offices in developed and developing countries.

International Standards in Forestry Statistics

The establishment of international standards an the development of methodology is carried out in consultation with statutory bodies and their subsidiaries and in collaboration and consultation with other international organizations such as UN Statistics Office, ECE, EEC, the Customs Cooperation Council and the World Bank.

Work on the development of standard approaches to statistical collection for the sector has included the development of the FAO Classification and Definitions of Forest Products. This is currently undergoing revision, particularly to include changes resulting from the introduction of the Harmonized System by the Customs Cooperation Council and Revision 3 of the UN Standard International Trade Classification. Contributions have been made to the development of SITC Rev.3 and to the UN Statistics Office initiatives on the development of manuals for environmental statistics and statistics on household activities. A recommendation on significant revision to the Harmonized System (HS) Chapter 44 relating to forest products is currently in preparation for presentation to the Customs Cooperation Council in 1991, as the introduction of HS, has caused the loss of important statistical information in this sector.

For the purpose of introducing world standard in the international collection of forest resource statistics in the context of international land use statistics, a common framework for World Forest Resource Assessment has been developed and published. This was prepared by the FAO Forestry Department and the Joint FAO/ECE Agriculture and Timber Division in consultation with the International Union of Forest Research Organizations.

Fostering Development of National Capability in Forestry Statistics

Development of National capability in Forestry Statistics has been tackled in three main ways. First, by the development of standard international enquiries which provide a minimum basis for national statistical collection. Secondly, specific missions to countries have had the objective of working with national forestry statistics offices to strengthen their system for collection of forestry statistics. Lately, this has included strong emphasis on the development of computer-based approaches. Thirdly, regional seminars and workshops on forestry statistics have been organized to support and extend the

capability of national staff in the field of Forestry Statistics.

Exchange of Data in Computer-readable Form

In recent years a new activity has been initiated to promote the exchange of data in computer-readable form between national offices responsible for forestry statistics and FAO. This activity has a number of objectives:

- to stimulate revised interest in the exchange of statistics;
- to assist in the establishment of consistent data within the country including consistent long-term series;
- to encourage regular updating of the series;
- to encourage dialogue between various statistical offices within the country concerned with forestry statistics, and between government and private sector bodies dealing with these statistics;
- to ensure a consistent framework for compilation and exchange of data within countries, and between the countries and FAO.

The method is to use the spreadsheet LOTUS 1.2.3. The questionnaire and validation framework is preformatted on the diskette which is provided to the national office by FAO. The national office enters the data and automatically checks it for internal consistency. This has several immediate advantages. Passive paper is replaced by the active electronic medium. Calculation and validation is integrated with the process of data entry. Once prepared in the standard format the data are transferable in electronic form without further intervention and thus eliminating the risk of copying errors. Above all, in practice, it has been found that the excitement of using a modern and interesting medium may both motivate and challenge the statisticians involved to achieve a good result. The interest of others involved in the methodology, for example in other departments, has stimulated the dialogue and has resulted in renewed willingness to exchange data within the country and to discuss inconsistencies and anomalies in the data.

So far, some 15 developing countries are actively participating in this activity.

Regional Seminars on Forestry Statistics

Regional Seminars have been held in the Asia Pacific Region in 1984 and 1989 and in Africa, for English-speaking participants, in 1989. A second seminar in Africa, for French-speaking participants, will be held in 1991 and a seminar will be held in Latin America for Spanish-speaking participants in 1992.

The seminars held so far have been invaluable in providing an opportunity for contact between forestry statisticians. They have generated recommendations on strengthening the organization and staffing of national forestry statistics units and on the development of international networks to bring support to the small national groups through contact from outside. They also generated valuable discussion on many technical aspects of forestry statistics collection.

A series of training seminars specifically concerned with tropical timber trade statistics is being carried out by ITTO in consultation with FAO.

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The collection and analysis of statistics on the production and consumption of fuelwood and charcoal

Neil Byron

SUMMARY

Most papers like this one would begin with "the importance of fuelwood". I accept that statement as well known already and incontestable, but adopt a "Devil's Advocate" position, questioning the importance of fuelwood surveys and statistics.

- Who needs the data and why?
- What types of data and to what level of precision?
- Is a new collection of data really warranted?
- What is the best method of collecting the required information?
- If a survey is chosen, how should it be designed? conducted? and analyzed?

There are many interesting technical aspects of the last of the above questions (statistical design, questionnaire design, the selection and training of field-staff, computer analysis, etc.). The author argues, from personal experience, that the objectives of the data collection must first be clearly formulated. If not, a great deal of resources, manpower and money may be misdirected (as has occurred in the past) because the preceding questions above had not been sufficiently considered and resolved.

For many purposes, Rapid Rural Appraisal may give better understanding of the relationships, at less cost, though probably with less statistical elegance. A well-executed survey will be more statistically reliable, but ONLY if it truly is well-executed – many surveys are not.

Furthermore, most fuelwood surveys have concentrated on consumption by rural people (and their share of the blame for deforestation, etc.). I argue that, if only for balance, we should be equally interested in their role in the production of woodfuels, a topic frequently overlooked, with some unfortunate policy consequences.

1. INTRODUCTION

The collection of statistics on the production and consumption of fuelwood and charcoal has often been rather haphazard and ad hoc in the past. Data are frequently used for purposes for which they were never intended and data have often been collected without a clear idea of how, why or even if they would be used. In this paper, we attempt to establish a systematic basis for the decisions about if, when, where and how to collect data on fuelwood supply and demand. However, from the outset it must be stressed (as Brokensha and Castro, 1983 also stressed) that there is no simple, universally applicable formula or pattern that can just be followed. I will argue that each data-gathering and data-analysis exercise, especially if through a large-scale and expensive survey or census, should be carefully and systematically thought through from beginning to end, before fieldwork begins. Without this there are serious risks of waste of manpower, time and money, in collecting numbers which may be irrelevant, useless or, worse still, misleading.

Rule 1: All numbers may not be data.
All data may not be facts.
All facts may not be wisdom.

The basic problem of measuring production and consumption was clearly stated by Arnold and Jongma in 1978. It is unfortunate that we seem to have little real progress over the last 12 years in resolving the issues that they so clearly identified then.

2. THE PURPOSE

There is often a presumption that information or statistics on the production and consumption of fuelwood and charcoal need to be collected through a survey. Not much serious thought is given as to why the information is necessary, what it will be used for, or what level of precision is required. Such

production and consumption statistics are not collected just for idle curiosity, or to fill in the blanks in governments' statistical publications.

Rule 2: If you are not going to use it, don't waste time and money collecting it! If a "ballpark" figure is sufficiently precise for confidently making the decisions required, then the expense of obtaining greater precision may not be warranted.

The need for new data and the degree of precision required will depend on the question under consideration. For international comparisons, or to highlight the significance of fuelwood use, broad national averages are sufficient. At a national level, these same data would be almost useless. To design a fuelwood plantation in a particular district, far more detail and local knowledge would be required.

The reason usually given to justify the expense of collecting data on the production and consumption of fuelwood and charcoal is that, in order to better plan for future needs, governments need to know more precisely the present status and trends. However, it could be argues that where the production and consumption of fuelwood is done almost entirely by rural households on a virtual subsistence basis, as in much of Asia, this may have very little connection with governments or Forest Departments. Such production and consumption has been going on for centuries as an entirely autonomous production system. The recent interest of Forest Services in monitoring and regulating such production raises some questions regarding the purpose of such monitoring and/or regulation.

It may be claimed that fuelwood production is coming from lands under the control of Forest Services and that uncontrolled exploitation of fuelwood is degrading the forest and the land. The evidence for this is, at best, debatable in many countries (Fisher and Gilmour, 1990). However this might be a starting point for determining the need for a fuelwood survey – not to find out how much fuelwood rural people use but what it is and where it comes from. If government forests are not under threat, the basis for state intervention might have to be reexamined.

There is now ample evidence, from many countries throughout Asia, of local forest management systems producing fuel and other products for local consumption with virtually no official recognition or assistance. If this is the case, WHO needs to know about current and future supply and demand for fuelwood. central planners or local people. Thus another possible explanation for the interest in fuelwood is that certain forestry organisations may have identified an opportunity for bureaucratic expansion through claiming a (potentially lucrative) role for themselves in the future production and trade in this socially important commodity.

A recent task force of the Government of India observed that wood would be the principal medium for cooking and projected annual demand of 250 million cu.m. of fuelwood by the year 2000 against a planned production of 100 million cu.m. The fuelwood shortage has reached almost crisis levels in many areas of the country. This shortage is putting pressure on forest resources causing damage to the environment and agricultural production potential in the long run. Even for the planned 100 million cu.m. production, more than 3 million hectares would have to be taken up annually for afforestation with a 10-year rotation and a required yield of 30 cu.m. per hectare. The task force expected that about 43 million hectares of area, which is presently classified as cultivable waste lands, fallow land under miscellaneous tree growth and permanent pasture and grazing land would have to be mobilized for additional afforestation. For this afforestation scheme, Rs.7,500 to 8,500 million, using an estimated cost of Rs.2500 per hectare, will be required.

Comment

This is one of many rather typical examples of the official view of rural people as CONSUMERS OF FUELWOOD – like a plague of grasshoppers or termites, the people are consuming the forests! Forest Departments may see themselves as having a virtual monopoly on the growing and protection of trees and wood. Thus they implicitly assume that they must heroically struggle to protect the forests and produce virtually all the required fuelwood, despite terrible odds.

This is, of course, totally inconsistent with much os the evidence. Most rural people throughout Asia and the Pacific produce far more fuelwood than they consume and far more than Forest Departments produce.

This logical inconsistency also leads to the absurd situation that governments must plan enormous, expensive fuelwood plantation programmes in order to meet the entire estimated rural consumption (thus

suddenly assuming that rural production will be zero!). So, while rural people themselves are producing and consuming X million cubic metres of fuelwood (mostly branches, lops and tops, scavenged deadwood, woody annuals and perennials, from private and common lands, the officials calculate how many thousand hectares of conventional plantations (producing 30 cu.m. per hectare of merchantable logs!) would have to be established to satisfy the total rural consumption of fuelwood. It is entirely conceivable that government intervention is completely unwarranted, particularly on such a large, commercial and centralised scale, when the rural consumers' demand is small-scale, decentralised and for smallwood, on a non-commercial basis.

3. WHAT SORT OF DATA AND WHY?

The significance of fuelwood and charcoal in meeting the energy needs of the rural (and often urban) people of Asia and the Pacific has been well-documented and is incontestable. There is sufficient evidence to suggest that this situation will continue for many years, even decades, to come. Other evidence firmly establishes that much of the total volume of wood used through Asia is used as fuelwood or charcoal and that this too seems unlikely to change in the foreseeable future.

However, this does not help us to decide what information needs to be collected now, where, by whom or how. Many surveys in the past have collected quantitative data on the volume produce or consumed. While this may be useful for other purposes, it might be far more valuable to know and understand more bout the relationships. Howe's 1987 work on fuelwood scarcity in Bangladesh, using Rapid Rural Appraisal techniques, provides richer insights into the nature, composition and determinants of fuelwood usage than the previous quantitative surveys. Not only did his RRA provide quantitative estimates, it also gave a sense of the longer term dynamics of production and consumption, the role of potential substitutes and the effects of prices and scarcities on production and consumption behaviour.

As Eberhard (1987) observed, we are caught in the dilemma between the anthropological approach of very detailed, intensive, localised qualitative surveys and the large-scale quantitative survey. The former puts the "brainpower" into the field, with a great deal of local knowledge, while the latter sends out junior (but hopefully trained) enumerators with pre-conceived questionnaires which hopefully concentrate on fewer, highly relevant topics.

It is now very rare for there to be a complete lack of existing information even though we might be very sceptical about the reliability of numbers. So before even thinking about designing another survey or census, a very comprehensive review of all existing data and literature is warranted and may avoid expensive errors.

A review may show that adequate information already exists and no new survey is required. More likely, it will reveal a terribly confusing range of prior estimates often varying more than ten-fold between the highest and the lowest (eg Donovan's (1981) summary for Nepal and Md.Nural Islam's summary for Bangladesh. We may conclude that some estimates are methodologically unsound or that the results differ due to other factors such as different households contacted, different seasons or different districts.

It can then be decided how new data collection can build on what is already known and be designed to incorporate existing knowledge, avoiding unnecessary duplication and focusing on priority aspects. Do we need more data on production, consumption or trade and transport, or perhaps on all three? Do we need a "snapshot" of the current situation or an understanding of longer-term dynamics.

Woodfuel production and consumption is one aspect of social behaviour in rural areas and, like all others, it is dynamic and constantly changing. By contrast, inferential statistics, and the predictions based on them, presume and require that relationships are constant. Perhaps the behaviouralist research methods such as participant observation and action research, or attitude surveys and market studies, are more relevant than the direct physical measurements of volumes of production and consumption at a particular time.

Example

What is the goal of our proposed data collection and analysis.

i. To find the average amount (volume of weight?) of fuelwood and charcoal used per household.

ii.

   a. What proportion does this represent of total household energy usage (however

measured?) – and perhaps, incidentally, what are the other sources of energy and how much of each is used?

b. What proportion does this represent of total household wood consumption/usage? – and, incidentally, what are the other usages of wood and how much of each?

iii. Do we need to know within one region, nationally, or to discriminate between North, South, East and West?

If, in answer to these questions we should get an answer such as:

"87% of rural households rely on fuelwood for 90% of energy consumption and national average consumption is 1.26 tonnes per household per year"

is this sufficient? Wouldn't we rather also know that:

the richest 10% – big landowners – use 3.6 tons per year

the middle income (30%) households use 2.0 tons per year

the poor and landless (60%) use only 0.5 tons per year.

Would we be interested to know that usage during the rainy season (4 months) is three-quarters of the annual total, at a rate of 240 kg per month compared to only 40 kg per month for the drier months?

OR

Those within 10 km of an "accessible" forest (however that may be defined) use three times as much as those living more than 20 km away from one.

OR

That 80% of the fuelwood used by rural households has been grown and/or collected on private lands, household fruit trees, etc.

OR (of course)

90% of those interviewed said that fuelwood production and collection is hard work and a problem (life generally is so for the rural poor!).

4. DESIGN THE OUTPUT

Before rushing out to collect quantitative data, it is essential to formulate some hypotheses, some expectation of what the data will confirm or deny. This is usually done only vaguely or implicitly. If it is made explicit, often it becomes apparent that some of the underlying assumptions are dubious.

Rule 3: Try to imagine what the final table of results from the data collection/analysis will look like: the tables, the conclusions, the policy decisions that might need to be made or revised as a result of the findings.

Is it sufficient to know that the national average fuelwood consumption per capita is 1.2345 cu.m. plus or minus 5% (or plus or minus 20%). Or is it necessary to be more discriminating, sorting out by regions, by socio-economic groups, urban or rural, those close to or far from forests?

Is it necessary to know about the source of wood, if we are studying and measuring consumption? Or the destination of the wood, if we are measuring production?

Are there some hidden problems of definition? Is all wood just wood? Do we include branches? Twigs? Stalks of Cajanus cajan or Sesbania bispinosa which are fuelwood but from woody annuals or short-lived perennials? Old construction wood and bamboo that is burnt when no longer useful? Can we assume that all the wood to be measured has comparable calorific content and are there major differences in moisture content that must be measured and corrected for?

5. DESIGNING THE SAMPLE

Having considered the nature of the questions that need to be answered, and assuming that all recommendations to try out RRA are rejected, we can proceed with the idea of designing a sample survey. In the past, the conventional approach has been to attempt to have a sufficiently large sample and a survey design that will yield the desired levels of statistical significance. This seems to me to be something of a myth or a mirage. In theory, if one knows the desired level of precision and the variance of the population to be sampled, it is possible to calculate the required sample size using a formula, for either a simple sample or a stratified sample. However, for fuelwood surveys, those two key items of information are generally missing.

This approach seems to reflect foresters' training in the biological world but, as Brokensha and Castro rightly observe, fuelwood consumption surveys (if done well) are really social surveys, not biological sampling. The purpose is quite likely to be to understand the socio-economic factors rather than to collect a single "hard" number. Unlike in biological surveys, probability sampling, such as random sam-

pling, may be decidedly non-optimal in a social survey. Both the sampled population and the problem being investigated may be unclear or poorly defined. Recording and dealing with people's behaviour is fundamentally different from counting trees as people have the right to non-response while trees cannot react to being surveyed!

Most fuelwood surveys (like traditional forest inventories) have used random sampling (with or without stratification) in which all units within the population have equal probabilities of being selected for measurement. This may avoid sampling bias but may result in a sample that is very widely dispersed and thus expensive and time-consuming to administer. Stratification, if done on an appropriate basis, can increase the overall precision and usefulness of the sample, while reducing the costs.

A more recent innovation in sample design is "cluster" sampling. In this, the choice of sample units within a specific stratum is by random selection of say 10 households surrounding each of perhaps 20 sample points, which have themselves been randomly or purposively selected within each of the strata. Although the random selection of points and samples retains the unbiasedness of the sample, there may be losses in precision due to increased sample variability, especially is only a few clusters are selected with many sample units in each. This technique can, however, result in significant cost savings which may make it possible to have a larger overall sample size which would not have been possible without clustering. (Having a larger sample size is not really an advantage but a disadvantage which leads to more data to record, code and analyze. Ideally we want the MINIMUM sample size.) The financial benefits of clustering will depend on the relative costs of the actual sampling within the village, compared to the costs of travelling between sample villages.

Systematic sample designs such as grid sampling are rarely used for fuelwood surveys and are unlikely to be either cost effective of statistically efficient.

Apart from purposive (non-random) sampling, as often used by social scientists, there are an array of new sampling techniques, generally called "variable probability sampling", such as PPS (probability proportionate to size) and Poisson-3P, which are used by either biologists or social scientists. These are much more efficient (greater precision, lower statistical sampling error, with a very small sample size and so lower costs). Unlike the conventional "equal probability" sampling where every unit is equally likely to be selected, variable probability sampling involves selecting relatively more of, and more infomration about, those units of most significance to our study.

If you have a preliminary estimate of the distribution of the characteristic of interest through the whole population, that can be used to weight the sample selection, and so find out more about the most important individual units. One can be most accurate about the major consumers and producers and rely on calibrated estimates for the minor participants.

It should be stressed that this is not just arbitrarily selecting more of the bigger consumers to sample (which would be biased) but rather a scientifically rigorous procedure which does not require more sophisticated computation and better training.

5.1 Stratification

The criteria for stratification may be regional, ecological or socio-economic differences in the population being sampled. Some prior knowledge is essential, to recognise which sub-divisions are likely to lead to distinctive, more uniform sub-populations.

For example, in the fuelwood consumption survey of the FAO/Planning Commission in Bangladesh, the data were collected and analyzed by Administrative Districts. Although there were major differences at the national level, it was thought that within each region there would be more uniformity (less variance) and so smaller sample were required than without stratification. However, while using the Administrative Districts may be useful for political decisions, subsequent reexamination revealed that there were much greater variations between different farming systems within each district than between different Districts. Similarly, a particular farming system had extremely uniform characteristics irrespective of which Administrative District it was found in. In other words, much greater insight and understanding could be obtained by stratifying households according to their type of land use, cropping systems and household behaviour (Farming System) than simply classifying them according to the District in which they live. This would have enable a much smaller and less expensive survey and would also have permitted the focusing of sub-

sequent policy activities according to the type of household in need, wherever they occur rather than just by District. Of course, at the time of designing the survey in 1978/79 there was no basis (apart from intuition) for realising that household production and consumption of fuel was closely related to land capability and farming system.

5.2 Sample size

Although much can be written on the theory of selecting the appropriate sample size to achieve statistical confidence level, in practice it often comes down to just " as many as we can afford to interview given our budget and manpower (see Practicalities below). Of the numerous fuelwood consumption surveys conducted throughout Asia and the Pacific in the past decade, there seems to have been no consistent basis for determining sample size. The range is from less than 100 to over 6 000 but usually much less than 1% of the population. As noted above, we may have wasted resources measuring and surveying more households than was necessary in some areas of uniformity and far too few in others.

5.3 Sampling frequency

As noted above, much of the information presently being circulated, quoted and republished has come from a small number of ad hoc, once-only, special surveys which collected fuelwood consumption estimates as a bi-product of surveys on energy-or wood-use or on women's workload (Cecelski, 1987). There seem to be very few regular periodic surveys covering the consumption of wood fuels and even fewer covering production. However, for strategic planning we need trend information from a series of repeated, comparable investigations. There are some (such as Howe, 1987) where the same few villages have been revisited 10 years apart, but these are very localised, rather than national monitoring efforts. Perhaps, in future, more surveys will be designed and implemented on the assumption of being repeated 5 to 10 years later. It almost seems as if, having calculated an estimate to show that national average fuelwood consumption per capita is very low, we either lose interest or initiate a new project for tree-planting or for improved stoves, hoping that the problem is thus solved.

Of course, if there is a national statistical organisation which regularly conducts surveys of rural production and consumption, it might be far more effective for foresters and planners to liaise with this organisation in order to get relevant questions included in regular census, rather than to conduct more of our own, independent once-only surveys, often using personnel who are inexpert in these matters.

5.4 Seasonality

There is now strong evidence from many countries regarding the seasonality of usage of fuelwood and charcoal and it may be crucial that sample data accurately reflect this. It is not sufficient to assume that annual consumption equals 52 times this week's consumption, but annual consumption is difficult to record and respondents' memories are probably unreliable. Thus at least 2 to 3 sampling visits within a year may be required. A possible alternative might be to measure households' fuelwood stockpiles, rather than current consumption. For example, if many households have accumulated significantly greater fuel reserves, or different types of fuel reserves (eg split wood rather than twigs, straw and dung or perhaps charcoal rather than wood) just prior to the onset of the wet season, we may learn something important about the seasonality of consumption and production behaviour.

5.5 Practicalities

Rarely are there enough trained enumerators ready and willing to conduct the sample survey which we have designed. As a result, the "grand design" is often watered down until we are left with the most comprehensive sample that is practicable. Apart from the obvious constraints of time and budget, manpower or, perhaps more importantly, woman power may not be available for the rigorous field work and difficult travel necessitated by out intention of sampling even the poorest and most remote households. Perhaps ideally, at least half of all respondents to a woodfuel survey should be women and, in many cultures, it may be socially or culturally difficult for male interviewers to approach women fuel-users.

Our intention may be to sample during 3 different seasons, but we eventually find that, during the rainy season, all the roads are impassable while in another season all rural families are far too busy sowing or harvesting their crops to "waste time answering some foolish questions about fuelwood for some government officials".

Alternatively, we may find that the results from

one district are not comparable with the results from a similar district taken 3 months later in a different season. If we are reasonably sure, in advance, that the two areas are indeed similar, it may be more useful to deliberately survey the same one twice, to assess seasonality factors, rather than have the complication of different districts.

6. DESIGNING THE QUESTIONNAIRE

In considering the design of a sample questionnaire, the main aspects are the content, the format and the wording.

There are many different types of questionnaire, but a basic distinction is between "closed" and open-ended. Closed questions merely require the respondent to answer with a number, a yes or no or one of five or six multiple-choice answers. This is very easy in the field and greatly facilitates computer coding and analysis of replies. Unfortunately, it is a very inefficient way of gathering **understanding**. It presumes the problems and question are clearly defined and that there can be no alternative interpretations of the issues.

Open-ended questions invite longer, more discursive replies during which all sorts of original insights might arise, suggesting new questions the questioner might wish that he had asked. Unfortunately, such answers are extremely difficult to code for numerical or statistical analysis by computer, unless some very sophisticated software from social science surveys is available.

The wording of a closed questionnaire should be quite precise, so that there can be few errors introduced by different phrasing or interpretation by the enumerators. Moreover, training should attempt to standardise the verbal and non-verbal presentation of the questions.

It is also extremely tempting, when designing a closed questionnaire, to think of all sorts of additional questions that it might be interesting to ask, or to try to cover all eventual possibilities. However, it must be born in mind that the respondent is unlikely to be as interested or motivated in answering questions as the questionnaire designer is in asking them. Many experts have suggested that 45 minutes to one hour is the maximum duration for a survey questionnaire. Even this may strain the patience and attentionspan of the respondent, particularly if he/she does not really see the relevance or usefulness of the questions or the survey.

Given that our purpose is to obtain only the information that is really relevant and necessary for the specified objective, and to do it as quickly, cheaply but reliably as possible, asking the right questions and utilising all available background information to avoid asking the obvious or the unanswerable, it should be possible to reduce the questionnaire to under 30 minutes.

A fundamental issue is whether to record the enumerators estimate of consumption, the respondent's estimate (recall or memory), some direct measurement, or a combination of all three and likewise for fuelwood and charcoal consumption. Surveys that rely solely on recall have consistently been shown to be very imprecise, partly because the respondent may not actually know how many killogrammes or cubic metres are used per day or per week. (How many peasant farmers use these measures at all and certainly not for fuel!) Further, the respondent may not reply truthfully even if he/she could, for fear of how the information may be used by officialdom, or particularly if some of the fuel has been obtained without authorization. Compounding both of these factors is the natural tendency of many poor farmers to tell the visitor whatever they think the visitor might like to hear.

Estimation by trained enumerators can be useful. It does not matter if the estimates are consistently high or low, as long as they are consistent. The estimates can then be adjusted according to a small number of calibration measurements.

To accurately measure and record fuelwood and charcoal usage by rural households can be difficult and time consuming and still may not give the information sought. For example, some surveys have weighed "average" headloads of fuel, although these might be extremely variable. In others, a measured quantity of fuelwood has been set aside, and the surveyors determine how many meals, days or weeks that quantity lasted. However, there is a serious probability that the fact that a survey is being conducted will cause people to use less fuelwood than normal. The existence of the survey in itself causes bias.

If the household is basically self-sufficient for fuel, the number, source and type of tree (and shrubs, bushes, woody annuals) might be recorded as a cross-reference to the consumption estimate. As noted above, the source of fuel may be more important in policy terms than the physical volume or mass.

The questionnaire should clearly distinguish between a precise answer of "none or zero" and non reply or does not know as these often have very different meanings.

6.1 Pilot testing

Any survey questionnaire must always be pre-tested, preferably by those enumerators who are going to do the fieldwork, in order to validate and verify that the questions do make sense to the interviewees and can be answered sensibly. It is also a very good training experience for the field staff, to practice their approach and delivery of the questions. It is well recognised that the answer received can be greatly influenced by the manner, posture, tone of voice, coaxing or introductory comments of the interviewer.

The pilot testing will also reveal whether some questions should be deleted and whether some need to be clarified or added. Finally, the mechanics of the exercise, such as how long it takes to record certain answers, how long the whole interview or measurement or recording takes, whether the interview form is too cumbersome or bulky to manage, can be checked and later improved.

7. DATA COLLECTION – THE FIELD IMPLEMENTATION

The actual collection of information in the field may seem to be the central and fundamental stage of the whole process, but if the preceding steps have not been done thoroughly. this will just be a huge waste of time and money.

So let us assume we have gone through all the above steps, we have designed a draft questionnaire and a sampling design for a national fuelwood survey. Perhaps a sub-contractor is to be appointed to administer the field work or perhaps it will be done by regular departmental employees. In either case, a detailed briefing and training will almost certainly be required.

In training, the importance of the survey and field staffs' crucial role in it should be emphasised to them. If possible, a comprehensive survey manual should be prepared and issued to field staff as a guide to the intent of questions and to the interpretation of possibly ambiguous questions and answers.

In selecting field staff, technical competence is unlikely to be a major consideration. It is far more important to be able to put people at their ease and collect truthful information and record responses neatly and accurately, than it is to understand silviculture and statistical theory.

Training should include practice in delivering the questionnaire, not only with helpful and responsive respondents but also with uncooperative individuals who will inevitably be encountered during the survey.

Supervision in the field is very important. We have all heard stories of questionnaires that were all filled out by the fieldworker while sitting in a tea shop or under a shady tree. Part of the training programme should include alerting fieldstaff to the fact that supervisors may be making unannounced spot visits to any sample village at any time and that there will be follow-up re-interviews of a 5% or 10% subsample 2 months after the initial interviews. This should be explained not as a threat but as an integral part of the survey checking and validation procedure, and it should be done with the same thoroughness as the basic survey.

The issue of non-response in such social surveys has already been mentioned and, to a limited degree, can be compensated by substituting other respondents. However, if more than say 5% of selected samples are unavailable or unwilling, follow-up procedures may be required. This would be particularly important if there is any basis for suspecting that those non-respondents share certain distinctive features not found among the rest of the sample (eg ethnic group, landless, or female heads-of-household).

Debriefing of field staff after the completion of the survey is also very important and potentially very useful. After all, these staff have been out in the field talking to rural people about fuel for months and, if they are at all intelligent, they will have made some observations of their own about what is happening and why or about striking differences they noted between different regions or types of households visited. One way of eliciting this is to ask field staff to talk about some of the most unusual things they saw or people they met. A great deal can be learnt by considering the exceptional cases: the largest and smallest landowners, the families that owned the most and the fewest trees, the areas that were treeless but where everyone seemed to manage (by using something else).

8. DATA PROCESSING

It must have been assured or assumed that the data processing capability existed to deal with the vast amounts of data to be collected, in the form in which it is being collected. If the questionnaire design did not take into account how the data would be processed and analyzed, it is a formula for failure.

There have been instances where it was assumed that, because a computer facility existed with apparently appropriate hardware, the sample interview forms could just go to the computer department and answers would come out. There are many crucial and complex steps between the completed questionnaire form and the computed results. These require almost as much time and effort as the planning phase or the fieldwork phase.

During the planning phase, we should be thinking about how the answers will be analyzed, what sort of cross-tabulation may be desired (eg fuelwood consumption x socio-economic group x District) and what statistical packages or computer software exist and are available that can do so.

As each set of completed survey forms arrives back at the office there should be a system in place for doing the following:

i. checking for obvious recording errors and for exceptional or unlikely responses, so that the field worker can be asked to immediately correct or confirm or, if necessary, re-interview.
ii. unless the questionnaire has been carefully designed and the enumerators well-trained, it is quite likely that certain answers will be in different units (eg acres, hectares, rai (Thailand) or bigha (India/Bangladesh). Weights may be in pounds, killogrammes, seer, maunds, etc.). All units of area, weight, volume measure and possibly prices need to be standardised.
iii. coding the responses into a form suitable for quantitative analysis by computer. The design of such coding is a linkage between the types of results expected from the analysis and the way the questions were designed.
iv. independent checking of the coding of responses is generally a useful phase here, depending on the ability and experience of those who did the initial coding.
v. the actual data entry into the computer is another potential source of errors, although it is possible for a competent and experienced programmer to write a small programme that will automatically check that data input is within certain ranges, in order to check against coding and data-entry/typing errors. Previously, data were first punched onto cards or paper tapes, but now it is increasingly common for data entry to be direct from the coded sheet or even from the coded questionnaire itself, into the computer memory.

The data-processing phase is thus likely to involve many people (editors, coders, programmers and machine operators) all of whom must be available, well-trained and competent. In the excitement of designing and implementing a survey it is easy to overlook this. Suitable hardware (many micro-computers (PCs) can now cope) with input and output peripherals are required, as is the statistical tabulation software. Many foresters and forestry sector planners in the past failed to fully appreciate these requirements until it was too late.

9. ANALYSIS AND REPORTING

Assume that our computer now contains all the coded replies to 55 questions from 5000 households all over the country. Our task is to analyze the data and prepare reports which will both represent the quantitative results and interpret the findings.

If our initial survey and questionnaire design were carefully attuned to our specific objective and our preliminary hypotheses about who uses how much of what, when, where and why, then the interrogation of the data base and interpretation of the statistics will be relatively easy.

Unfortunately, it sometimes happens that the whole exercise ends at the point where millions of numbers have been entered into a computer.

The nature of the results might include:

- numbers of respondents in each category and percentage.
- the total and mean (area, volume, weight, number of trees).
- the range of values corresponding to each mean.

For example, in regard to our hypothesis about different socio-economic groups in each region using different amounts and types of fuelwood from different sources, we might set up the following series of tables:

i. For each Region and for each of the following four socio-economic groups:
   - large landowners
   - middle landowners

- small landowners
- landless

the following:

a. the number who produce their own wood fuels
b. the number who buy their woodfuels
c. the number who collect elsewhere.

ii. For each of the groups a), b) and c) we might wish to know:
- mean annual consumption
- maximum and minimum annual consumption (range)
- the % composition of consumption whether

1. split wood from stem and large branches
2. small branches and twigs
3. other biomass.

There are many other formats in which the same or similar information might be extracted. For example: "Of those who use over 1 cubic metre per year, what is their socio-economic group and what is the major source of their woodfuels?"

In practice, only the most basic summary tables seem to be extracted, such as average consumption per district and per socio-economic group. This represents a mere fraction of the amount of data collected at such expense and effort. If the survey has been planned and executed well, and the data are thus reliable, we have an obligation to use it fully. If the data are not reliable, then perhaps we should not even have bothered with the summary tables.

An important part of the analysis is to compare our tables of results with previous studies, and to ask for informed comment from other experts, practical foresters, rural development workers, etc. before finalising our written report. This is one more validation step in the quality control process to ensure that the findings presented to decision-makers are as comprehensive and reliable as possible.

10. CONCLUSIONS

The major conclusions that I wish to emphasise in this paper are:

i. The need for a logical framework for the whole exercise, from inception to reporting. What do I need? What is the most effective way of doing that? Can I be sure that if I do A, B and C then D, E and F will result? What could go wrong? Where are the weak links in the chain between sending out interviewers with questionnaires (the input) and getting the desired reliable results? In the case of fuelwood surveys, there are many weak links and many aspects that could easily go wrong!

ii. The usefulness and relevance of the results depend on ALL phases of the exercise being correctly and thoroughly completed. A breakdown at any point may lead to a final result that is nonsense. The organisers must therefore monitor the exercise carefully. If it should become apparent that the wrong questions are being asked or that the data are faulty, it may be better to abort the whole exercise rather than spend more money processing and analyzing meaningless numbers.

iii. The design and execution must at all times attempt to minimise errors and bias in both the design and execution – in the sample design, in the questionnaire design, in the filed collection, in the choice of respondents, in the timing or season of fieldwork, in the handling of completed survey forms, in coding and data entry and in the final analysis and report writing.

iv. There is no standard recipe for "How to conduct a woodfuel survey". The appropriate design and method depend on the specific features of the country, the specified objectives of the survey, the required precision and the available resources (including funds, trained manpower, computers with relevant software, etc.) The most useful information from a survey may not be the number of cubic metres or tonnes produced or consumed, but the insights about how a particular society manages and utilises its scarce woodfuel resources.

11. CHARCOAL

The situation for charcoal is generally slightly different than for fuelwood, tending to be more formalised and commercially oriented, though still undertaken predominantly by the "informal" sector. Unlike fuelwood, it is less likely to be produced for purely household or subsistence use (although Paya et al, 1988 have shown in their comprehensive study,that it is heavily produced and used within households in Northern Thailand during the wet season).

There are many phases of the production-consumption process, and so many different points at which data can be collected: roundwood output, charcoal input from kilns, transport, marketing,

wholesalers and final consumption.

Experience suggests that the best way to gain a comprehensive picture of the charcoal "industries" is to conduct sample surveys at each level of the process, in a number of locations and then try to put together the pieces of the puzzle into a consistent pattern. However, it is important to recognize that to do so requires much more information than just quantitative data on inputs, conversion efficiencies and tonnage of out-turn.

The relationships between activities, the structure of the markets, the proportions being used "at home" compared to the proportion being sold, the proportion used domestically as compared to industries and restaurants, etc. Thus the Rapid Rural Appraisal technique may lend itself to the study of charcoal, much more than the large numerical survey might. It is unlikely that all the sample data will immediately fit together to give a complete and consistent picture the first time, but at least the major areas of uncertainty should become apparent, as a basis for follow-up study and verification.

For example, we might undertake an aerial reconnaissance to estimate the number of active kilns, and knowing their average capacity and number of loads per year, calculate an estimate of production, followed by field verification.

We might estimate the area of (mangrove) forests cleared over the past ten years, thus the approximate volume of wood removed and compare this to our estimate of kiln capacity and production. Alternatively, working backwards, what area of forest would have been needed to produce that much wood for kilns and does that seem plausible.

It is relatively easy to technically sample charcoal kilns to assess the range of, and average, conversion efficiency.

We might count the number of sacks of charcoal being transported by trucks and buses along the highway, to see what rough proportion of the estimated production goes to urban areas.

A sample of charcoal sellers in the towns and cities might provide evidence of the number of sellers, the sales per week, the seasonality of demand, and who the major consumers are.

A sample of final consumers — rural households, urban households, restaurants, craftsmen and small industries — might give indicative consumption levels for each.

Why do we need these data? What is the policy relevance? What will the government Planning Commission or Forest Department do with the results of such an analysis?

If there is concern about the depletion of wood resources, options for action might include the following:

i. encouraging increased private production of wood to go to kilns (where, and who will pay?)
ii. increased efficiency in conversion
iii. demand modification, depending on the availability, price and acceptability of substitutes (who are the users? where are they located? can they convert to other fuels?)

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Appendix 1

Measuring wood fuel use

The scarcity of quantitative information about the use of fuelwood and charcoal in developing countries is mostly due to measuring problems: because fuelwood is cut and gathered locally by members of the household that will use it, the whole cycle of use goes largely unrecorded. Very little of it appears in production records. Very little of it passes through commercial channels or moves through transport systems which maintain records. Therefore, the only way to measure this activity is at the place where fuelwood is consumed. In fact, all the information in Table 2 was obtained through consumption surveys of one sort or another. Such surveys can be carried out only on a light sample basis because consumption is dispersed very widely and thinly. The design of accurate sample surveys can be difficult when, as is the case here, very little is known about the pertinent characteristics of the population to be sampled.

Other measurement problems arise from the physical characteristics of fuelwood: it is difficult to measure the volume of stacks of small, irregular pieces of wood; and the relationship between volume and weight, which can be assessed more readily, will vary, often appreciably, with species, moisture content, etc. Moreover, use tends to vary with the season of the year. An accurate assessment would therefore require continuous or repeated measurements throughout a twelve-month period. This is why the estimates in Table 2, which were extrapolated from measurements take at one particular time, cannot be expected to be very accurate, as is suggested, for example, by the two sharply differing Tanzanian estimates.

TABLE 1

Energy budgets of prototypical composite villages in different regions.

Unit: million kilocalories/ caput/year[1]	Bihar, India	E.Hunan, China	Tanzanian plateau	North. Nigeria	North. Mexico	Bolivian Andes
Organic fuels						
– wood fuel	0.25		5.50	3.75		8.33
		5.00			3.57	
– other[2]	0.75		–	–		–
Commercial energy	0.04	0.87	–	0.03	9.19	–
Human energy	0.75	0.75	0.75	0.71	0.89	0.83
Animal labour	1.88	1.25	–	0.18	1.78	2.50
TOTAL	3.67	7.87	6.25	4.67	15.43	11.66
– domestic use	1.00	5.00	5.50	3.75	4.25	8.32
– agricultural use	1.82	2.07	0.57	0.72	10.25	1.68
– other[3]	0.85	0.80	0.18	0.18	0.90	1.65

Source: adapted from Makhijani and Poole. Energy and Agriculture in the Third World, Ballinger, Cambridge, USA.
[1]/ All data refer to gross (inout) energy.
[2]/ Animal dung and crop residues.
[3]/ Transport, crop processing, etc.

TABLE 2

Pattern of consumption of wood fuels in selected countries

Country	Year	Average use per caput/year m^3	as charcoal %	for household use %	for urban use % of total household
Gambia	1973	1.61	26	85	25
India	1970	0.38	–	–	–
Kenya	1960	1.00	6	98	–
Lebanon	1959-63	0.17	37	98	20
Sudan	1962	1.66	42	98	15
Tanzania	1960-81	1.14	–	97	3
	1968-69	2.29	3	93	4
Thailand	1970	1.36	46	91	12
Uganda	1959	1.53	–	92	–

Appendix 2

Decision tree for woodfuel surveys

1. Define the problem, the need, the geographic scale, and the required precision.
2. Check all existing sources and relevant literature.
3. Check, redefine and clarify problem.
4. After completing steps 1-3 (once), does the existing knowledge need to be updated and extended?
   IF NOT, STOP.
5. Is Rapid Rural Appraisal more suitable?
   IF YES, CONDUCT RRA and related long-term social, anthropological studies supplemented by small surveys.
6. Is there sufficient information to stratify population?
   IF NOT, GO BACK TO STEP 2.
   IF STILL NOT, CONSIDER STOPPING.
   OTHERWISE, REPEAT STEPS 1-5.
7. Estimate sample size required and calculate budget required.
   or, Given budget, calculate number of sample units possible.
   Do either 7a or 7b seem plausible?
   IF NOT, REPEAT STEPS 1-5.
8. Are trained enumerators and data-processors available?
   IF NOT...

8a. Could they be trained or recruited?
   IF NOT, REPEAT STEPS 1-5.

8b. IF YES, COMMENCE TRAINING/RECRUITMENT.

9. Design draft questionnaire.
10. Is pilot testing OK?
    IF NOT, REPEAT 1-4, THEN REPEAT 9 & 10.
    IF STILL NOT, STOP.
11. If funds are available, staff trained, timing and seasonality OK, commence fieldwork and related supervision.
    IF UNSATISFACTORY, STOP OR RETURN TO 1.
12. Data processing: checking, editing, conversion, coding, entry and validation.
    IF UNSATISFACTORY, CORRECT AND GO TO 13.
    IF NOT CORRECTED, STOP.
13. Conduct statistical analyses and prepare tables of results.
14. Compare with initial hypotheses, previous results, local expert opinion and other countries' studies.
15. Return to step 1. Is further infomration still required?
    IF NOT, SUBMIT REPORT.
16. Conduct follow-up studies, RRAs, debriefing of field staff and spot survey as required.
    SUBMIT REPORT.
17. BE CONGRATULATED.

Non-wood forest products in the Asia-Pacific Region: an overview

Y.S.Rao

1. WHY NON-WOOD FOREST PRODUCTS (NWFP)?

More commonly known in several developing countries of this region as Minor Forest Products, products of the forest other than timber/wood have come to be relabelled in recent years, at least in some international circles, as non-wood forest products. Underlying this "name change" are reasons with more potent logic than a simple addiction to semantic nuances. We may even speculate that the unfolding global environmental crisis has certainly something to do with the growing recognition that the so called MFP are indeed very important products deserving rechristening.

Although foresters never ignored NWFP and had always paid attention to their management together with wood, such attention as was paid was never more than of a routine nature. It is the modern, conservation-minded scientists who seem to have "rediscovered" the products other than wood. This rediscovery fitted with the ethos of the times: as "reserved forests" are getting converted into "removed forests", it is time that the world moves to a phase where the thrust of forest management is not solely directed towards "harvesting the trees" but is equally and seriously concerned about appropriately managing the "harvest of the trees".

Faced with the inevitable challenge of finding practical measures for promoting sustainable development, some countries regard their ability to mobilize NWFP as the key test to their ability to manage forest resources in a sustainable way.

Forests and the people living near the forests form an interlocking natural resource/human eco-system. The concept of sustainability is realizable only when the local communities perceive and benefit from conservation and utilization of the resources around them. It is in this context that development of NWFP is a legitimate area of concentration for foresters in the future.

To developing countries in this region NWFP provide considerable opportunities for local employment and incomes. Local craftsmen, small-scale artisans and cottage industries depend on forests for bamboo, rattan, beedi leaves, (Diospyros melanoxylon) tannin materials, etc. Rural people also draw upon the forest for food such as honey, a wide variety of tubers, fruits and leaves and bush meat.

The forests of the region, in view of their heterogeneity and numerous multi-purpose species, can be considered as a veritable land bank for NWFP. Increasing the potential contribution of these products to domestic economies and world trade poses a challenge to the forestry profession.

2. WHAT,WHERE, AND HOW MUCH OF NWFP?

This topic is the reason why we are discussing this subject here today, in a gathering of forestry statisticians. The numbers on NWFP are scarce. A brief overview of the importance of NWFP to the countries of this region is probably in order.

2.1 Bangladesh

Many NWFP are extracted from the forests of Bangladesh. Based on data supplied by the Forest Department of the country, but not in any systematic way, the following estimates of annual production

Products	Quantity	
- Golpatta (leaves of *Nypa fruticans*)	70000	tons
- Honey	300	tons
- Wax	100	tons
- Cane	50000	metres

Estimated annual production of bamboos (1980s)

Source	Bamboos ('000 tons)
- Government Forests (recorded)	150
- Homesteads	800
- Other sources	50

during the 1980s were developed.

In Bangladesh, bamboos support the rural economy in several ways. More than the forests it is the homesteads that provide four- to five-times higher numbers of bamboos, especially for use by the rural population.

2.2 Bhutan

In Bhutan there is one rosin and turpentine factory which receives its raw material from the extensive chir pine forests in the lower elevations of the country. In several parts of Bhutan distillation of lemon grass derived from the forests is an additional source of income to the rural people.

2.3 China

China has developed a classification for its NWFP output which fits its unique resources. Six categories of NWFP are recognized:

i. Edible oils (olive, Thea oleoss, etc)
ii. Industrial oil (tung oil, jojoba, etc)
iii. Edible fruits (chestnut, walnut, etc)
iv. Spices/flavouring agents (pepper, cinnamon, etc)
v. Medicinal herbs
vi. Industrial NWFP (resins, lac, etc).

Output statistics show that in addition to the above, wildlife products and raw silk also are among the important NWFP of China. Resin, oil seeds and lac appear to dominate the NWFP scene in China.

2.4 India

The experience of India in organizing the collection of NWFP at the local level is enormous. State governments maintain statistics which are seldom communicated to the centre and hardly any data at national level are available. Several states have established cooperatives to organize NWFP collection by the tribal population. Often, the tribal welfare departments maintain NWFP statistics. The range and quantities of NWFP collected in India are vast. Estimates of the more important NWFP, based on averages for 1980s are given below:

Product	Quantity ('000 tons)
Bamboo	3000
Tandu petta	300
Gum karaya	10
Resin	50
Sal seed	700
Mahua seed	100
Myrobolans	100
Katha & cutch	5
Palmarosa	50
Blue gum	150
Sandalwood	150
Lemon grass	800

2.5 Indonesia

Indonesian forests abound in a variety of NWFP, the most prominent among which is rattan. Estimates of annual exported quantities of some NWFP during the 1980s are:

Product	Tons	
Rattan	70 000	
Bamboo	6 000	
Nutmeg	9 000	
Resin	5 000	
Cassia bark	6 500	
Illipe nut *(Shorea)*	4 100	
Copal *(Agathea)*	500	
Turpentine	300 000	liters
Kayuput oil *(Malalenca)*	200 000	liters

2.6 Korea

In Korea (Republic of) NWFP statistics are collected in a systematic basis for 10 product groups which include a variety of products such as bamboo,mushrooms, resin, tannin, medicinal plants and fruits/nuts.

2.7 Malaysia

The NWFP of Malaysia include rattan for furniture and basket making, bamboo for panelling, baskets and handicrafts, damar, resins and gums from several tree species for the manufacture of varnish and finishes.

2.8 Myanmar

The forests of Myanmar are capable of yielding a very wide range of useful NWFP. Roughly, there are about 30 different products and the most important ones are:

- Bamboo: by far the most important among the NWFP in Myanmar. Annual production for trade and domestic uses by the local villagers is estimated at about 3 million tons.
- Canes: found throughout the moist forests of

the plains and lower hills. They are used mainly in the rafting of timber, wicker work and the furniture industry. There are about 30 different species of canes of which only a few are of economic importance. Annually about 60 to 70 million pieces are taken out from various parts of the country.

- Cutch: a water extract of the wood of Acacia catechu. It is a tan as well as a dye. The production of cutch forms an important local industry in central Myanmar. The annual production is around 360 metric tons.

2.9 Nepal

In Nepal, rosin and turpentine are the most important among the NWFP. Two factories were set up with an annual production of 3,000 and 6,000 tons on east and west sides of Karnali river. Medicinal plants are collected and either used directly by the local population or sold through contractors. Katha, cutch, myrobolans (fruits of Terminalia) honey, gums, skins, hides, and lemon grass oil constitute the other NWFP in the country.

2.10 Pakistan

In Pakistan, rosin and turpentine are important industries. There are three factories currently operating (Mirpur in Azad-Kashmir, Jhello in Punjab and at Haripur in N.W.F.P.). Resin production in Pakistan varies between 4000 to 5000 tons annually.

2.11 Papua New Guinea

In Papua New Guinea the important NWFP are resins, copal, rattan, *Mentha arvensis* (mint), Calophyllum nuts and cinnamon oil. Wildlife is very important as food for the rural people. Two crocodile species *(Crocodylus porosus* and *C. novaeguineae)* form the main cashorop for many villages. They are captured in the wild or the eggs are collected and raised. The skins are sold mainly for export. Major areas are the Fly river basin, the Gulf area and Sepik river basin. On an average, annual earnings may amount to US$500 000.

2.12 Philippines

In the Philippines, rattan and bamboo cottage industries are playing a significant role in maintaining the local economies. Currently, rattan is being imported to meet the needs of local furniture industry.

2.13 Thailand

A number of NWFP are collected in Thailand. The more important ones are: bamboo, canes, resin, cutch, honey, camphor, etc.

3. ROLE OF FORESTRY STATISTICIANS IN PROMOTING NWFP

Forestry statisticians have an important role to play in providing data and in advising policy makers and planners in evolving a viable strategy for accelerated promotion of NWFP. The rapidly declining forest resource base has a profound socio-economic impact on forest dwellers and local communities who depend on NWFP for a living. To remedy this situation development interventions are needed at the national level. These can be catalyzed by establishing a sound data base on which informed decisions can be made. Towards this end forestry statisticians should be able to set up systems dealing with:

- Classification of NWFP
- Methods of survey and measurement
- Institutional mechanisms for collection of production data
- Standardizing the forms for collection of data at the level of gathering of raw material, intermediate processing, final processing and marketing
- Establishing a time series data on prices of more important NWFP
- Monitoring exports/imports in volume and value terms
- Collection of data on employment in NWFP related activities
- Assessing the economic value of NWFP and their contribution to the national economics.

Collection and administration of production/trade statistics regarding non-wood forest products in Asia and the Pacific

Peter May

1) Data on non-wood forest product (NWFP) production and trade will be essential to efforts toward natural forest resource management, project development and market prevision.
2) To date, statistics on production generally are lacking in consistency and reliability in the Asia-Pacific region as a whole, although some individual nations' procedures for data collection are more sophisticated or complete than others (e.g., N. Korea).
3) Trade statistics are usually of somewhat better quality, due to bills of lading and import/export permits providing a concrete source of data. However, such statistics exclude large bodies of products that do not enter significantly into trade channels, or group them in categories that do not serve useful for planning or analysis purposes. For example, naval stores and resins not identified as to species source provides little indication of trends in the industry or resource; medicinal or aromatic plants grouped generically rather than separately by species of origin; etc.
4) There are significant problems of data leakage/inaccuracy owing to contraband, fiscal erosion, inadequate measurement/sampling techniques. If fiscal data collection is the primary source of data, it is best to multiply the production by some factor to reflect leakage. It is best to base estimates on guesses by local traders of the proportion shipped without reporting (also presumably underestimated), data on final product output from industrial sources converted to raw material equivalent, etc.
5) For development of new product markets, it is important to adequately gauge output, quality characteristics, seasonality, storage requirements, etc. as they influence prices and volumes demanded. Survey research on specific products entering local markets is necessary to complement trade statistics to develop product profiles. Methods for assessing production and consumption conditions and the importance to household income formation of NWFP at the community level are provided on the attached list. Sources refer to publications which used mentioned methods in S.E. Asia, based on de Beer and McDermott (1989).

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Non-wood forest products: exploitation and marketing in Karnataka State, India

S.Sunder Someshwar

1. INTRODUCTION

1.1 Topography

Karnataka State is located in south-western India and has a land area of 192 204 square kilometres. Topographically it is made up of a narrow coastal strip along the Arabian Sea, a mountain belt running parallel to the coast and rising up to about 1 000 metres, and gently inclined plateau which drains towards the east. The rainfall varies from 5 000 mm per year in the west to 375 mm per year in the north-east, resulting in a diversity of vegetation types. Most rainfall is received during the south-west monsoon from June to September.

1.2 Forest types

The legally constituted forest area of the State is 3.8 million hectares. In the west, where population pressure is least, there is 3-to 5-tier evergreen and semi-evergreen forest of up to 40 metres. A multitude of species are found in this area including ebony *(Diospyros ebenum)*, white cedar *(Dysoxylum malabaricum)*, pepper, cinnamon and cardomum. The geological structure, exposed aspect and lashing rains have resulted in enclaves of grass land within these forests which are increasing in area because of fires.

To the east of this zone is found moist deciduous forest rising to a height of 30 metres, made up of teak *(Tectona grandis)*, rosewood *(Dalbergia latifolia)*, Indian laurel *(Terminalia tomentosa)*, *Pterocarpus marsupium, Laegerstroemia lanecolota, Albizzia* spp. and bamboo *(Bambusa arundinacea)*. These forests are of high economic value. The damage to these forests from grazing, fire and collection of firewood is of mid-intensity, between that faced by the evergreen forests to the west and the drier forests to the east. The wildlife in these forests includes elephant, tiger, panther, bison, sambar, spotted deer and others.

The next belt to the east, which is further degraded but still left with some vestiges of forest, is dry deciduous forest rising to a height of 10 metres. It is predominantly made up of *Anogeissus latifolia*, teak, *Terminalia* spp., *Hardwickia binata, Buchanania latifolia, Phyllanthus emblica*, sandal *(Santalum album)*, and bamboo *(Dendrocalamus strictus)*. If protected, the zone could be rich in wildlife such as elephant, tiger, panther, wild dog, wild pig and spotted deer. It is also an area rich in produce yielding forest species.

The open scrub forest with *Albizzia amara, Chloroxylon swietenia*, and throny Acacias spread over the driest zone of the State is in very bad shape.

Altogether, two million hectares of legally constituted forests in the State are badly or totally degraded.

1.3 Definition of forest produce

Under the Karnataka Forest Act, forest produce includes the following:

i. Whether brought in from the forest or not: Timber, Charcoal, Catechu, Lootikai *(Capparis mooni)*, sandalwood and sandal oil, wood oil, resin, natural varnish, bark, lac, mahua *(Bassia latifolia)* flowers and seeds, seeds of *Prosopis juliflora*, tupra *(Diopryros melanoxylon)* leaves, rosha *(Cymbopogon martini)* grass and oil, myrabolams *(Terminalia chebula, T. belerica, Phyllanthus emblica)*, rampatre *(Mystica fragrans)*, shigakai *(Acacia concinna)* and rubber latex

ii. The following when found in or brought from a forest :
- trees and leaves, flowers and fruits and all other parts or produce of trees not already mentioned
- plants other than trees (including grass, creepers, reeds and moss) and all parts or produce of such plants
- wild animals, peafowls, and skins, tusks, horns, bones, silk cocoons, honey, wax and all other parts or produce of wild animals, peafowls and insects.

- peat, surface soil, rock and minerals (including limestone), laterite, mineral oils and all produce of mines and quarries
- any other products of forests that the State Government might declare, by notification, to be a forest product.

The distinction between items under (i) and (ii) serves a legal purpose. Transport anywhere of items under (i) has to be covered by a forest pass and the source of origin of the produce has to be established. In the case of items under (ii), a forest pass is required only when they are being transported within the forest belt and, once outside the forest, the source of origin is of no consequence. As a large number of non-wood forest products come under category (ii), the assessment of quantities removed is rendered difficult.

Generally, in India, non-wood forest products are described in the forest rules under the loose definition of "Minor Forest Products". Under the Karnataka Forest Rules, minor forest produce means "forest produce other than timber, sandalwood, firewood, charcoal, bamboos and minerals and includes forest produce such as myrobalams, barks, fibres, flosses, gums, resin, dyes, grass, leaves, roots, fruits, seeds, creepers, reeds, moss, lichens, wood oil, honey, wax, lac, wild animals, wild birds, horns, hides, bones, tusks, trophies, etc."

This definition serves the purpose of identifying the items permitted to be collected when the right is sold by the Forest Department. For the purposes of this paper, sandalwood, firewood and bamboos will be included while peat, soil, rock and minerals will be excluded.

1.4 Non-wood forest products in Karnataka.

The major items of non-wood forest produce in Karnataka are:

i. Firewood
ii. Grass
iii. Sandalwood
iv. Bamboos
v. Rubber
vi. Cashew
vii. Tamarind
viii. Tupra leaves
ix. Canes

Minor items of non-wood forest produce are:

i. Fruits and seeds *(Feronia, Buchanania, Ilanzan, Sapindus emarginatus, Semicarpus anacardium, Prodopis juliflora, Acacia concinna*, wild cardomum, wild pepper, *Strycnos, Nux vomica*, mango, *Myrstica spp., Capparis mooni, Garcinia spp., Artocarpus lakucha, Vateria indica*, rubber seeds, *Myrobolams*, etc.)
ii. Leaves (cinnamon, *Butea frondosa*, etc.)
iii. Barks *(Cassia fistula, Cassia auriculata, Machilus macrantha*, etc.)
iv. Roots *(Hemidiscus spp., Rauwolfia spp.*, etc.)
v. Gums *(Acacia niloticus, Boswellia serrata*, etc.)
vi. Resin *(Ailanthus malabaricum, Harwiekia pinnata*, etc.)
vii. Floss *(Salmalia malabaricum, Ceiba pentandra*, etc.)
viii. Fibres *(Kydia spp.*, members of *Sterculiaceae, Helieteris isora*, etc.)
ix. Horns, ivory, honey, wax and a large number of non-designated species of medicinal and food value.

The direct revenue to the Forest Department from non-wood forest products (without taking into consideration the value of those removed free) is around Rs.250 million or about US$ 14.3 million.

2. DISCUSSION

2.1 Firewood

Due to major policy changes in the direction of conservation, timber extraction today is 30% of what it was a decade ago. Selective felling in evergreen forests and conversion of good forests to plantations in the deciduous zone have been given up. Due to these measures, firewood extracted by the Department is now barely 0.4 million tons. A major proportion of this quantity is sold at heavily subsidised rates in the forest belt through depots run by the Department and its corporations (at around Rs.175 per tonne as against Rs.500 per tonne at auction). This is to reduce illegal removals.

A rough assessment of firewood requirement in the State is put at 11.0 million tonnes. Free removals from the forest are put at 4.0 million tonnes, this figure being based on an understanding that free removal is ten times the quantity harvested by the Department - a questionable formula not supported by any concrete survey. In spite of this high figure, it is hard to explain how the gap of 7.0 million tonnes is made up. A part of this quantity comes from revenue land (community privilege areas), a

lesser proportion from private areas and, since the last 3-4 years, some proportion of social forestry and farm forestry plantations.

It is a regrettable fact that there is no correct assessment of what is removed free from the reserve forests and other Government lands.

2.2 Grass

Grazing has been free and unrestricted in reserve forest since 1973, except where fenced after planting. According to Department estimates, the fodder grass consumed in the forest is of the order of 14.22 million tons per annum which, at Rs.100 per tonne would imply a write-off of Rs.1,422 million per annum.

In the dry zone of the state, *Cymbopogon martini* grass, occurring both in reserve forests and other Government land, is sold for extraction of oil. There is some loss of this grass due to browsing in the initial stages. Further, as the growth of grass depends largely on seasonal factors, the rates offered are presumably based on what is expected if drought were to prevail.

A reasonably feasible assessment of the annual removal is feasible.

2.3 Sandalwood

Karnataka and Tamilnadu account for 95% of the sandalwood produced in India. In Karnataka (unlike Tamil Nadu), it is a monopoly of the Government, wherever it occurs. When extracted from private land, 75% of its net value is given as a bonus.

Karnataka extracts about 700 tonnes of sandal heartwood per year, restricting the removals to dead trees and root portions left behind by smugglers. The Department supplies around 50 tonnes to artisans (at 25% of its value, 75% being subsidised by the Industries Department to the Forest Department), a small quantity for religious purposes at full value and the to 2 Government distillation units. The rates charged to these units are based on the auction rates received in Tamilnadu with a reduction of 10% (on the basis that these Government units cannot make use of smuggled produce like private sector units). Even at these subsidised rates, these Government units have not been able to operate for the last 3 years.

Sandalwood-smuggling is rampant, because of its high value (around Rs.100,000 (US$5,700) per tonne) and sporadic occurrence. In spite of the efforts of the Forest Department, depletion of this resource is continuing unabated. Seizures effected by the Department annually are around 250 tonnes. The amount smuggled is unknown and the lack of rules covering sandalwood in the rest of the country permits its free transport outside of Karnataka and Tamilnadu States.

With an all-India effort, the total out-turn of sandalwood, including through smuggling, could be assessed.

2.4 Bamboos

No sale of bamboo has been carried out for 2 decades. Presently it is extracted by concessionaire paper mills or the Department through contractors or through one of the Corporations of the Department. A proportion (20 to 30%) of bamboo extracted by paper concessionaires has to be supplied to the Department for release to cottage industries and rural artisans, who are charged 50% of the rate applied to industries. A small proportion is sold by auction and also released at retail sale rates.

Removals of bamboo do go on within the forest belt, but as this is generally for bonafide use, it is generally overlooked by the authorities. It would be more profitable for the State if bamboo were to be offered at subsidised rates within the forest belt so that its extraction could be regulated. The quantities removed for in this way are small compared with the requirements of the paper industry.

A reasonably correct assessment of the quantity of bamboo harvested can be made.

2.5 Rubber

Rubber latex has recently been brought into category (i) of forest produce (whether found in the forest of not) in order to try to curb pilferage of latex from Government plantations. This is only the case in Karnataka and even here this definition has caused serious problems for private plantations and has resulted in protests. It is now proposed to bring under category (ii) whereby it would be regarded as forest produce only of found in reserve forest areas.

Total assessment of rubber production from all sources poses no problems.

2.6 Cashew

Cashew, like rubber, is an exotic and occurs only where it has been introduced. In Karnataka, the Forest Department has planted about 40,000 hectares

primarily as a soil conservation measure in degraded areas while the KCDC, a corporation of the Forest Department, has raised over 20,000 hectares. It is also grown in small numbers on degraded and private land, but it is only regarded as forest produce when it occurs in reserve forest.

The Forest Department sells the right to collect cashew nuts in specifically defined plantation areas. Removals from plantations are, in theory, fully covered by permits but, in practice, this is not always the case.

KCDC plantations are better managed and a truer picture of removals is available as the plantation areas are more concentrated than Forest Department plantations.

A reasonable assessment of cashew nut production is possible from the production of processed nuts, but this includes cashews from non-forest reserve land which is not defined as forest produce.

Cashew fruit, which currently has no commercial value, is expected to rise with the licensing of a few units to distil cashew liquor.

2.7 Tamarind

Tamarind, which constitutes an important item of minor forest produce, is not indigenous to India an d it occurs only in abandoned habitations which have reverted to forest, in Forest Department plantations, along roadsides as avenue trees and in homesteads.

The right to collect tamarind fruit is sold as a separate item in all the forest division where it occurs. The sale notification specific the forest blocks and road lengths included in each unit. As the Public Works Department originally planted the tamarind trees on road sides, the trees has to be transferred to the Forestry Department for sale of usufruct and management.

A fairly accurate assessment of tamarind yield should be possible as the number of trees involved is not too large, the fruits ripen together and are unlikely to be pilfered before ripening as they are of no value. However, a survey would be required to estimate production from private sources. With the commencement of social forestry programmes, millions of seedlings of this species have been raised and distributed and large-scale planting has been carried out on road sides.

2.8 Tupra *(Diospyros melanoxylon)*

Shade-dried, tender tupra leaves are used as wrappers in beedies (indigenous cigarettes). The right to harvest the new flush of leaves is sold as a separate item, then lease periods covering two years. Lease areas include reserve forest and all Government lands. This item is not a major revenue earner in Karnataka, although sales in one division recently jumped to RS.15 million for no apparent reason.

2.9 Canes

Canes occur in the semi-evergreen and opened up evergreen forests. It is used in the furniture industry. Cane is now harvested by the Forest Department, cured and released to the furniture industry at retail rates. Export of cane outside the State is banned,whereas if this ban were to be lifted, the prive of cane could easily reach five times its current rates.

2.10 Minor items

The forests in Karnataka contain a tremendous diversity of minor forest produce. Generally, the rights to harvest these products are sold all together as one unit. In forest divisions where one item is particularly important this item is sometimes excluded from the unit and sold separately.

2.11 Sale of minor forest products

Departmental extraction of minor forest produce is limited to sandalwood, firewood, rubber, ivory and horn. Leases are also issued to societies of tribals or backward communities living in or around forest areas, under the umbrella of the Cooperatives Department. In all other cases, extraction is carried out by contractors who engage hired labour who are invariably paid on the basis of what they collect, as opposed to a daily wage. This results in frequent destructive harvesting of forest produce as both contractors, who have a fixed-term lease, and their labourers are more interested in immediate profit than in sustainable yield.

The Deputy Conservator of Forests of the division is responsible for preparing the "upsets" or lowest Government price at which the sale offers can be accepted for the different items to be sold. The upset figure is based on the quantity estimates for the item, the wholesale price of the item in major marketing centres, the cost of extraction and a margin of profit.

If the price offered is 10% or more below the upset, the Deputy Conservator of Forests has to refer to his superiors before sanctioning the sale. Consid-

erable care is taken to safeguard the financial interests of the State in these cases. The sale is by tender-cum-auction to guard against ring formation.

The list of labourers engaged by the contractor should also be made available to the local ranger and each labourer has to have an authorising note from the contractor. Labourers transport the produce to a central point from which any further transport has to be authorised by the Ranger. If this procedure is correctly followed, a true picture of the quantity of removals should be obtained. However, removals are generally under-reported.

Inevitably, collection rights tend to be monopolised by a group of contractors who have experience and knowledge of the bureaucratic set-up, markets and sale conditions and a good rapport with labourers. This group tends to keep upset prices low and to exclude newcomers by offering higher prices when new contractors are expected to participate.

In the case of societies and cooperatives, contracts are made over at the sanctioned upset price. This is intended to maximise the profit margin accruing to local inhabitants involved in collection but it is often exploited by outsiders who control the society.

3. PROBLEMS

3.1 Customary collection

In forested areas, many products obtained from the forests are customarily collected by the local people for their own use. No quantitative assessment is available for this and the facility is occasionally misused. An example was the request for the rights to collect *Vateria indica* fruits made by a major chocolate company for use in making butter for chocolate. This request was turned down by the Department on the grounds that this butter was a widely used cooking medium among local people in the forest belt. However, it was seen that the fruits ended up first in a factory for butter production and subsequently in the chocolate factory anyway as the company was able to use incentives to obtain the fruits from local people.

3.2 Lack of coordination

In a few cases, the lack of co-ordinated effort results in the loss of valuable commodities. For example, the Departmental Corporation has 4,500 hectares of rubber plantation. Rubber seeds are rich in oil but the period in which the fruits ripen and fall is very short and the oil quickly turns rancid. As a result, this valuable resource is wasted.

3.3 Lack of knowledge

In some cases, lack of knowledge of the end use of forest products results in poor collection practices and low revenue. A case in point occurred in the tribal belt of the State where an enterprising Deputy Conservator of Forests took over as President of the Tribal Cooperative Society. He found that the margin of profit in the case of moss was barely Rs.1 per kilo. He traced the marketing channel of this commodity until it ended up in Calcutta paint factories and found that, by directly negotiating with the factories, he could increase this margin of profit to Rs.10 per kilo. This also resulted in better collection practice.

3.4 Poor processing

Minor modifications in handling and processing practices could often result in better returns and reduction of wastage during transport. Dakshina Kannada District has several cashew nut processing centres and imports cashew nuts from the adjacent states of Maharashtra and Goa. At the same time, a good proportion of the cashew nuts produced in the district are exported to Tamilnadu because the drying process used in the district renders the nuts unsuitable for processing in the types of plant set up in there. *Phyllanthus* fruits are transported several hundred miles in lorries for the preparation of medicinal items and heavy wastage occurs during the journey. Likewise *Terminatia chebula* fruits are collected in the northern districts of Karnataka and transported to Maharashtra for the extraction of the concentrate used for tannin, incurring considerable costs for transport.

3.5 Under-valued lease amounts

In some cases, the lease amount for the rights of collection of produce is very small in comparison to the eventual returns for the contractor. *Butea monosperma* occurs in open degraded areas of the State, in reserve forests, revenue lands, privileged areas and private compounds. Its shade-dried leaves are used in some cities as plates for food. The collection of the leaves provides work for a large number of rural people, particularly women and old men. The lease contractor merely collects the bundles of leaves, pays for the lease, which includes collection charges, and arranges for the transport of the leaves

by rail to the cities. While the lease amount is usually barely a few thousand rupees, the market price for the leaves loaded on rail at Dharwar for transport to Bombay amounts to Rs.5 million per year.

3.6 Destructive working methods

For the majority of minor forest products, the working methods used in harvesting are destructive and are leading to a steady decline of resources. In many cases, this is the result of a lack of appreciation of the value and importance of the commodities. A case of poor harvesting methods is that of beedi leaves, where the repeated cutting back and ground burning used to promote the flush of new leaves which is harvested also leads to the gradual elimination of the plant. This is a resource which currently earns the Forest Department several thousand million rupees per year.

3.7 Grazing

One of the major hazards faced by forests in India is that of uncontrolled grazing. Apart from the revenue from grass which is foregone, there is great damage to the forests through the elimination of regeneration, the increase in run-off and associated forest fires. A work study conducted by ISEC calculated that society as a whole pays Rs.970 per head of cattle grazing in the forests. Between firewood removed free from the forests and free grazing, the monetary loss is estimated to be Rs.1,422 million per year in Karnataka, as against a total revenue of Rs.550 million accredited to the Forest Department.

3.8 Lack of investment

Today, investment in non-wood forest products is practically nil. There have been a few sporadic attempts to include some minor forest product species in the afforestation programme. A small first step towards managing the non-wood forest resource has been made through the inclusion of a condition, in some divisions, which specifies a certain number of trees which must be tended by contractors.

3.9 Conclusion

However, a full appreciation of the value of these products, as sources of food, medicine, employment, items of daily use and direct and indirect revenue still needs to be properly highlighted. Collection of proper data would be a first step in this direction.

The Government of India has set up a working group to review the methodology and data base used for the gross domestic product of the forestry sector. The group was dismayed over the existing methodology for compiling data, with its inaccuracies and timelag. it has urged the need to have a strong data base in the forestry sector.

Forestry will not receive the attention it deserves from governments until this lacuna is set right, in the tropical region.

Collecting Trade Statistics

P. Wardle

Involvement in trade in the participating countries includes the export of tropical logs, sawnwood and plywood, local trade in sawnwood and panels made from raw material from coniferous plantations and the export of wood pulp. Imports include sawnwood and panels by some countries and of paper by all countries. The export of non wood products such as gum arabic is important in some countries.

Statistics on forest products exports are collected by the producing enterprises, by forest authorities and by the customs offices. The assembly of formal statistics on trade is usually carried out by the customs office in relation to trade ministry central statistics office or central bank.

Trade statistics are arranged according to internationally agreed trade classifications. Most countries use either (i) the UN Standard International Trade Classification – SITC – (the latest version is revision 3, introduced in 1988 – SITC Rev. 3), or (ii) the Customs Cooperation Council trade classification (CCCN or BTN), up to 1988. From 1988 many countries introduced the new classification called the Harmonised System (HS).

FAO collects international trade data on forest products according to a standard format which follows SITC.

Some aspects of forest products' trade in the Asia – Pacific Region

Y.S.Rao

1. FOREST INDUSTRIES AND TRADE

The Asia-Pacific Region enjoys a dominant position in the tropical timber and timber products trade of the world. For many development countries of the Region, export of forest products is an important source of foreign exchange earnings. In addition, in order to capture the benefits flowing from the backward and forward linkages and multiplier effects of forest utilization (in terms of employment, income and added value) countries are taking concerted action to establish and expand processing industries and to increase the share of processed wood products in their exports. These developments have several implications. Information is a prerequisite for taking decisions on the nature and direction of development interventions. Often the quality of decisions taken depend on the quantity and reliability of available statistics.

For decision making in the broad sector of forestry and forest industries, trade statistics are vital. The FAO year book of Forest Products has in fact more tables on trade than on production: out of 255 tables only 49 tables deal with production and the others pertain to quantity and value of imports and exports; direction of trade and unit values of imports/exports. This concentration on trade statistics in the FAO publication does reflect the importance of trade in forest products in the countries of the Region. The purpose of this paper is two fold:

i. to review the data of forest products trade in the Asia-Pacific Region.
ii. to provide information on some aspects of trade such as trade barriers and transfer pricing to help understand the use of trade statistics.

2. STATISTICS ON FOREST TRADE

Trade statistics in forest products are assembled and reported, almost in every country of the Region, by the customs authorities, usually under the Ministry of Commerce. For the purposes of compiling these statistics the following definitions are observed by several countries:

i. Imports record all goods which enter the country and are cleared by customs officials. No distinction is made between imports for home consumption and imports for re-exports.
ii. Exports could include re-exports i.e. goods previously included in statistics as imports.

The compilation at the national level are made by calendar month and the compilation for the month of December gives data for the month as well as for 12 months (January-December) of the calendar year.

In general values are based on the declaration of importers and exporters, and subsequently verified by customs officials. Imports are compiled from C.I.F. value (transaction value) to the landed port inclusive of packing, commission and all charges as specified in the commercial invoices approved by the customs officials. Exports are compiled from F.O.B. value at the Port of Departure as declared in the export entry by the exporter. F.O.B. values are drawn form the documents of sale for the actual amount received in term of national currency, including export duty, if any.

Quantities and weights are recorded in units in accordance with the National Trade Nomenclature, but where goods are required to be entered by weight, net weight excluding packing and containers is used, except in case of certain goods as provided in the Customs Tariff, such as weight of immediate packing.

Regarding commodities classification, although the search for greater compatibility of foreign trade statistics has been going on for a very long time, it was not until 1960 that governments of a large number of countries were compiling trade-by-commodity data according to Standard of International Trade Classification (SITC). This is an internationally agreed nomenclature in which commodities are grouped according to the nature of the material of which they are made. A second revision, SITC Revision 2, was prepared in 1975 to accommodate changes in geographic and commodity patterns

resulting from a rapid increase in world trade. Governments of a vast majority of countries now regularly make available data according to SITC, Revision 2. More recently the system of classification has been further revised (SITC Rev. 3) and a Harmonized System (HS) has been developed.

3. TRENDS IN PRODUCTION AND TRADE IN THE ASIA-PACIFIC REGION

Developing countries of the Asia-Pacific region produced about 1000 million m^3 of round wood during 1988 which is 29 % of the world total. Round wood production registered an average annual rise close to 2% which is about the same as the world average. Quantity wise fuelwood and wood for charcoal constitute the bulk (77%) of the removals. Sawlogs and veneer logs constitute only 16% of total round wood production. Log production rose from 134 million m^3 in 1978 to 163 million m^3 in 1988 at an average annual rate of 2.0% which is higher than the world average of 1.5%. During the same period the proportion of log exports in relation to total log production declined. The pattern of production and exports in the different countries of the region has also undergone substantial alteration in the decade 1978 to 1988.

Data on production and export of non-coniferous (hard wood) sawlogs and veneer logs, during 1978 and 1988 from selected countries of the region are presented in the table below:

TABLE 1

Annual production and exports of sawlogs and veneer logs (non-coniferous) in selected countries of the Asia-Pacific Region (1978-88)

		(in thousand m^3)			
Country	Period	1978		1988	
China	Production	17180		20889	
	Exports	39		10	
Indonesia	Production	26620		36226	
	Exports	19200	(72%)	3	
India	Production	11449		15812	
	Exports	28		61	
Malaysia	Production	28504		35100	
	Exports	18708	(66%)	20572	(59%)
Myanmar	Production	1227		2789,	
	Exports	77	(6%)	208	(7%)
Papua New Guinea	Production	1093		2416	
	Exports	445	(41%)	1283	(53%)
Philippines	Production	7169		3157	
	Exports	2200	(31%)	176	(6%)
Thailand	Production	2609		2048	
	Exports	17		–	
Vietnam	Production	1470		1382	
	Exports	–		–	
TOTAL	Production	97321		119819	
	Exports	40714	(42%)	22313	(19%)

* The figure bracketed against exports represents the proportion of exports to log production.

Major changes in the patterns of log production and exports during 1978-88 are summarized below:

- Export of logs from Indonesia was banned which meant that from a peak log export figure of 19.2 million m^3 in 1978, Indonesia saw a complete stoppage of all log exports in 1987. Export of logs earned for Indonesia about US$1,550 million in 1979 (a peak year), but by 1988 this earning was reduced to a mere US$278,000. There was increased domestic processing – especially wood-based panels – as evidenced by a rise in production from 425,000 m^3 in 1978 to 6.6 million m^3 in 1988. A feature of the 80's was, indeed, the emergence of Indonesia as the most important exporter of processed wood products in the region. Indonesian export of wood-based panels grew from 70,000 m3 in 1978 to 6.4 million m^3 in 1988. Export earnings from panels grew from US dollars 18 million in 1978 to US dollars 2135 million in 1988.
- Export of logs, (including teak) from Myanmar increased from 77,000 m^3 in 1978 to 208,000 m^3 in 1988. In terms of export earnings, the rise is from US$35 million in 1978 to US$73 million 1988.
- In the Philippines, hardwood log production during 1978-88 decreased significantly – from 7.2 million m^3 to 3.2 million m^3. There was a corresponding decline in log exports from 2.2 million m^3 to 176,000 m^3. The growth in export earnings from sawnwood and panels during the period was from US$164 million to US$255 million.

- In Malaysia log production continued to rise, from 29 to 35 million m^3 in a decade. This increase was mainly attributable to production in Sabah and Sarawak. There is also an increase in the quantity of logs exported, from 18 million m^3 in 1978 to 21 million m3 in 1988.
- A notable feature in the region was the growing dependence of Thailand on imports of logs in recent years. From a net exporter Thailand has emerged as a net importer during 1978-88. Sizable imports of logs first started in 1977 (61,000 m^3) and gradually increased to around 500,000 m^3 by 1988. The importation is mainly from Malaysia.

4. TRENDS IN IMPORTS OF FOREST PRODUCTS

During 1978, the annual imports of 27 developing countries of the Region amounted to US$2568 million, against exports of US$ 3696 million. Developing countries of the region, put together, were thus net exporters of forest products. However by 1988, the trade balance situation worsened and the countries became marginally net importers.

TABLE 2

Trade balance of forest products: Asia-Pacific Region 1978-88

	1978	1988
- Value of imports (Million $)	2568	7321
- Value of exports (Million $)	3696	7285
- Trade balance (Million $)	+1128	-35

Data on trade balance (forest products) in the developing countries of the region shows that the following countries are the major net earners of foreign exchange on account of forest products: Indonesia, Malaysia, Philippines, Papua New Guinea, Myanmar and Solomon Islands in that order.

The major net importers are: China, Rep. of Korea, Thailand, India and Pakistan in that order. Details are shown in Table 3:

5. TRADE BARRIERS

Among the many difficulties that developing countries face when engaging in international trade are the range of trade barriers which exist. These controls and restrictions range from the well-known tariffs to a variety of lesser-known and difficult to identify non-tariff barriers.

TABLE 3

Trade balance in forest products of Asia-Pacific countries - 1988

Country	Trade Balance 1988 (US$1000)		
	Imports	Exports	Trade balance
Bangladesh	14 916	7 688	-7 228
China	3 553 654	771 535	-2 782 119
Fiji	8 450	5 916	-2 534
India	301 077	16 337	-284 740
Indonesia	286 355	2 872 868	+2 586 513
Malaysia	317 772	2 571 735	+2 253 963
Myanmar	8 600	87 442	+78 842
Nepal	7 181	12 000	+4 819
Pakistan	137 594	-	-137 594
Papua New Guinea	5 504	108 932	+103 428
Philippines	125 481	278 931	+153 450
Republic of Korea	1 809 364	396 047	-1 413 317
Sri Lanka	24 402	600	-23 802
Thailand	479 899	130 448	-349 451
W. Samoa	2 369	1 478	-891
Solomon Islands	2 292	10 530	+8 238

5.1 Tariffs

Average tariff levels have generally declined on a wide range of products. Although average tariff rates for forest products are relatively low, this masks the problem facing specific products. Unprocessed wood products such as logs, squares or rough-sawn timber in most developed market economies face the lowest tariffs. Basic products such as wood chips and pulp (which are really raw materials) have zero or low tariffs. Semi-processed forms such as veneers, fibreboards and dressed timber generally face higher rates. The more highly processed forms such as plywood, some reconstituted panels, and furniture usually face the highest tariffs. This tendency (known as tariff escalation) makes it more difficult for exporters to trade in more processed products and so denies the exporting country the benefits of added-value and reduces opportunities open for developing countries to industrialise.

Special preferences can reduce the duties that exporters must face. In particular a Generalised System of Preferences (GSP) scheme was negotiated under the United Nations Conference on Trade and Development (UNCTAD). This provides lower duty rates for developing country exporters, and has resulted in some products from these countries entering many developed markets free of duty. Although of considerable benefit to developing countries, the

full potential of the GSP is not realised for a number of reasons. These preferences are not legally binding and can be withdrawn. Each importing country determines whether or not it is willing to offer these preferences, the countries the preferences will apply to, which products are eligible, and the period they apply for. Additionally, many GSP allowances are subject to various limitations (e.g. quotas, market share criteria). Of importance to developing countries is the fact that products such as panels and manufactured wood products are often excluded from the GSP schemes.

5.2 Non-Tariff Barriers (NTBs)

Non-tariff measures used for protective purposes are wide- ranging. They include direct quantitative controls such as quotas, or voluntary export restraints. Less direct controls such as import authorizations (licenses, permits etc), and health and technical standards.

Forest products are less affected by NTBs than most other products. Quantitative restrictions, price controls and other forms of NTBs are not widespread. Some NTBs do, however, create considerable problems for some forest products. A number of products entering Japan and the EEC are subject to tariff-quota limitations. Newsprint and plywood into the EEC are controlled in this manner as a number of wood products entering Japan under GSP tariff preferences. Health and technical standards and imports authorizations often act at NTBs but the distinction between those used for legitimate health and safety reasons and those being primarily used for trade control is often unclear.

5.3 Transfer Pricing

There is a great deal of concern in some of the exporting countries in this region about transfer pricing, a mechanism through which companies avoid paying the full royalties and taxes due to the government.

A recently concluded Commission of Inquiry into forest operations in PNG has identified the following mechanisms by which transfer pricing is practised:

- misdeclaration of species
- downgrading of log grades
- underscaling of volume
- under-valuing log prices
- over-valuation of external management, machinery, lease and consultancy costs
- overstated freight rates
- overstated claims for damages
- nil profit accounting
- third country invoicing (double invoicing)
- collusion by importers.

i. How significant is transfer pricing to trade?
PNG data indicate that loss of revenue due to transfer pricing could be substantial. The Commission of Inquiry in PNG estimated that through double invoicing (mainly through Hong Kong companies) losses from transfer pricing during 1985-87 accounted for about US$10 per m^3. During 1987, PNG lost overseas earnings totalling US$14 million on its exports of 1.4 million m^3. The loss of revenue to the PNG government (export duty) is 10% of this.

ii. Would it be possible to control transfer pricing? Could statisticians do something about this?
A thorough knowledge about FOB log prices for comparable timber at ports in the different countries (i.e. Sabah, Sarawak and PNG) could enable authorities to question the .pa invoicing practices of companies and even establish a minimum export pricing system.
An alternative method to estimate the level of transfer pricing is to derive notional FOB prices for PNG logs by deducting margins and costs from wholesale prices for PNG ex log pond in Japan, and comparing these to actual FOB prices achieved. Table 3 below gives results from these calculations, reported recently in the TFAP review of Papua New Guinea.

TABLE 4

Estimated Losses from Transfer Pricing, 1985-88 (Ex Japan Wholesale Price Basis)

Year	Export Volume m^3	Transfer price US$/$m^3$	Lost overseas earning US$ million
1985	1 063	20	21.3
1986	1 019	11	11.2
1987	1 284	23	29.5
1988	1 158	22	25.5

6. CONCLUSION

A review of trade statistics shows that for a fuller understanding of the nature of trade, and its implications to forestry sector development or the country's exchange earnings, it is important to compile quan-

tities, values and prices of forest products traded, adopting an internationally comparable Classification System. In addition systematic monitoring of various types of trade barriers and trading practices would be necessary to formulate trade policies.

Forestry Statistics for to-day and tomorrow (Notes about a Forestry Statistical Office)

F. Padovani

BACKGROUND

Six years of experience in data exchange in the Asia Pacific Region. After the first Forestry Statistics Seminar held in Bangkok 3-7 December 1984 and two visits, in 1987 and 1989 in the following countries: Sri Lanka, Malaysia, Fiji, Papua New Guinea, Philippines, Thailand, Indonesia, Viet Nam, China; the results can be summarised as follow.

FAO/FODP activities focused on four aspects of national forestry statistics:

1) To identify **"national focal points"**, in order to exchange forestry statistics with FAO/FODP.
2) For the **past data**, all the national forestry statistics available in FAO Forestry Department from 1961 onwards were provided to representatives of government and pulp and paper industries. This was done in order to ascertain that the heritage of the last 30 years of forestry statistics corresponded to their records (where they exist) as well as providing a **common base** for the government and industry statistical offices.
3) For the **present and future** to verify the availability of IBM PC or compatible computers, having DOS and LOTUS 123, in each government and industry statistical office visited and install the basic FAO Forestry Department questionnaires on LOTUS 123 programmes and train staff in their use.
4) To improve the dialogue among various government department statistics offices dealing with forestry and the forest industry statistics offices within a country to ensure the availability of sound statistics for planning.

The conclusions were:

- in each forestry statistical office visited was used their **hardware and software**.
- the approach was accepted with a lot of **enthusiasm** by the principal representatives as well as by their satellite offices.
- **a country "FOCAL POINT" was established which will provide the country data and in return will receive data for the rest of the world, free of charge, in magnetic or printed forms.**
- for all the countries visited **information processing technology and knowledge is no longer the major problem.**

INTRODUCTION

The **aims** of this seminar are to:

1) **"examine the collection, analysis and dissemination of forestry statistics" and "review the objectives and functions served in policy formulation, planning and management of the sector".** ***Special attention*** will be given to **support national information, provide international information for countries and international cooperation.**
2) **stimulate the exchange of data in computer-readable form between Asia Pacific national offices responsible for forestry statistics and FAO.**

FAO/FODP normally sends a questionnaire on paper, then receives the same questionnaire on paper and finally distributes the publication (Yearbook of Forest Products, Surveys) on paper.

What we are attempting is to:

Send, Receive, Distribute
data in
Computer-readable form

with all the benefits any data producers and/or consumers could imagine. The method is very simple,

it uses LOTUS 123 under DOS. The questionnaire on paper is converted into LOTUS spreadsheet as a MIRROR IMAGE

allowing data entry, validation, analysis and reporting of COUNTRY DATA.

That means, from this stage on CLEAN DATA, officially approved data can be transferred to other systems, to other people.

A FORESTRY STATISTICAL OFFICE

The main objective of a Forestry Statistical Office is to provide statistics that Improve the Effectiveness of decision. This can be achieved essentially by.

1) Collecting the highest quality and most useful data possible.
2) Collecting data in a timely and cost effective manner.
3) Producing the most appropriate and accessible data products possible.
4) Teaching the benefits and methods of using statistical information to potential data user in order to create more effective decision makers.

A STATISTICAL INFORMATION CYCLE

The key part of a Forestry Statistical Office is the organization of **the Statistical Information Cycle** which can be structured in the following steps:

1) As soon as, a need for a – Decision, Action, Policy, Program) is perceived.
2) The Problem and the Information needed to solve it, are defined.
3) The Information Collection Operation is – Designed, Promoted, Conducted and the data Collected.
4) The information gathered is processed.
5) The information products are produced and released.
6) The information products are promoted and disseminated to user.
7) Using the knowledge gained from the information products, the user makes the decision or initiate the action, policy or program.
8) Based on the experience of using the information, new information needs are perceived or feedback is given on how to improve the existing information.

For our type of data, we have annual cycles. This approach has to be repeated every time in order to keep any statistical application up-to-date and to respond to the needs of data consumers.

BUILD UNDERSTANDING AND SUPPORT

It is necessary continuously to **build understanding and support** for the statistical work. Few suggestions are:

1) Don't wait for policy maker or potential data user to come to you. Take the initiative by actively promoting the value of your products.
2) Begin by motivating. Show the rewards of using data. Quickly show people why they should listen to you, talk about statistics.
3) Keep it simple in the beginning. Tell others only what they are likely to use. Avoid too much detail.
4) Build support vertically. Explain the value of your work to those above you and below you within the government.
5) Build support horizontally. Go to other agencies of the government at your level and explain how you may help them.
6) Build support outside. Do it among private business, organizations, and individuals outside the government.
7) Recognize that you produce a product. To succeed you must prove the value of your product to prove the value of your organization and your work.
8) Consult all types of data users and allow them to suggest improvements to what you collect and how the products are designed and delivered.

In spite of the data being: in the form the customer expects and wants; available where the costumer expects and wants it to be; available as close as possible to when the costumer want it, there will be always **a conflict of interests between data producer and data consumer.**

These dynamics generate "problems" which sometimes provide good **opportunities** to move forward. The solution of the problems can be integrated in the Statistical Information Cycle with the support of the Forestry Information Center with appropriate hardware, software and people.

DEMAND, SUPPLY AND MARKETING OF STATISTICAL DATA PRODUCTS.

We should assume that, in the individual decision-making process, **FACTS/STATISTICS** are not the only ingredient necessary to reach an effective decision. In addition, other resources and skills are required like **KNOWLEDGE of the problems, specific EXPERIENCE, ANALYSIS, JUDGEMENT to finally reach decisions possibly base on a CONSENSUS at local, national, regional and global levels.**

Which share in the decision making process belong to

"FACTS – STATISTICS"
?

The kinds of products that a Forestry statistical Office should deliver are Statistical, Methodological, Analytical and Geographic. These should be disseminated to different users using different media like: **Publications, Microfiche, Computer Tapes, Diskettes, WORM Discs, CD-ROM, Online Data Bases, Video. Each has the advantages and disadvantages according to the type of user (General Public, Libraries, Universities, Government Agencies, Private companies, Local agencies, Freelance consultants).** In addition a demand for the 'goods' produced has to be created by **promoting and explaining the benefits of using statistics and the benefits of planning.** Which are that they:

- Encourage systematic thinking
- Improve coordination of efforts
- Encourage performance standards
- Sharpen guiding objectives, policies and decision
- Prepare for the unexpected
- Involve leader's participation

Confidence and priority for sector statistics comes when leaders demand accurate information and use it.

The rewards of data dissemination are of different kinds. There is a variety of improvements which are difficult to quantify with a figure; but definitely statistics create a sort of **"culture"** which improves:

- **National and Local Economies**
- **Management of Social Programs**
- **Feedback improves Data**
- **Support for Statistical Efforts**
- **International Investment Interest**
-
-

CONCLUSION

INFORMATION

IS AVALUABLE

NATIONAL RESOURCE

The work of FAO on Forestry statistics is an important contribution to the work of countries on improving their information of forests and the contribution of the forestry sector to the national and rural economies.

Adequate

information is essential
to
a
clear
understanding

of the problem and the formulation of

sound policies
and
programmes

which will ensure the conservation of our valuable heritage of forest and secure the benefits of their products and services for people of all countries.

Part Two

COUNTRY BRIEFS

Presentation of country briefs

Country briefs were prepared by National participants according to the following outline:

1. Introduction - background on the forestry sector
2. Forest sector statistics - statistical organization and its effectiveness
3. Informal sector products - fuelwood and charcoal, other forest products
4. Modern sector products - production and capacity of industrial roundwood, sawnwood, wood-based panels and pulp and paper
5. Trade - imports and exports
6. Forest product prices
7. Summary, conclusions and recommendations

For each topic information was requested on:

measurement units
definitions
method of survey
coverage
frequency
offices responsible and
publications

FAO statistics were provided to be checked for accuracy and for updating and completion where data are missing. At the end of each brief the data on production and trade updated to 1988 is attached.

Bangladesh

Jamil Ahmed Chowdhury

1. INTRODUCTION

Bangladesh, at present, has a population of more than 110 million people living in an area of 14.3 million ha of which 0.93 million ha are waterways, 8.5 million ha cropped area, 2.67 million ha uncultivable land and 2.2 million ha under forests. The forest area is about 15% of the total land. However, only 0.93 million ha (6.5%) is under tree cover (UNDP/FAO Global Environment Monitoring System, 1983-84). The remaining area includes denuded grassland, scrub and encroached lands. On the basis of the location, climate, physiography and management practices, the Government forests including village groves can be classified into five broad types (Chowdhury, et al. 1989):

TABLE 1

Area and Growing Stock of Bangladesh Forests by Type

Type	Area (million ha)	Growing stock (million cu m)
Mangrove forest	0.67	16.00
Hill forest	0.67	28.32
Plain land forest	0.12	00.04
Unclassed state forest	0.73	negligible
Village groves	0.27	54.70
Total	2.46	99.06

At present, the bulk of supplies of roundwood, fuelwood and bamboo come from homestead forest, the area of which is estimated to be 0.27 million ha, 1/10 of Government forest area. It is estimated that village forests supply 70-80% of saw-logs, 90% of bamboo and 90% of fuelwood of the total domestic consumption of our country.

It has been reported by Salehuddin (1990) that only 0.53 million cu m of timber and 0.93 million cum of fuelwood were extracted by the Forest Department of Bangladesh against the estimated consumption of 1.07 and 6.13 million cu m respectively in 1986-87. The balance must have come from village woodlots, illegal felling in Government controlled forests and some imports.

With a very low per capita consumption of 0.01 cu m of timber and 0.06 cu.m. of fuelwood, the estimated demand in 2000 AD would be 1.32 and 7.92 million cu.m. respectively, given a low population growth rate of 2% and a total population of 132 million. The probable supply of timber and fuelwood would be around 0.58 and 4.24 million cu.m. resulting in an estimated deficit of 0.74 and 3.68 million cu.m. respectively in the year 2000 AD. It is estimated that about 8000 ha of national forest lands are being depleted every year due to encroachment caused by population and other use pressures, illegal felling, shifting cultivation, etc. (Atiqullah, M. 1985).

Besides timber and fuelwood, the forest provides food, fodder, poles, posts, medicines, essential oils and other products. In Bangladesh, a great number of small and medium-scale industries such as furniture shops, sawmills, veneer and plywood mills, pulp and paper industries, and treatment plants largely depend on a sustained supply of raw materials from forest.

However, due to over population, the country's Government managed forests as well as village resources are believed to be over exploited causing substantial depletion of forest. This in turn creates serious problems such as soil erosion, drought, flood, decline of soil fertility and the destruction of wildlife habitat. Therefore, the Government of Bangladesh has imposed a moratorium (October, 89) on the extraction of forest produce from state-managed forests. However, concessions have also been given to important wood based industries.

To ensure a sustained supply of forest products, the conservation of soil and the maintenance of the ecological balance, the Government of Bangladesh has given priority in the forestry sector by implementing various projects. Among these are projects in participatory forestry, Upazila Banayan, multi-tier plantations, buffer zone plantations, road-, rail-and canal-side plantations with fast growing exotic and indigenous species.

2. FOREST SECTOR STATISTICS

Sound decision-making depends upon access to, and adequate means for making use of, good information. However, in Bangladesh, statistics on production and consumption of wood and nonwood forest products are not yet readily available.

So, emphasis needs to be given to the timely collection, updating, synthesis and dissemination of forestry information through a co-ordinated effort of all the sectors engaged in producing forest statistics.

In Bangladesh, the major sources of Forest Sector Statistics are:

- Forest Department
- Bangladesh Forest Research Institute (BFRI)
- Bangladesh Forest Industries Development Corporation (BFIDC)
- Bangladesh Chemical Industries Corporation (BCIC)
- Planning Commission
- Bangladesh Bureau of Statistics (BBS)
- Ministry of Trade and Commerce.
- Forest Department

Almost all the forest areas in the country are owned by the state and managed by the Forest Department. So, Forest Department is responsible for generating, updating and disseminating data on the production and exploitation of state controlled forests. Each Forest Division (District office) collects raw data from the field through its administrative staff based at the lowest administrative unit. The District Forest Officer then compiles the data of his district sent by his subordinate officers. This is sent to the Planning Cell of the Office of the Chief Conservator of Forests. The Planning Cell compiles the data from all the Forest Divisions in the country and publishes it in the Annual Progress Report of the department. The Annual Progress Report includes a summary of the activities of the department during the reporting year. It contains information on the area under forest, its distribution by vegetation types, output of timber, fuelwood and other minor forest products, progress achieved in various management operations, revenue earned and expenditure incurred. The department collects data on forest production only from state controlled forests. A lot of unrecorded consumption of timber, fuelwood and non-wood forest products from homesteads and other sources is not shown in the department's statistics.

The Forest Utilization Division of the Forest Department collects data on market prices and trade statistics on forest products. This division conducts occasional surveys to gather data on the market prices of different forestry products. This data is collected using prescribed forms. This data is compiled and published in the Annual Progress Report of the department.

- Bangladesh Forest Research Institute (BFRI)

The Bangladesh Forest Research Institute has been conducting research in 18 different disciplines of forest production and management. The Forest Inventory Division of BFRI is mainly engaged in the collection, processing and reporting of information on the current status and stock of Government controlled and homestead forests. This division has already published reports such as "The Maturing Mangrove Plantation of the Coastal Afforestation Projects", and an "Inventory of Forest Resources of Southern Sylhet Forest Division", which were prepared in collaboration with UNDP/FAO. The division is also contemplating undertaking a survey of village woodlots.

The Forest Economics & Statistics Division recently undertook surveys on saw-milling industries in both urban and rural areas of Bangladesh and the report is in the process of publication. "Forest Statistics of Bangladesh" is a regular annual bulletin of this division. It includes statistics on the area under forest, legal status, climate, annual output, industrial products, export-import etc. of forestry sector.

- Bangladesh Forest Industries Development Corporation (BFIDC)/Bangladesh Chemical Industries Corporation (BCIC)

The Bangladesh Forest Industries Development Corporation runs 14 projects which produce timber (round, sawn etc.), fuelwood, charcoal, veneer and plywood, particle boards, and rubber. On the other hand, Bangladesh Chemical Industries Corporation has 7 different projects of paper, paperboard, newsprint mills, rayon mills, hardboard mills etc. The data on the production, sale etc. of the respective industries are sent to the Headquarters of both BFIDC and BCIC at Dhaka by their enterprises monthly, quarterly and annually. The BFIDC and BCIC receive data on the capacities (installed and attainable) from industries controlled by them. The management information systems (MIS) of both the corporations compile and publish this data in their Annual Reports.

Some small-scale private enterprises produce industrial products like plywood, pulp, particle board etc. but the production and consumption of these industries are not monitored regularly. However, through projects sponsored by local and international organizations reliable data on the consumption, production and sale of forest products are occasionally collected from the private as well as from the nationalized industries.

Regarding the industrial sector, relevant data on products like industrial roundwood, sawlogs, veneer logs, pulpwood, sawnwood, wood-based panels and pulp and paper can be collected from the industries themselves and project reports.

- Planning Commission of Bangladesh

The Planning Commission of Bangladesh collects data on the supply and demand for forest products in order to formulate future development strategies. They also undertake projects on Industrial Forestry Sectors, Rural Energy and Biomass Supply etc. in collaboration with different international organizations. Though these projects generate reasonable information on the forest sector, this type of collection of data makes no provision for updating as it is considered one-time exercise.

- Bangladesh Bureau of Statistics

The Bangladesh Bureau of Statistics under Ministry of Planning was formed in 1976 by merging the Agriculture Census, Population Census and Bureau of Agricultural Statistics. The relevant ordinance was passed in the subsequent year and describes the function of the department as to collect and interpret statistics for the purpose of furnishing information required in the formation or carrying out of Government polices in any field or for fulfilling the needs of trade, commerce, industry or agriculture including forestry. It gives power to communicate statistics collected to whomever the information may be useful. It has the power to give notice to any person to furnish particulars. The BBS collects and compiles data on almost all the sectors of economy and publishes these in its periodicals, the Statistical Year Books. It also compiles production, price, industry and trade statistics on timber. The industry statistics are collected by the Mailed Questionnaire Survey method. The timber trade statistics are compiled from documents - the Customs Declarations Forms, extended to the BBS by the Customs and Excise Department. The trade statistics are more accurate since customs declarations on all products for export are enforceable by law.

In addition, other organizations involved in data collection on forestry products are the Ministry of Commerce and Trade and the Ministry of Energy and Power.

While there are several different organizations collecting information on forestry products, no step has yet been taken by any appropriate authority, apart from the BBS, to reconcile the data from various sources. The BBS is the only organization in our country engaged in the reconciliation and publication of data from various sources.

2.1 Dissemination of forest statistics

The dissemination of forest statistics is carried out through periodic publications such as reports and bulletins and through personal correspondence, workshops, seminars and symposiums.

The important periodicals and bulletins producing forest sector statistics are mentioned below:

1. Annual Progress Report of the Forest Department
2. Annual Reports of the Bangladesh Forest Industries Development Corporation.
3. Annual Reports of the Bangladesh Chemical Industries Corporation.
4. Current Economic Situation of Bangladesh, a monthly bulletin of BBS.
5. Statistical Year Books of Bangladesh, publication of BBS.
6. Foreign Trade Statistics of Bangladesh, publication of BBS.
7. Forest Statistics of Bangladesh, a bulletin of BFRI.
8. Bano Biggyan Patrika, a forest science journal of BFRI

2.2 General Observations

The classification used by the FAO of roundwood, saw logs veneer logs, and pulp wood is not followed in reporting wood production either from the state controlled forests or from homestead forests in Bangladesh. It is, however, followed in the case of wood-based panels, pulp and paper and paperboard. In the case of trade statistics, both for export and import, the FAO classification is compatible with the classification used in Bangladesh. However, in many cases, difficulties arise in calculating the total

for a given product when, under the same group of products, different units of measurements are utilised. So, in the case of export-import data, value figures are mostly used.

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood and Charcoal

Two broad sources of statistics can be clearly identified in the case of fuel wood and charcoal production viz. State-run forests and homestead forests. Fuel wood and charcoal produced in state forests are recorded in prescribed formats. However, the collection of data on the same product in homestead forests is very unorganized. Periodic surveys organized by local and international institutes produce reliable basic data with a wide coverage. Members of government departments also conduct occasional surveys to generate information covering demographic and socio-economic characteristics as well as production and consumption of forest products. The BBS, Planning Commission, Institute of Statistical Research and Training, Bangladesh Institute of Development Studies (BIDS) and Energy Department of the Government account for the major proportion of surveys so far conducted in this field. Information on surveys of fuelwood and charcoal are given in Appendix 1.

Households, the most important basic economic units in society, are the main consumers of fuelwood as energy. Fuelwood is used mainly for domestic purposes i.e. for cooking. The results of different surveys on the consumption of biomass fuel used for cooking are given below:

The Bangladesh Energy Planning Project (BEPP), 1985 estimated the trend of woodfuel supply up to 2000 AD. It showed a downward trend in supply of woodfuel from 1981 to 2000 AD. The Village Forest Inventory of 1981 estimated the availability of 44.3 million cu m of fuel wood. and 10.60 million cu m of saw logs in the homestead forest.

The BBS conducted agricultural census in 1960, 1977 and 1983-84 and a Farm Forestry Survey in 1988. These surveys provide valuable information on the use, sale and consumption of timber and fuelwood. The Farm Forestry Survey estimated that about 10.74 million holdings reported consumption of 2.4 million metric tons of fuelwood.

By contrast, there is no record of any detailed survey on the production and consumption of charcoal in the country. Figures on the production of charcoal from one of the projects of BFIDC are available in their Annual Report. Blacksmiths, goldsmiths and bakery shops are the major consumers of the charcoal produced by the private sector.

TABLE 2
Composition of Sources of Biomass Fuel (%)

Reference		Fuel wood	Agri Residues	Animal Residues	Total	Per Capita Fuel Consumption (Gj/year)
GOB	1976	12.5	62.5	25.0	100	2.8
Islam	1980	71.0	24.0	5.0	100	4.9
Douglas	1981	63.0	37.0	+	100	4.4
Rahman	1982	57.0	38.0	5.0	100	1.6
Islam	1982	74.0	10.0	16.0	100	4.4
BEPP	1982	2.67	72.8	24.5	100	–

++ included in Agri. residues
Source: BEPP, 1985. Rural Energy and Biomass Supply. Vol. 4, Bangladesh Planning Commission Project.

3.2 Forest products other than wood

In Bangladesh bamboo, cane, patipata, sun-grass, golpata, honey, wax, fish, fruits, raw-rubber and similar products are considered as non-wood forest products. All these non-wood forest products are very important to local communities and some of them are important to many wood-based industries.

Statistics regarding the production of golpata, honey, wax, etc. from the Sundarban Forest are collected by the Forest Department. A printed form is used to keep the records of these products and these are published in the Annual Progress Reports of the Forest Department. Statistics regarding non-wood products other than those stated above from government-managed forests are also available in the same annual reports. Information on surveys of non-wood forest products is given in Appendix 2.

Information on non-wood products from village sources is obtainable from the reports of different projects conducted by local and international organizations. The BBS also collects data directly from households and industries which use non-wood products.

Bamboo

Bamboo is a 'poor man's timber' in our country. It has many uses from cradle to coffin. Many small-scale cottage industries are entirely based on bamboo. But the statistics on its production and con-

sumption are not up-to-date even though it plays a vital role in the rural economy.

According to the Village Forest Inventory (Hammarmaster,1981), resources of bamboo were estimated to be 7480 million culms, whereas the estimate of growing stock, according to Choudhury (1984), was 2.58 million Ad tons. The Farm Forestry Report, 1988 estimated the total number of bamboo culms at about 2,047 million on 6.04 million holdings (households with 0.05 acre or more cultivable area are treated as one holding).

4. MODERN SECTOR PRODUCTS

The main sources of production data for modern sector products such as industrial round-wood and sawn-wood are the Divisional Forest Offices, and the industries and mills themselves. Statistics on the production of plywood, particle-board, fibre-board, pulp and paper are available in the records of respective mills/industries. The other sources of data are the Annual Reports of the Forest Department, BFIDC and BCIC and publications of BBS. No data on the production of industrial forest products in homestead forests are available except for a few survey reports. Detailed product-wise information on modern sector products is given in Appendix 3.

5. TRADE

Statistics on imports and exports of wood and wood products are collected by the Foreign Trade Section of the Bangladesh Bureau of Statistics. This section has staff at all the important custom ports. From the bill of entry or shipping bill, the relevant information about the quantity and value of wood products are collected by BBS staff.

Information about trade statistics are published monthly and annually respectively in the "Monthly Economic Situation of Bangladesh" and in "Foreign Trade Statistics of Bangladesh", both published by the BBS. Besides, the Chief Controller of the Export-Import and Export Promotion Bureau keep the records of all trade including wood and wood products. In addition, the state-owned wood-based industries themselves have records of exports and imports made by them and publish the same in the Annual Progress Reports of BFIDC and BCIC.

The Bureau of Statistics deals with national trade statistics and, up to 1988, it utilised the international coding system called the Bangladesh Standard Trade Classification (BSTC). However, it has recently switched over to using Harmonised Systems.

The measurement units of some major products in trade are given in Table 3.

TABLE 3
Measurement units of Major Wood Products

Industrial	Roundwood:	cu m.
	Logs:	cu m
	Pulp wood:	cu m
	Sawnwood:	cu m
	Plywood:	cu m
	Pulp:	MT./kg
	Paper:	MT./kg

6. FOREST PRODUCTS PRICES

It has already been mentioned that the Utilization Division of Forest Department collects data on the market prices of major commercial species traded within the country. The market prices of commercial forest species (round and sawnwood) in major cities and towns are recorded quarterly in a standard form by the staff of the respective Forest Divisions where those cities and towns are located. These price lists are then sent to the Utilization Division for further compilation.

The BBS also collects the market prices of timber and fuel wood along with other commodities. The price statistics of forest products are published in the Statistical Year Books of the BBS.

Table A shows annual average prices of commercially important forest products in major cities and towns.

7. COMPUTERS

The use of computers in the forestry sector has started recently. The Bangladesh Forest Department has introduced computerized Resource Information and Management Systems (RIMS) to store data obtained through inventories and to update thinning regimes. The department has a number of micro-computers. The Bangladesh Forest Research Institute has four micro-computers. These computers are mainly used for storing and processing research data using different software packages, some of which have been developed by BFRI personnel themselves to suit the BFRI purposes. Other organizations such as the BBS, BCIC, Planning Commission and Bangladesh Agricultural Research Council also have computer facilities.

8. PROBLEMS

Some of the problems encountered in the compilation of statistics for the forest sector in Bangladesh are as follows:

i. There is no organization or structure for the collection, synthesis, updating and dissemination of different sets of forest statistics originating from various sources.
ii. There is a lack of co-ordination between executive, research and administrative agencies involved in the collection of forest statistics.
iii. The collection of forest statistics has always been considered a one-off exercise and provisions for regular updating have never been made.
iv. The resources necessary for comprehensive data collection and the maintenance of a good information and statistical base in forestry are not available.
v. There is a lack of awareness at policy level regarding the importance and usefulness of a sound data base in forestry planning.

9. MAJOR PRIORITIES FOR DEVELOPMENT

i. A detailed and continuous updating information on the supply, demand and consumption of forest products.
ii. The availability of statistics on substitutes for forest products, such as pre-fabricated door and window, railway sleepers, etc.
iii. The generation of detailed information on the growth and yield of different forest formations. This would be particularly necessary for the sustainable management of forest resources and wood based industries.
iv. Detailed and periodically updated information on the collection, synthesis and dissemination of village tree resources, rates of depletion, rates of augmentation and on the socio-economic practices influencing tree plantations in non-traditional land, such as village homesteads and marginal land.

10. RECOMMENDATIONS

i. The establishment of a centrally co-ordinated body, under Ministry of Environment and Forests, for the collection, synthesis, updating and dissemination of forest statistics. This body should have a built-in mechanism to permit close co-operation and liaison with the BBS, the Ministry of Commerce and Industry and other relevant agencies.
ii. Projects should be commissioned for building up an adequate statistical data base on forestry and related activities.

Appendix 1
Surveys on Fuelwood and Charcoal

Name and date of survey Publication	Authority carrying out survey	Coverage	Frequency	Units of measurement
Report on survey of Farm Forestry 1988. Bangladesh Bureau of Statistics, 1990.	Bangladesh Bureau of Statistics	Nationwide, rural areas, excluding the hill districts.	One time	Number, %
Rural Energy and Biomass supply, Vol – IV Planning Commission, May 1985.	Planning Commission, Bangladesh	Nationwide.	2-3 yearly	kg, tons
Year book of Agriculture Statistics of Bangladesh. BBS, Dec.1985.	Bangladesh Bureau of Statistics	Nationwide, rural areas of Bangladesh	5 yearly	maunds, tons, etc
Supply and Demand for Forestry Products and Future Development Strategies, Douglas, Rahman & Aziz:Field Document No.3, BGD/78/010 October, 1981.	UNDP/FAO Planning Commission.	Nationwide, wood-based sector.	One time	kg, tons etc.
Report on Special Studies of Selected Industries in Bangladesh.1981. UNDP/FAO Project BGD/78/020, 1981.	Alif Internationa Ltd., Bangladesh	Nationwide, wood-based	One time	mounds, tons etc.

Appendix 2
Surveys on Non-Wood Forest Products

Product	Estimated quantity	Survey Name & Date	Coverage – by product – geographical	Publication reference
Fruit trees	5.2 million m.tons	Farm forestry survey – 1988	Entire rural areas of Bangladesh	BBS, 1990.
Bamboo	2047 million culms	– do –	6.04 million holdings out of 10.7 m holdings	– do –
Bamboo	7480 million culms	Village forest inventory-1981	Entire rural areas of Bangladesh.	Field Document No. 5, UNDP/FAO BGD/78/020, Oct., 1981.
Golpata	65358 kg	Supplied by the Dept.of Forest.	The Sundarban forest of Bangladesh	BBS-Statistical Year Book of Bangladesh, 1986
Sungrass	1678 bundles	– do –	– do –	– do –
Honey	273 kg	– do –	– do –	– do –
Fish	9506 kg	– do –	– do –	– do –

Appendix 3

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: In general, pole, post and piles, both processed and unprocessed, veneer and saw logs having a diameter of more than 20.0 cm.are treated as industrial roundwood.

MEASUREMENT UNITS: Industrial roundwood (saw-logs and veneer logs) are measured in cu.ft. (Hoppus) under bark. But the pole, post and piles are measured in rft. (different girth). These are then converted into the metric system for special purposes.

METHOD OF SURVEY & COVERAGE: Only products of state forests are recorded. Homestead forest products are not included in the management record of the department. Special surveys using aerial photographs are undertaken occasionally to gather information on growing stock.

FREQUENCY: Data on production from state-owned forests are compiled annually.

OFFICE RESPONSIBLE: The Forest Department, BCIC and BFIDC collect and report the production of Industrial roundwood.

PUBLICATION: Annual Progress Reports of Forest Department, BFIDC and the Statistical Year Books of BBS.

PRODUCT: SAWNWOOD

DEFINITION: Sawnwood includes converted timber for furniture, joinery, construction, railway sleepers etc.

MEASUREMENT UNITS: The measurement unit for sawnwood is cu.ft.

METHOD OF SURVEY & COVERAGE: Official returns include only data on removals from forest areas and by right holders through pit sawing.

FREQUENCY: Data is assembled annually when forest coups are auctioned for collecting revenues.

OFFICE RESPONSIBLE: The collection and reporting of statistics on the production of sawnwood are the responsibility of the Forest Department. BFIDC reports the production of sawnwood which is processed in its processing units.

PUBLICATION: Annual Progress Reports of the Forest Department and Annual Reports of BFIDC publish the production of sawnwood produced in the state controlled forests.

PRODUCT: PLYWOOD

DEFINITION: Plywood having 3, 5, 7 and 9 plys are generally used for tea-chests (3 plys) and other construction purposes.

MEASUREMENT UNITS: Plywood is measured in sq.ft. In general, plywoods of 1/8", 3/16", 1/4" and 3/4" thickness are available in the market.

METHOD OF SURVEY & COVERAGE: Production data are not readily available as nineteen out of twenty plywood mills are in the private sector. BBS collects production data by interviewing the owner/staff of the private mills. BFIDC collects data from its own plywood industry.

FREQUENCY: BBS collects data annually. Few surveys have been conducted in the industrial forest sectors of Bangladesh.

OFFICE RESPONSIBLE: BBS and BFIDC collect data from plywood mills.

PUBLICATION: The Statistical Year Books of BBS and Annual Reports of BFIDC.

PRODUCT: PARTICLE BOARD

DEFINITION: Particle boards are made from hard wood species – single layered and three layered.

MEASUREMENT UNITS: Particle board is measured in square metres.

METHOD OF SURVEY & COVERAGE: Information on the production of government-managed industries is obtained from Annual Reports of BFIDC. Production statistics for private mills are available in the records of those mills.

FREQUENCY: The data from state controlled industries are collected quarterly and annually while data from the private sector are gathered annually.

OFFICE RESPONSIBLE: BBS collects and reports the production of both government and private industries. BFIDC also report productions of its industries.

PUBLICATION: The Statistical Year Books of BBS and Annual Reports of BFIDC.

PRODUCT: FIBRE BOARD

DEFINITION: Fibre board includes hard board and insulation board, the thickness of which is 0.5 inch for insulation board and varies from 0.125 inch to 0.5 inch for hard board.

MEASUREMENT UNITS: Fibre board is measured both in sq.m. and sq.ft.

METHOD OF SURVEY & COVERAGE: There is only one fibre board mill in the country owned

by the state. Information on production can be gathered from the mill or BCIC reports.
FREQUENCY: The data is assembled quarterly and annually.
OFFICE RESPONSIBLE: BCIC is responsible for collecting and reporting the production data.
PUBLICATION: Annual Reports of BCIC and the Statistical Year Books of BBS.

PRODUCT: PULP AND PAPER
DEFINITION: Pulp includes mechanical (ground wood) and chemical (sulphate and soda – both bleached and unbleached) pulps while paper includes writing, printing, packaging paper, and newsprints.
MEASUREMENT UNITS: Pulp and Paper are measured in metric tonnes.
METHOD AND SURVEY & COVERAGE: All pulp and paper mills are owned by the State except for one. Information on production is obtainable from the records of the mills and BCIC reports.
FREQUENCY: The data is assembled quarterly and annually.
OFFICE RESPONSIBLE: BCIC is responsible for collecting and reporting the production data. BBS also collects and reports on the production of pulp and paper.
PUBLICATION: Annual Reports of BCIC and the Statistical Year Books of BBS.

PRODUCT: PAPER AND PAPER BOARD
DEFINITION: Paper and paper board includes paper for writing, printing, packaging, newsprint, etc.
MEASUREMENT UNITS: Paper and Paper board are measured in metric tonnes.
METHOD AND SURVEY & COVERAGE: All pulp and paper industries are owned by state except one. The information on production is obtainable from the mills and BCIC reports.
FREQUENCY: The data is assembled quarterly and annually.
OFFICE RESPONSIBLE: BCIC is responsible for collecting and reporting the production data. BBS also collects and reports on the production of pulp and paper.
PUBLICATION: Annual Reports, BCIC and the Statistical Year Books, BBS.

China

Yang Xianghong

1. INTRODUCTION

1.1 Forest resources

According to the Third National Inventory of Forest Resources conducted between 1984-1988, China now has 267 mil. ha. of forest land while forest cover amounts to 125 million hectares or 12.98% of land surface. The total volume of standing timber is 9,420 million cubic metres, of which forest accounts for 8,000 million cubic metres or 84.9% of the total.

Forests in China provide timber, fruits and industrial raw materials, environmental protection, industrial and household fuels and other uses. Table 1 illustrates the forest resources of China classified by use:

TABLE 1
Forest Resources by Use

	Area (Mil. ha.)	Percentage of total (%)	Notes
Total area of forest	119.4771	100	a. not including forest resources beyond the controlled lines of Taiwan Province and Tibetan Autonomous Region.
Timber forest	83.6159	69.98	
Economic forest	13.7438	11.5	b. bamboo groves are included in Timber forests.
Protective forest	14.5573	12.18	
Fuelwood forest	4.4438	3.72	
Forest for special uses	3.1163	2.61	

1.2 Wood production and environmental protection

China's forest resources are unevenly distributed, being mainly concentrated in the mountains and hills of the Northeast, Southeast and Southwest regions. In these regions, the forest area covers 81.15% of the total land area. These areas account for 80% of the timber supply per year as per the state plan. Taking 1989 as an example, the output of timber in the whole country was 58.02 mil. cu. m., of which 54.07 mil.cu.m., or 93.2% of the total output, was produced in these major timber production areas.

Since the founding of the People's Republic of China, forestry has been greatly developed. By the end of 1988, the area of plantations established was 31.01 million hectares, making up 25.96% of total forest land. However, until recently, attention has been mainly focused on the direct utilization and economic benefits of forests, neglect ing the ecological and social benefits of forest resources. This has resulted in over-logging and over-utilization of forests, serious depletion of forest resources and the deterioration of the environment and ecological balance.

However, through the development of forest science and technology, as well as from the lessons learnt from this deterioration of forest resources, the public understanding of the ecological and social benefits of forest has been improved. Nowadays, forests are regarded as a precious resource and China has already implemented a policy of felling quotas. It is clearly stipulated in "The Forest Law" that: "In accordance with the principle that the consumption of timber forest must be lower than the increment, the State controls the felling yield strictly ...". At present, the felling quota under the state timber production plan is 126 million cubic metres.

In order to protect the environment, ensure the successful development of the national economy and ensure better living conditions for the people, the State has adopted several protective measures in addition to the strict control of the felling of forests. A number of nature reserves and forest parks in major forest areas have been set up, forest investment has been increased and major efforts have been made to stress the protective benefits of forests. Up to the end of this century, special emphasis will be put on the develop ment of five large-scale shelterbelt systems: the "Three North Shelterbelt Systems" in the Northeast, the North and the western part of the Northeast of China, the shelterbelt system along the middle and upper reaches of the Yangtse River, the shelterbelt system along the coastal areas, and the afforestation projects in the Taihang Mountains and plains. This plan covers the afforestation of a total of 26 million hectares of land. The achievement of these development objectives should have significant ecological impact in these areas. 33.33 million hectares of farmland will be protected and it is

estimated that the annual grain production will be increased by about 20 million tons. An appreciable improvement in the situation of timber and water supply is also expected.

1.3 Forest products and forest by-products (not including timber, fuelwood and charcoal)

With a rich variety of economic tree species and resources, as well as the long history of cultivation, the production of forest products and by-products from economic forests has become an indispensable component of the management of forest resources in China. There are now 13.74 million hectares of economic forests in the whole country, ac counting for 11.03% of the total forest area. The staple products of economic forests are divided into edible oil trees(oil-tea camellia, olive), industrial oil trees(tung, Chinese tallow, jojoba), industrial woody material(rubber, raw lacquer, palm chips, rosin), edible fruits, woody flavouring(pepper, anise) and medicinal herbs.

In recent years, the State has paid great attention to the development of economic forests and evident achievements have been gained. The yield of staple products from economic forests has been raised appreciably. Table 2 shows the changes of the staple forest products production.

TABLE 2

Changes in Production of Staple Forest Products 1978-89

Variety	1987 (tons)	1989 (tons)	Output in 1989 as against in 1978 (%)
– Seeds of oil – tea camellia	479 000	667.000	39.2
– Walnut	113 000	160 000	41.6
– Chestnut	62 000	103 000	66.1
– Pine gum	338 000	487 000	44.1
– Seeds of tung tree	391 000	335 000	–14.3
– Seeds of Chinese tallow tree	85 000	56 000	–34.1
– Raw lacquer	2 000	3 000	50.0
– Palm chips	27 000	40 000	48.1
– Fruit	6 570 000	18 319 000	178.8
– Tea	268 000	535 000	99.6
– Silkworm cocoons	228 000	488 000	114.0

1.4 Industrial Plantations

Industrial plantations refer to timber forests which are purposely cultivated using special technology for the specific requirements of industrial production. The earliest establishment of industrial plantations in China took place in the coal mining sector for the production of pit stays. Subsequently, a number of timber forest bases and forest farms have been established to produce pulp wood to meet the needs of pulp industry. Fast-growing and high-yield plantations have also been developed by selecting areas with better natural conditions and easy access, and the adoption of advanced science and technology to produce commercial timber. 1.25 million hectares of fast-growing and high-yield plan tations have been planted. It is planned that before the end of the century 8 million hectares will be established in order to increase national timber production.

1.5 Forest Industry

The past 40 years since the founding of the People's Republic of China has seen the development of a complete forest industry, including logging, wood processing, forest chemistry, and forestry machinery manufacture. By the end of 1989, 1,942 forest industry enterprises of different sizes had been set up all over the country, employing 1.279 million workers and staff members and producing 12.26 billion yuan of gross value of annual industrial output (calculated at current prices). Table 3 shows the general situation of forest industry in China:

Most forest industry enterprises are located in forest areas or in medium and small-sized cities in provinces and autonomous regions with rich forest resources. A few wood processing and forest chemistry enterprises are located in Beijing, Tianjin and Shanghai Municipalities and some coastal cities.

TABLE 3

Forest Industry in China

Forest industry enterprises	Quantity	Staff & workers by the end of the year (million persons)	Gross value of output (calculated on current prices) (million Yuan)
– Total	1942	1.279 mil.	12 260 mil.
– Logging	1430	1.102 mil.	8 880 mil.
– Wood processing	321	0.126 mil.	2 190 mil.
– Forest chemistry	122	0.024 mil.	0 700 mil.
– Forest machinery manufacture and repair	69	0.027 mil.	0 490 mil.

Since 1980, the state has made special investments for the development of wood processing industries,

in particular for the improvement of technology in the wood-based panel industry. Since the 1960's, the output of wood products, especially wood-based panels, has increased remarkably. The forest chemical industry has also made considerable progress over the last ten years. Details of the changes in output of various products of the wood processing and forest chemical industries are shown in Tables 4 and 5.

TABLE 4

Changes In Output of Wood Processing Industries: 1963-89

Products	Output (cu. m.)			Output in 1989 as against in 1963 %
	1963	1978	1989	
- Sawnwood	8 264 000	11 055 000	13 933 000	68.6
- Plywood	104 000	252 000	727 800	599.8
- Fibre board	19 000	329 000	1 442 700	7493.2
- Particle board	13 000	44 000	442 000	3300.0

TABLE 5

Changes In Output of Forest Chemical Industries: 1963-89

Products	Output (Ton)			Output in 1989 as against in 1963 %
	1963	1978	1989	
- Rosin	98 000	282 000	409 000	317.3
- Shellac	200	1 400	800	300
- Tannin extract	6 100	30 100	26 400	332.8
- Pulp	1 096 000	3 455 000	11 435 400	943.4
- Paper and paperboard	1 283 000	4 387 000	12 645 400	885.6
- Turps	11 000	47 900	57 200	420.0
- Active carbon	400	5 800	12 300	2975.0

Over the last 40 years, the forestry machinery industry in China has grown from nothing to 69 enterprises manufacturing more than 500 kinds of machines for the forest industry. Table 6 shows the output of staple forest machinery products.

TABLE 6

Changes In Output of Forest Machinery

Products	Output (sets)		Output in 1989 as against in 1980 (%)
	1980	1989	
- Sprayers	800	4098	412.3
- Brush cutters	500	2221	344.2
- Chain saws	1811	10728	492.4
- Loaders	80	810	912.5
- Planing machines	1420	1314	-7.5
- Band saws	24	87	262.5
- Chippers	49	139	183.7
- Hot presses	102	106	3.9

2. STATISTICS IN THE FORESTRY SECTOR

2.1 The items and orientation of forestry statistics Forestry statistics aim to collect, process and analyze information relating to forest resources, exploitation, management and development, and to illustrate the scale of activities in the sector, so as to seek out trends of development. The following are the 13 key items of forestry statistics in China:

i. Statistics on silviculture
   - providing information on forest management by forestry enterprises, institutions, rural collectives, or ganizations and individuals. The activities covered include seed collection, nurseries, site preparation, regeneration, tending, etc. in terms of quantity and quality. The statistics also give information on the value and volume of output of forest products, on forest protection and on disease and pest control.

ii. Statistics on forest industries
   - including information on the output of the logging, wood processing, and forest chemical industries. Data is provided on type, specification, quality of timber, sawn timber, plywood, fibreboard, particle board, tannin extract and rosin. Forest industry statistics also give the output value of commodities and total and net output values from the forest industry and the operation of major forest enterprises as well as the product structure of the industry.

iii. Statistics on forestry equipment
   - indicate the quantity, performance, and technical parameters of all kinds of forestry machineries as well as their maintenance and repair, and the degree of mechanization in the forestry sector.

iv. Statistics on productive capabilities
   - information on changes in the productive capabilities for main forest products, such as timber, sawn timber, plywood, fibreboard,

particle-board, tannin extract and rosin, etc.

v. Statistics on forestry fixed assets
   - covering information on capital construction in silviculture and the forest industry. In each classification within the sector data is given on total investment from various sources of funds, additional fixed assets and productive capabilities, economic benefits resulting from the investment, and progress and quality of operations.

vi. Statistics on wages in the forestry sector
   - covering changes in the wages of people working in the forestry sector, wage structure, productivity, labour in surance, welfare and safety, as well as the total and average number of forestry workers.

vii. Statistics on supply of forestry goods and materials
   - providing information on the supply, consumption and storage of raw materials for silviculture, forest in dustries, capital construction and fuel.

viii. Statistics on marketing of forest products
   - reflecting the marketing, storage, and delivery of various forest products, and the execution of delivery contracts. The products covered include timber, sawn timber, wood-based panels, rosin, tannin extract and alcohol.

ix. Statistics on agriculture and sideline production by forestry enterprises and institutions
   - providing information on the area under cultivation and the output of various crops in forest areas along with data on animal husbandry, and by-products.

x. Statistics on forestry finance and cost
   - indicating the sources of funds and their uses in forestry production, the costs of various products and profits gained, including changes in fixed and circulating funds, payments to the state and the efficiency of use of funds.

xi. Statistics on forest resources
   - showing changes in the distribution and classification of forest resources, including the utilization of various types of forest land, the area of stands and plantations established, species, and forests of different ages as well as their standing volume, increment, consumption and plantation established.

xii. Statistics on forestry education
   - illustrating the scope, structure, tendencies of forestry education, including information on the number of teachers, courses, students in institutions of high learning and secondary schools.

xiii. Statistics on forestry science and technology
   - provide information on achievements in scientific research, extension and application, etc.

2.2 The Organization of Forestry Statistics

Since the founding of the People's Republic of China, the forestry statistical system has improved greatly. The number of people involved in forestry statistical activities has reached to 25,000-30,000. The organizations responsible for forestry statistics at various levels are components of forestry administrative departments and enterprises of different types. The Statistical Division of the Ministry of Forestry is in charge of statistical work in the forestry sector in the country. It is responsible for the formulation of rules and regulations concerning the reporting of forestry statistics, for the revision of the system of statistics, for creating various types of statistical reporting forms, and for publishing reference materials of forestry statistics and related statistical data.

The responsibilities of the Statistical Division also include the collection, processing and analysis of comprehensive statistical information concerning silviculture, forest industries, productive capabilities, forestry equipment, wages, investment on fixed assets and total output value from forestry. The Division receives direct guidance from the State Statistical Bureau. Within the Ministry of Forestry, each specialized department is responsible for statistics on their relative subjects, but they receive guidance from the Statistical Division.

The forestry department in each province, autonomous region or municipality has its own forestry statistical organization with specialized staff in charge of statistical work. The statistical organizations at prefecture and county levels are classified into 2 categories. In major forest areas, full-time staff are assigned to statistical work, while in non-forest areas, especially at county level, most of statistical work is done by part-time staff. At the forestry working stations at township level, staff are responsible for collecting, classifying, and reporting

forestry statistical data in addition to their other duties.

TABLE 7

Responsibilities for Statistics within the Forestry Sector

Administrative unit in Ministry of Forestry	Specialized statistical subject area
Statistical Division, Dept. of Planning	Silviculture, forest industry, wages, fixed assets, productive capabilities, forestry machinery and total output value
Dept. of Forest Industries	Forest industry, agriculture and sideline production, timbers of supply and marketing
Dept. of Finance	Financing and costs of forestry
Dept. of Education	Forestry education
Dept. of Forest Resource	Changes in forest resources and their structure
Dept. of Science and Technology	Scientific research and extension
China Forestry Machinery Co.	Manufacturing, marketing, and storage of forestry machinery
China Forest Products Industry Co.	Wood processing, supply and marketing, and forest chemical products
China Forestry Material Supply Co.	Supply and storage of forestry materials
China Seed Co.	Supply, marketing and trade of tree seeds and seedlings

2.3 The collection of forestry statistical data

Accurate and reliable forestry statistical data are currently obtained through overall investigation with sampling used as an auxiliary means of investigation. Taking comprehensive statistics as an example, the Statistical Division in the Ministry of Forestry is in charge of formulating unified reporting forms, and circulating then to forestry statistical organizations in provinces as legal documents. Each province can make adjustments to allow for local conditions and then set up a reporting system. This reporting system using unified forms runs through the counties and local statistical organizations (county forestry bureaus or state-owned forest farms and forest industry enterprises). However, statistical forms for reporting must be completed in accordance with regulations and cannot be changed or altered. Reporting must be done verbatim starting from county to prefecture, province and finally to the Ministry of Forestry. Before reporting, the completed forms should be approved by the local administrative head. Information and data in the forms cannot be revised without convincing reasons and the necessary approval procedures.

As far as silviculture statistics from rural areas are concerned, the Ministry of Forestry together with the State Statistical Bureau creates forms and distributes them to the forestry working stations in townships and to local-level statistical organizations for data collection.

2.4 The Function of Forestry Statistics

The functions of forestry statistics can be defined as follows:

i. to collect, classify and analyze the situation in forestry development, and to provide accurate information for the government and decision makers enabling them to formulate forestry development plans and policies.
ii. to monitor the implementation of policies, to feedback existing problems to decision-makers to enable them to make the necessary adjustments and improvements and to ensure the accomplishment of forestry programmes.
iii. to study tendencies in forestry development and prepare comprehensive statistical information to support research activities.

Statistical forms are usually reported monthly, quarterly, half-yearly, and yearly. The monthly, quarterly and half-yearly reports are mainly for providing information concerning technological, economic and productive activities, as well as wages. The yearly report is aimed at giving a overall view of forestry, forest industry and management. The yearly statistical information is used by the authorities at all levels for ensuring efficient management and making appropriate plans and decisions.

Before 1986, forestry statistical data received limited circulation. However, since the adoption of the policy of 'Open to the Outside World', statistical information has been openly published. In order to meet the needs of the foresters at all levels and people from other sectors, a collection of statistical information 'National Forestry Statistics' was published in 1987.

3. STATISTICS ON FUELWOOD AND CHARCOAL

The same system and means of statistical collection are adopted for fuelwood and charcoal. However, only fuelwood and charcoal produced commercially by the forestry sector are included, not those produced for self-consumption by individual forestry enterprises.

The consumption of fuelwood takes up a big proportion in the forest resources in China. Statistics

on fuelwood consumption are not complete and, in most cases, are estimated by irregular sampling. According to a statistical estimate made in 1984-1985 in each province or autonomous region, the national consumption of fuelwood is more than 0.20 billion tons, which is 10 times than the amount estimated the government. Fuelwood is mainly consumed by small industries run by townships and rural households. According to these statistics, consumption of fuelwood takes up about 25%, and sometimes as much as 50%-60%, of the total annual consumption of forest resources. In recent years, attention has been focused on the renovation of stoves in order to save wood and special funds are set aside for extending this experience to the areas with high consumption of forest resources. However, the high consumption of forest resources still remains a critical problem in China.

Statistics on production and consumption of charcoal products are not available on a nationwide basis, but mainly rely on information provided by the commercial sector which reflects the actual amount of charcoal purchased. In comparison with fuelwood, the consumption of charcoal is very small limited. Charcoal is mainly used as industrial material and fuel. The output value of charcoal has dropped sharply with the depletion of forest resources. According to the statistics of the commercial sector, 285 000 tons of charcoal products were produced in 1988, and 245 000 tons were sold, a reduction of 56.2% and 55% respectively compared with 1978.

Information on surveys on fuelwood and charcoal is contained in Appendix 1.

4. TRADE ON FOREST PRODUCTS

4.1 Trade in forest products

With an average per capita forest area of only 0.12 hectares and a per capita standing volume of 9 cubic metres, respectively equal to 18% and 13% of the world per capita average, China is a land with limited forest resources. The implementation of the open policy since 1978 and the subsequent development of the national economy has led to an increasing demand for timber. However, with the depletion of indigenous forest resources and the subsequent imbalance between domestic supply and demand, the state has to spend a great amount of foreign exchange importing timber each year. From 1981-1985, 31.49 million cu. m. of the timber were imported, at a cost of US$395 million. In the last few years, imports of timber and timber products have decreased to some extent, but imports are still far greater than exports. The export for bamboo, forest by-products and forest chemical products is continuously growing (the following table shows the rising figures).

TABLE 8
Imports and Exports of Forest Products

Products	Unit	1985		1989 (Estimated Value)	
		Import	Export	Import	Export
– Timber	1000 cu.m.	9 834	25	5 970	–
– Plywood	t	534 825	3099	696 552	–
– Bamboo	t	8	46 838	–	–
– Forest chemical products	t	11	166 421	–	193 098
– Forest by-products	t	96	62 011	–	74 941

4.2 Statistics on trade in forest products

Under the current statistical system in China, the State General Administration of Customs is in charge of import and export trade statistics. Each customs office classifies the actual import and export trade amount (with reference to the classified standard of commodities) and presents an itemized report to the State General Administration of Customs. The General Administration is responsible for national data compilation, printing, publication and distribution to government organizations, special departments concerned and to the public.

Trade statistics on forest products provide a scientific basis for systematic analysis and study of the forest products trade, and thus for maintaining appropriate trade scales and adjusting product structure and production.

China has over 20 countries and regions as the major trading partners in forest products, including Japan, Mongolia, Indonesia, Malaysia, Burma, the Soviet Union, the United State of America, Canada, Brazil, Chile, and Sweden.

The measurement units used for main trade products are as follows:

– cu.m. for log, sawn timber and paper pulp wood.
– t. for plywood, and paper-pulp and paper.

5. COMPUTER APPLICATION

Since late 1983, microcomputers have been used for processing forestry statistics. Since 1985, all the processing of yearly statistical statements has been done by microcomputers, putting an end to the considerable time-lag caused by processing statistical statements by hand, and drastically improving working efficiency and quality. Subsequently, computerization has been progressively carried forward in provincial forestry statistical organizations. At present, microcomputers are commonly in using in 30 provincial forestry statistical organizations and some prefectures and counties where forestry is the main business, as well as in some forestry enterprises and institutions. Since 1989, the yearly report of national forestry statistics has been computerized. In the future, a computer communication network system is going to be set up at central and provincial levels for computer statistical calculation, data sorting, in formation circulation, compilation, publication, etc. The main types of microcomputers used currently are IBM series or other compatible types such as IBM (XT.286), GW-286, AST286, 386 etc. The software in use includes BASIC and DBASE(III) and the applied procedures are programmed domestically. Some applied softwares such as Supercall and Office are extensively used in processing statistical tables.

6. EXISTING PROBLEMS AND FUTURE PLANS

6.1 Problems

There are three principle problems in forestry statistics in China:

i. During the current period of planned commodity economy in China, diversified economic components are co-existing. The product scale is constantly expanding, mandatory plans are gradually diminishing and various systems of economic responsibility introduced. As a result, the whole pattern of economic activity in Chinese society has changed from simple to complex. Consequently, the subjects of the statistical investigation are increasing and the economic dynamics of the country are becoming more and more changeable. Current statistical investigations by forestry administrative departments all use the over-all investigation method, as in most socialist countries. However, the single over-all investigation method cannot completely reflect the whole range of socio-economic activity currently going on in China.
   For example, statistics on the areas afforested by both village collectives and individual farmers, harvesting of bamboo and wood, production of forest by-products and timber in the forest industry requires investigation using flexible and diverse statistical methods.
ii. The number of qualified statistical personnel is insufficient in forestry statistical organizations. In general, forestry statistical personnel at central and provincial levels are more competent while forestry statistical personnel at county level or below are apparently weak. Most of these latter are part-time staff with poor statistical background, especially in the areas where forestry is not a priority.
iii. Computer operation has not been popularized and the statistical calculation method at grassroot-level is backward. Although efforts have been made in recent years to introduce microcomputers at central and provincial levels, computer utilization in the country as a whole is low. The transformation from traditional to modern methods is slow and the use of computers is limited to single machine operation. The establishment of a computer network is still in its early stages with calculations at county level and below still being done manually.

6.2 Future action

The following action is required to tackle these problems:

i. The full use of alternative investigation methods, such as sampling investigation and typical investigation, and gradual setting up investigation systems for special statistics which will make up for the deficiency in the over-all investigation method and ensure the integrity and accuracy of forestry statistics data.
ii. The strengthening of statistical organizations with special attention to the training of statistical personnel at grassroot level. Among measures which need to be taken are the provision of full-time statistical personnel and the training of statistical personnel to strengthen their knowledge of statistical methods and of techniques of computer application.
iii. The continuation of the modernization of

forestry statistics and the improvement of computer operations. Special emphasis should be laid on setting up a computer communication network at central and provincial levels and gradually popularizing computerization at prefecture-and county-level. In the future, computer utilization will be expanded and an integrated data bank on forestry statistics progressively established, will lay a solid foundation for the realization of office automation in statistical work.

7. TWO RECOMMENDATIONS

i. It is recommended that FAO should regularly or irregularly organize international exchanges on forestry statistics for the discussion of important statistical issues between countries and regions. This could also be achieved through the circulation of documentation to introduce (non-periodically) the advanced experiences and scientific and technological developments of each country in the field of forestry statistics.

ii. An international forestry statistics information network should be set up, with the FAO as its centre, to exchange statistics information, promote mutual understanding, analyze and study issues in world forestry developments and make contributions to forestry development in each country.

Appendix 1

Surveys on fuelwood and charcoal

Name & data of survey Publication	Authority carrying out survey	Coverage Geographical Districts	Remarks Frequency Measurement
Reference		Household/Industry-Fuelwood/Charcoal/ both	
"Systematic Statistics Annual Report"	General Supply and Marketing Cooperative, Ministry of Commerce.	part for purchasing and marketing(both)	annual report (tons)
"National Forestry Statistics Data"	Statistics Division of Planning Dept., Ministry of Forestry.	part for production marketing (both)	semi-annual report (tons)

Appendix 2

Surveys on forest products other than wood (non-wood forest products)

Products	Estimated Quantity (tons)	Survey Date	Coverage Method	Publication Reference
– Raw lacquer	2 950	1989	Overall Investi-gation	"National Forestry Statistics Data"
– Tungoiltree seed	334 757	"	"	"
– Camellia	667 245	"	"	"
– Chinese tallow seed	56 106	"	"	"
– Palm chip	40 336	"	"	"
– Dried bamboo shoot	72 821	"	"	"
– Walnut	160 053	"	"	"
– Chestnut	102 546	"	"	"
– Shellac	2 375	"	"	"
– Gallnut	5 266	"	"	"
– Pine gum	486 837	"	"	"
– Fruit	18 319 310	"	"	"China's Agricultural Statistics Data"
– Tea	534 876	"	"	"
– Silkworm	488 098	"	"	"

Appendix 3

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Roundwood of different dimensions produced by logging (consisting of final cutting, tending cut ting, sanitation cutting and stand improvement etc.) and scaled, checked and accepted according to the standards issued by the State and the Ministry of Forestry. There are three major dimensions for roundwood standards: super roundwood: 4-8 m in length and over 20-26 cm in diameter; roundwood for direct use: 2.2-6 m in length and 10-24 cm in diameter; roundwood for processing: 2-8 m in length and over 14-18 cm in diameter.

MEASUREMENT UNIT: cu.m. or 10 000 cu.m.

METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage contains those available for unified allocation by the State, local marketing, state-owned forestry entities and other departments for their own use.

FREQUENCY: Semi-annual report and annual report.

OFFICE RESPONSIBLE: Statistics Division of Planning Department, Ministry of Forestry.

PUBLICATION: "National Forestry Statistics Data" (for publication).

PRODUCT: SAWNWOOD

DEFINITION: Processing timber product which uses roundwood as the raw material and is vertically cut with sawnwood machinery or manual tools into certain dimension (width and thickness) in accord with "Sawnwood Standard" issued by the State and the Ministry of Forestry and other agreeable standards ordered by the users, including common sawnwood and sawnwood for vehicles, trucks, ship, packing boxes and sleepers etc.

MEASUREMENT UNITS: cu.m. or 10 000 cu.m.

METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage includes sawmills with independent accounting and non-independent accounting, integrated timber processing plants, sawnwood produced in sawmill workshops affiliated to logging enterprises and processed in mountainous areas.

FREQUENCY: Semi-annual report and annual report.

OFFICE RESPONSIBLE: Statistical Division of Planning Department, Ministry of Forestry.

PUBLICATION: "National Forestry Statistics Data" (for publication).

PRODUCT: PLYWOOD

DEFINITION: Roundwood made into veneer by peeling into plywood of various dimensions by drying, gluing and hot-pressing in accordance with the standards issued by the State and the Ministry of Forestry and the agreeable standards ordered by the users.

MEASUREMENT UNITS: cu.m. or 10 000 cu.m.

METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage includes sawmills with

independent accounting and non-independent accounting, integrated timber processing plants and plywood produced by workshops affiliated to logging enterprises.
FREQUENCY: Semi-annual report and annual report.
OFFICE RESPONSIBLE: Statistics Division of Planning Department, Ministry of Forestry.
PUBLICATION: "National Forestry Statistics Data" (for publication).

PRODUCT: PARTICLE BOARD
DEFINITION: Boards made from wood shavings by drying, glue blending, forming and hot-pressing in accordance with the standards issued by the State and the Ministry of Forestry and the agreeable standards ordered by the users.
MEASUREMENT UNITS: cu.m. or 10 000 cu.m.
METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage consists of logging enterprises with independent accounting and non-independent accounting and particle boards produced by workshops attached to logging enterprises.
FREQUENCY: Semi-annual report and annual report.
OFFICE RESPONSIBLE: Statistics Division of Planning Department, Ministry of Forestry.
PUBLICATION: "National Forestry Statistics Data" (for publication).

PRODUCT: FIBREBOARD
DEFINITION: Board made from wood slashings or vegetable slashings with non-wood fibre made by fibre separation, forming and hot-pressing in accordance with standards issued by the State and the Ministry of Forestry and the agreeable standards ordered by the users. The board is divided by characters of raw materials into wood fibreboard which includes hard fibreboard, soft fibreboard and MDF and non-wood fibreboard.
MEASUREMENT UNITS: cu.m. or 10 000 cu.m.
METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage includes logging enterprises with independent accounting and non-independent accounting and fibreboard produced by workshops subsidiary to logging enterprises.
FREQUENCY: Semi-annual report and annual report.
OFFICE RESPONSIBLE: Statistics Division of Planning Department, Ministry of Forestry.
PUBLICATION: "National Forestry Statistics Data" (for publication).

PRODUCT: PULP AND PAPER
DEFINITION:
- PULP: Wood pulp, bamboo pulp, reed pulp, straw pulp and other pulps of all sorts produced by various methods.
- PAPER: All kinds of papers with fixed weight below 200 g/sq.m. and thickness below 0.1 mm.

MEASUREMENT UNITS: t. or 10 000 t.
METHOD OF SURVEY & COVERAGE: Overall investigation. The coverage consists of enterprises with independent accounting and non-independent accounting and papers and pulp produced by workshops subsidiary to other enterprises.
FREQUENCY: Semi-annual report and annual report.
OFFICE RESPONSIBLE: Statistics Division of Planning Department, Ministry of Light Industry, is responsible for the relevant statistics of the whole country.
Statistics Division of Planning Department, Ministry of Forestry, deals with statistics of the output of the products produced by forestry sector.
PUBLICATION: "Annual Report on Light Industry Statistics" (for limited circulation).
"National Forestry Statistics Data" (for publication)

PAPER AND PAPERBOARD
DEFINITION: paper or paperboard or thick construction paperboard with the fixed weight over 200 g/sq. m. and thickness over 0.1 mm.
MEASUREMENT UNITS: t. or 10 000 t.
METHOD OF SURVEY & COVERAGE: Similar to paper and paperpulp.
FREQUENCY: Semi-annual report and annual report.
OFFICE RESPONSIBLE: Similar to paper and paperpulp.
PUBLICATION: Similar to paper and paperpulp.

Fiji

Ram Swarup

1. INTRODUCTION

The forestry sector in Fiji is at a crossroad in its evolution. Until 1987, activities in the sector had concentrated on the following:

- reforestation of logged-out areas, primarily with mahogany
- afforestation programmes establishing caribbean pine on grassland
- harvesting of indigenous species
- milling of domestic species mainly for the domestic market
- veneering and plywood manufacture.

A number of developments occurred in 1987 which have effected the future of the sector. Firstly, industrial processing of plantation resources was commenced with the commissioning of the Tropik Wood Industries complex for integrated sawn pine and chip production. Secondly, the May political upheaval caused a fall in domestic timber demand as the economy slumped and led to the devaluation of the Fijian dollar. The result of this was that the timber industry at the time either had to export or cease operations. Some smaller mills have closed but larger operators have upgraded product quality and are successfully exporting, taking advantage of the devaluation and their resulting international competitiveness. These events form the operational context to what is the key to the future of the forestry sector in Fiji – the use of the plantation resource and sustaining indigenous resources.

The potential for the timber industry in Fiji is tremendous. It is possible for the industry to expand manyfold over existing levels and become a significant contributor to the national economy. However, for this to occur, a number of different agencies have to work together while recognising and respecting their different interests. This will not be possible without the availability of more information on the industry both locally and abroad.

2. FORESTRY SECTOR REVIEW

With the approaching maturity of its large-scale pine plantations established in the early 1970's, the Fijian government considered that the time was appropriate for a comprehensive review of the forestry sector and the policies for its development. FAO was nominated as the executing agency and the study was completed in November, 1988.

The objective of the review was, basically, to formulate a strategy for the development of the forest sector in Fiji over the next 25 years (to 2015). The objectives of such a strategy would be:

- to maximise the sustainable contribution of the sector to the development and diversification of the economy
- to bring the indigenous Fijian people into fuller and more active participation in forest sector development at all levels and stages
- to protect and enhance the effectiveness of the country's forests in environmental conservation.

In its simplest terms, the review had two tasks. Firstly, to establish how much and what sort of forest it is in the country's long-term interest to have and for what purposes it should be used. Secondly, to determine how that forest resource and the benefit from it could be most satisfactorily provided.

The range of possible options for the forest sector depends on linkages and relationships for the understanding of which an updated and reliable database is necessary.

3. FORESTRY SECTOR STATISTICS

Statistics and information are essential tools for any organisation for both its immediate and long-term planning and decision-making. Proper planning for future action requires the examination of historical data in the light of the current situation.

In Fiji, two agencies are responsible for collecting information on the forest industry: the Bureau of Statistics and the Forestry Department. Although the Inland Revenue (tax information), Customs (exports) and Native Land Trust Board (logging licences) also collect information on the industry, their data collection systems either go hand-in-hand with the Forestry Department's or they are totally separate and unobtainable (e.g.taxes paid by companies).

3.1 Bureau of Statistics

The Bureau of Statistics, under the Ministry of Finance, publishes the following on an regular basis:

- The Census of Industries
  This is an annual publication compiled from questionnaires sent to various companies. Besides material flows (e.g.log intake and output, volume of fuel purchased) and prices for specific products and destinations, the questionnaire includes sufficient information to assess the industry at an aggregate level. Although information such as taxable income and taxes paid are included in the questionnaire, these figures are not published. This publication offers excellent time series data by which to assess the industry and also provides the opportunity to evaluate the industry's performance against other manufacturing industries in Fiji.
- The Annual Employment Survey
  This publication is also available in a time series. The data based on the questionnaire includes occupation, race, age, sex and rate of wage or salary and allowances for industry workers. Used in conjunction with other data sets, this information can help to verify and define certain changes in the industry.
- The Trade Report
  The Trade Report, which is also an annual publication, shows imports and exports, destinations and sources, by volume and value for a range of products. The data is based on Customs invoices and is useful for aggregate analysis but limited in respect to marketing information. Some inconsistencies have been noted in recording certain items, indicating the need for training Customs agents in classification of certain products.
- Current Economic Statistics
  This quarterly publication includes changes in exports based on Forestry Department and Customs data. Annual production statistics form the Forestry Department are also included. Two main price indices, the Consumer Price Index and the Building Materials Index are shown in terms of monthly and annual changes. Data are collected monthly to compile these indices.

3.2 Forestry Department

The Forestry Department collects trade information in three main areas: logging, exports and production.

- Logging
  The Forestry Department keeps records of licences issued, licence area reports, information on species removed, length, diameter, gross volume, defects, and net volume of logs, payment of royalty to landowners and government fees. This information is coded and entered in the Department's CPM-based computer system. Current analysis of data is focused on the variables cited above and presented in the publications indicated earlier as well as in internal documents, departmental annual reports, etc.
- Exports
  Forestry department export documentation included data on species exported, grades, moisture content, preservative treatment, dimensions, volume, FOB price, port of loading, supplier, destination, etc. Infomration on export is published in Forestry Department and Bureau of Statistics publications. However, none of the Department's data are computerised which limits detailed analysis.
- Production statistics
  Sawmills are required to submit monthly log input and sawn timber output statistics. These figures are collated and published by the Forestry Department and the Bureau of Statistics.

3.3 Future Directions

A considerable amount of data is already being collected but its application is limited. The reasons for this limited use are a lack of personal computers and staff necessary for analysis work. Formats for data collection need to be standardised to meet the requirements of both the Forestry Department and the Bureau of Statistics. Regular, formal meetings between the Bureau, the Native Land Trust Board and the Forestry Department on data collection and analysis of data could reduce a lot of duplication and help to minimise costs.

The following areas of forestry statistics require immediate attention:

i. Indigenous Resource Inventory
   Current estimates of Fiji's indigenous forest areas are based on surveys undertaken during 1967-68 by the Land Resources Division and published in 1970. The accuracy of these estimates is being challenged as they have not been adequately updated taking proper account

of encroachment on the forest by agricultural clearings and using stocking estimates of the indigenous forest by logging companies. Both these omissions have serious consequences. Failure to account for the former indicates that the loss of forest cover could be significantly more than reported by the Forestry Department, while the latter omission leads to an underestimation of the commercial value of the forest. The German GTZ Project has offered to undertake an inventory of native forests in 1991 to check out the areas and volumes of native production forests that remain available for commercial logging.

ii. Land Use Planning

Land use statistics and land use planning are currently limited to detailed analysis for urban and tourism areas by the Town and Country Planning and Native Land Trust Board. To date, there have been few major conflicts between alternative forms of land use in areas in which forestry and logging are the main activities. However, this may not always be the case as forestry activities and agriculture continues to push against conservation and protection areas. This again points to the need to systematically integrate data bases.

iii. Environmental Protection and Planning

Environmental issues will obviously be based on resource estimates. Under the Land Resources Division Survey of 1966, 33% of indigenous forest was classed a "protection forest" for streamflow and watershed conservation. Unfortunately, there has been encroachment by logging and forest clearing. Efforts are being made to reduce the negative environmental impact of logging by the Logging Training School and the implementation of the National Code on Logging Practices. Information is required to ensure that adequate reserves are created to cater for all forest types and associations. All forestry and associated developments should be accompanied by an environmental impact study.

iv. Industry Practices

A manpower study for future industry development has high priority as it will have a significant impact on landowner employment. The levels of education and skill of available manpower as well as overall numbers will be of importance. The available workforce should be able to be trained to operate new machines and adapt to new production processes as the industry expands.

4. INFORMAL SECTOR PRODUCTS

4.1 Fuelwood and Charcoal

In Fiji, the proportion of total energy supplied by fuelwood decreased rapidly with increases in Gross National Product. This is illustrated by the greater proportion of households using kerosene, electricity and gas stoves in the higher income brackets. In the rural sector, firewood is still widely used for cooking because it is available nearby, inexpensive or free, and in any case cheaper than alternative fossil fuels.

Although statistics are available on fuelwood production and reported by the Forestry Department, these reflect only a minor proportion of what is actually being used. Indigenous forest owners have customary rights to use of firewood and do not require licences to remove wood for fuel. The problems of obtaining accurate data are compounded by illegal cutting and unrecorded sales of slates as off-cuts from sawmills.

In 1977, the Centre for Applied Studies in Development of the University of the South Pacific undertook a survey on the use of wood for cooking meals, smoking fish catches and firing copra driers (see Appendix 1). The survey showed a rural person's total annual wood consumption to be 506.26 kg (oven-dry). Of this, 353.37 kg is consumed for home cooking and general preservation and 150.9 kg by wood-fired copra driers. Fiji's national average wood consumption rate was determined to be 350 kg (oven-dry) per capita per annum.

Fiji has no tradition in the use of charcoal. A small quantity of charcoal is produced to cater to the local barbecue market. Charcoal is measured and reported by weight. A conversion factor of 0.006 is used to convert charcoal in kilograms to roundwood equivalent in solid cubic metres.

4.2 Forest products other than wood

In Fiji, a number of products other than wood are derived from the forest, particularly for sustenance of traditional village life. These include food items (root crops, fruits and wild animals), shelter material (posts/poles, thatch, reeds and bamboo) herbs and medicines.

Unfortunately, no estimates are available on the

amount or volumes used and no surveys have been undertaken on the availability of these products with the exception of a partial survey of bamboo resources (see Appendix 2).

TABLE 1
Export/Import of timber & other wood products: 1989

Product destination/source	EXPORTS			IMPORTS		
	Unit	Quantity	Value $	Unit	Quantity	Value $
ROUNDWOOD (LOGS)	cu.m					
People's Republic of China		9843	820637			
TOTAL		9843	820637			
POLES/POSTS	cu.m					
American Samoa		11	4990			
Western Samoa		3	1529			
TOTAL		14	6519			
SANDALWOOD	tons					
Taiwan		48	46790			
TOTAL		48	46790			
SAWN TIMBER	cu.m					
Australia		22166	6998443			
New Zealand		3278	1614418			
Tahiti		1130	534755			
Belgium		893	321045			
New Caledonia		836	486756			
Japan		818	691851			
United Kingdom		669	313751			
Tonga		526	216223			
Tuvalu		458	153640			
Vanuatu		409	210086			
U.S.A.		149	64566			
Kiribati		131	36148			
Western Samoa		123	24982			
Taiwan		115	57471			
Singapore		36	10000			
Cook Islands		31	14544			
Hawaii		30	32460			
Hong Kong		16	7264			
American Samoa		12	7046			
Solomon Islands		1	495			
TOTAL		31827	11795944			
VENEER SHEETS	cu.m					
U.S.A.		3758	2476852			
Australia		1265	1601374			
New Zealand		130	117373			
Japan		72	126599			
TOTAL		5225	4322198			
PLYWOOD/CHIPS	tons					
Japan		183873	12144261			
TOTAL		183873	12144261			

TABLE 1
Export/Import of timber & other wood products: 1989 (cont'ed)

Product destination/source	EXPORTS			IMPORTS		
	Unit	Quantity	Value $	Unit	Quantity	Value $
PLYWOOD	cu.m.					
Australia		916	981495			
New Zealand		605	498581			
Solomon Islands		140	119859			
Tahiti		124	158664			
Vanuatu		121	117101			
Tonga		83	79046			
Western Samoa		71	55491			
Tuvalu		48	71436			
New Caledonia		26	27622			
Cook Islands		14	8141			
Kiribati		12	23060			
American Samoa		2	2548			
TOTAL		2162	214044			
BLOCKBOARD LAMINATED PANELS	cu.m.					
Tonga		46	29100			
Western Samoa		37	5184			
Vanuatu		26	18715			
New Caledonia		22	15146			
Solomon Islands		12	5565			
American Samoa		10	22239			
Tahiti		6	5374			
Cook Islands		4	6653			
Tuvalu		3	2693			
New Zealand					14	12284
TOTAL		166	110669		14	12284
CHIPBOARD and PARTICLE BOARDS				sq.m.		
New Zealand					43265	228359
Australia					16580	62209
Thailand					4763	11689
TOTAL					64608	302257
HARDBOARD				sq.m.		
New Zealand					91520	269890
Thailand					60357	143763
Australia					24529	126480
TOTAL					176406	540133
SOFTBOARD				sq.m.		
New Zealand					12637	92333
TOTAL					12637	92333
IMPROVED WOOD				sq.m.		
New Zealand					13046	64793
Australia					4789	17323
TOTAL					17835	82116

5. MODERN SECTOR PRODUCTS

These include industrial roundwood, sawn timber, plywood and wood chips. The definitions, units of measurement, coverage and method of data collection are shown in the attached proformas for each product. The coverage includes production from indigenous forests, plantations and extension schemes (see Appendix 3).

6. TRADE

The Trade Report, which is published annually by the Bureau of Statistics, shows imports and exports, destinations and sources by volume and value and range of products. The data base is customs invoices. Forestry trade figures are also summarised in *Forestry Department Annual Reports*. The 1989 Trade Report is shown in Table 1.

7. COMPUTERS

The Bureau of Statistics, which is part of the Ministry of Finance, is well equipped with data processing facilities. Its data processing system is centralised.

Currently, the Forestry Department has only a CPM system, which is used to process timber removal statistics and royalty accounting, and an IBM/AT compatible purchased by the Sector Development Study to run Forest Resource Model to establish a resource data base. There are no systematised recordings or analyses of production and trade including economic and financial analysis.

It was recommended by the Sector Development Study that 6 personal computers be acquired of which 2 should be 286 or 386 models with at least 70 megabyte hard-disks with tape back-ups. One of the 286 or 386 machines should replace the current CPM unit which could then be used for word-processing. The second 286 or 386 machine should be available to the 3 economists but mostly used by the Timber Industry Economist. The remaining 4 personal computers can be pc or xt compatibles preferably with hard-disks, 2 used for recording timber production and trade statistics and in timber utilisation research and the other 2 used in headquarters by the head economist of the division for computerising other existing data.

The training of staff, including clerical officers, in the use of computers will be a major requirement and activity, both in terms of formal classes and day-to-day assistance.

The pooling of resources with the Bureau of Statistics and the Native Land Trust Board could reduce a lot of duplication and data errors.

8. CONCLUSION

There is considerable data being collected on the timber industry in Fiji, much of which is seldom analyzed. Lack of analysis is due partly to lack of staff, lack of tools such as personal computers and lack of techniques such as appropriate models and partly to errors and contradictions found in the data. None of these problems are unsurmountable. Rather, modest increases in staff and other resources could overcome short term deficiencies and help to alleviate some of the current problems faced by the modern forestry sector.

For products other than wood, special surveys would be necessary to determine quantities available and means of sustaining their availability.

As stated earlier, the potential of the forest industry in Fiji is tremendous. As it grows, the Forestry Department will require additional resources in order to ensure its efficiency. Without these resources, it may not be able to perform the services required of it.

Appendix 1
Surveys on fuelwood and charcoal

Name & date of survey publication reference	Implementing authority	Coverage	Frequency/measurement units
1977 (Unpublished)	Centre for Applied Studies in, Development, University of the South Pacific	Survey based on case studies in villages & 7 isolated farmers representing most of Fiji's main farm types. Survey covered use of wood for cooking meals, smoking fish & firing copra drier.	Sampling for periods of up to 1 week & repeat visits in cooler seasons. Samples weighed & moisture content determined to convert to oven-dry weight.

Appendix 2
Surveys on Non-Wood Forest Products

Product	Estimated Quantity	Survey Name & Date	Coverage	Publication
Bamboo	26 276 acres (10 638 ha.)	1966-69 Land Resources Division Survey	Main island of Viti Levu & blocks of over 10 acres	Land Resource Survey

Appendix 3
Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: All indigenous and plantation roundwood that is harvested for production of sawn timber, plywood and veneer, chips, matches, posts, poles, and piles but excluding firewood and charcoal.

MEASUREMENT UNITS: Cubic metres, in the case of industrial pine, logs are weighed on a weighbridge and the weight is converted to volume using density and moisture content. Indigenous logs are measured using diameter tapes and a ready reckoner used for volume.

METHOD OF SURVEY & COVERAGE: Removal of all native produce, including free issues, is licenced. Information is obtained from official documents such as removal passes and timber statements. The data processing is centralised using EDP facilities.

In the case of pine, weighbridge documents are processed by computer. Weights determined using the weighbridge are periodically checked by sample measurements.

Volume of roundwood used on leases e.g. fence posts, etc., are not recorded.

FREQUENCY: On a daily basis.

OFFICE RESPONSIBLE: Forestry department, Fiji Pine Commission and Tropik Wood Industries.

PUBLICATION: Annual Reports of Forestry Department coordinating all removals. The Bureau of Statistics also publishes various reports in which these removals are reflected but their main source of information is the Forestry Department.

PRODUCT: PLYWOOD

DEFINITION: Wood panel manufactured by gluing veneer sheets with the direction of the grain in alternate plies generally at right angles.

MEASUREMENT UNITS: Cubic metres. The Bureau of Statistics used square metres based on 4mm thickness.

METHOD OF SURVEY & COVERAGE: Covers total production (only 1 facility) through monthly reporting by the manufacturers.

FREQUENCY: Actual monthly production.

OFFICE RESPONSIBLE: Manufacturer responsible for reporting production to Forestry Department which coordinates forestry sector production.

PUBLICATION: Forestry Department Annual Report.

PRODUCT: SAWNWOOD

DEFINITION: Wood sawn lengthwise to a predetermined width and thickness.

MEASUREMENT UNITS: Solid cubic metres based on area of cross-section multiplied by length.

METHOD OF SURVEY & COVERAGE: Data obtained from monthly sawmill input and output returns from all licenced sawmills in the country.

FREQUENCY: Returns received monthly.

OFFICE RESPONSIBLE: Forestry Department.

PUBLICATION: Forestry Department Annual Reports.

PRODUCT: PULP AND PAPER (CHIP)

DEFINITION: Wood reduced to chips from wood in round and slabs suitable for pulping.

MEASUREMENT UNITS: Tonnes.

METHOD OF SURVEY & COVERAGE: Actual production recorded by the only chip producer, Tropik Wood Industries Limited.

FREQUENCY: Recorded daily for each shift worked.

OFFICE RESPONSIBLE: Tropik Wood Industries Limited.

PUBLICATION: Tropik Wood General Manager's Report and Forestry Department Annual Report.

India

Sukdhev Thakur

1. INTRODUCTION

India is the second most populous and the seventh largest country in the world with a total geographical area of 3.288 million square kilometres.

The officially recorded forest area in the country is about 75.18 million hectares which is 22.8% of the total geographical area. However, more recent estimates by the Forest Survey of India based on satellite imagery put actual forest cover at 64.01 million hectares or 19.46% of the total area.

Some basic data on Indian forests are shown in Table 1 and data on wood resources, production and demand in Table 2.

TABLE 1
Selected Data on Indian Forests

	Ha. millions	% total forest area	% total land area
i. Total Forest Area	64.01	100	19.46
ii. Forest density			
– dense forest (crown density = 40%)	37.8	59.05	11.50
– open forest (crown density 10 – 40%)	25.7	40.15	7.83
– mangrove forest	0.42	0.66	0.13
iii. Forest type			
– tropical moist deciduous	23.6	36.9	7.18
– tropical dry deciduous	18.6	29.06	5.66
– tropical wet evergreen	5.1	7.97	1.56
– subtropical, alpine, etc.	16.7	26.09	5.08
iv. Forest elevation			
– below 600 metres	66.0		
– 600-1800 metres	25.0		
v. Forest management			
– "protection forests"	12.6	19.68	
– production of timber	16.0	25.0	
– social forest (for firewood & fodder)	25.0	39.06	
– National Parks & Wildlife Sanctuaries	13.0	20.31	

Early records of forest management in India date back to the Mauriyan period, c.300 B.C. However, from the early Middle Ages up to well into the colonial period, forest management was generally neglected.

TABLE 2
Selected Data on Wood Stocks, Demand and Production

	millions cu.m.	% growing stock
i. Growing stock of wood	4196.0	
Annual increment	52.0	1.24
ii. Annual demand/supply		
firewood – demand	235.0	
– supply	40.0	
industrial wood – demand	27.58	
– supply	12.0	

The systematic management of forests in the country began in 1864 with the appointment of Dietrich Brandis, a trained German forester, as the first Inspector General of Forests. Almost simultaneously, the Government of India took the revolutionary decision of treating forests as State property and extinguishing the proprietary rights of individuals to forest land. The newly created Forest Department took up the tasks of survey and demarcation of forest areas, control of shifting cultivation, protection from fire and assessment of growing stock.

The early 20th century saw increasing attention being paid to the scientific aspects of forest management. Tree felling was regulated and management plans based on principles of sustained yield were prepared for nearly all areas demarcated as reserved forests. However, during the two World Wars the indiscriminate exploitation of Indian forests to support the British war effort took a heavy toll.

After the Independence of India in 1947, erstwhile princely states were integrated with the rest of the country and many large forest areas privately owned by big landlords (Zamindars) came under Government control. This resulted in the extension of areas under scientific management and the unification of

laws relating to forests. At the same time, large-scale forestry development and rehabilitation works were included in the five year plans. This included massive programmes for artificial regeneration aimed at increasing the productivity of all forest areas.

Today, all State Forest Departments in the country have Working Plan Divisions whose responsibility is to increase the area of forest under planned management. At present, 58.9 million hectares or 78 % of all officially recorded forest area is covered by working plans. These plans are comprehensive documents which contain past and present statistics on forests and lay down the future course for management of forest areas. They are valid for periods of 10 to 15 years after which they are revised. The National Forest Policy, 1988 establishes that forests should not be exploited without an approved management plan.

2. FOREST SECTOR STATISTICS

For proper management of forest resources on a sustainable basis, a reliable data base on forests and forestry is essential. Investment in forestry has a long gestation period and the regular, time-bound collection of reliable forestry statistics essential for long-term planning and investment. Given the multi-dimensional role of forests, touching upon the lives of its inhabitants, supplies of fuelwood, fodder and timber, the availability of industrial raw material, supplies of minor forest products, employment and environment, forest management decisions can have far reaching ecological and economic consequences. This makes the availability of the information required for forest management all the more important.

The principal areas of information for which forest statistics are collected are:

i. forest areas according to ownership type, legal status, economic management or exploitation, protection and use for grazing.
ii. forest areas surveyed, the demarcation and maintenance of forest boundaries, and the progress of forest settlement.
iii. afforestation, volume of standing timber and firewood, and the production of timber, firewood and minor forest products.
iv. revenue and expenditure of the forest department.
v. employment in forestry and forest industries.
vi. foreign trade in forest products.

2.1 The organisation of forest sector statistics in India

In the past, the Directorate of Economics and Statistics (DESAg) under the Ministry of Agriculture used to deal with Forestry Statistics and was responsible for compiling the data received from State Forest Departments. These were published annually in "Indian Forest Statistics and in "Forestry in India(Summary Tables)". However, these publications have long since been discontinued.

At present, the DESAg publishes data on the area under forests in their bulletin of Indian agricultural statistics, based on data supplied by State agricultural and revenue departments. In addition, other publications by the Ministry of Agriculture like the "Timber Trends Study for the Far East – Country Report for India" and "Timber Trends and Prospects for India (1960-75) contain useful information on various aspects of forest exploitation.

The most detailed and complete source of information on forests in India is to be found in the Division-level working plans for forest areas. The Working Plan aims at ensuring the continuity of forestry practices and at regulating the exploitation of forests to ensure adequate regeneration. It is based on an inventory of forest resources and an assessment of the current condition of the forest. It contains information on the composition, description and history of the forest compartment, regeneration and felling prescriptions, and details of production, fire incidence and many other aspects of forestry. The Working Plan provides the basic data for forestry statistics in India.

In addition, the following organisations are engaged in the collection and compilation of forestry statistics:

i. Survey and Utilisation Division, Ministry of Environment and Forests.
   Responsible for the collection, compilation and dissemination of forestry statistics at national level, based on returns from State Forest Departments. These are published, with a considerable time lag, in "India's Forest".
ii. State Forest Departments.
   The main source of forestry information. Basic data generated at Division level is compiled and published in the Annual Administrative Report of the Forest Department.
iii. Forest Survey of India (FSI), Dehradun.
   The FSI generates a considerable amount of

forestry data which is published every second year in the State of Forest Report series. The latest in the series is the 1989 Report.

iv. Forest Research Institute, Dehradun.
Generates information on forests and forestry.

v. Central Statistical Organisation, Ministry of Planning, New Delhi.
Collects data on forests in order to estimate gross domestic product (GDP) generated by the forest sector.

vi. Indian Institute of Forest Management, Bhopal.
Generates information on forests and forestry.

vii. Directorate of Commercial Intelligence and Statistics.
Publishes data on the import and export of forest products as part of its overall statistics on foreign trade.

viii. National Wasteland Development Board
Collects data on afforestation, social and farm forestry.

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood and Charcoal

The domestic fuelwood survey carried out by NCAER in 1978-79 indicated that 75% of household energy needs are met through non-commercial sources such as fuelwood, crop waste, dung cakes and biogas. Annual consumption of these fuel sources by households is shown in Table 4.

TABLE 4
Annual Household Consumption of Non-Commercial Energy Sources

	Energy source	Consumption	
		millions tons	cu.m
i.	Fuelwood	99.95	–
ii.	Crop wastes	30.6	–
iii.	Dung cakes	71.7	–
iv.	Charcoal	0.61	–
v.	Biogas	–	25 000

The State of Forest Report, 1987, published by the Forest Survey of India estimates the annual demand for firewood in the country to be 235 million cubic metres, while annual production of firewood is estimated at only 40 million cubic metres (see Appendix 1).

A serious limitation of these production statistics is that they include only officially recorded forest resources and, as a result, a substantial quantity of production goes unrecorded. Among the elements which make up this unrecorded production are the following:

i. authorised but unrecorded removals of fuel wood and timber from reserved/protected forests by right holders staying on the periphery of forests;

ii. unauthorised removals;

iii. unrecorded production from private forests and non-traditional forest areas such as trees on community lands, field bunds, canal banks, road sides and farm forestry plantations, etc.;

The National Sample Survey Organisation (NSSO) is currently carrying out a survey to assess the consumption of fuel wood in the non-household sector i.e. in hotels, bakeries, restaurants, brick kilns, and other small-scale industries.

3.2 Forest Products other than Wood

The information available on forest products other than wood i.e. minor forest products is very scanty. Data on quantity and prices of most of these products are not available. The items included in this category vary from state to state as do the agencies responsible for gathering data on the subject. For some states data on production and prices of some important minor forest products are available while in other states only the royalty value realised is recorded.

4. MODERN SECTOR PRODUCTS

According to the State of Forest Report, 1987, the total annual industrial wood demand in the country is estimated at about 27.58 million cubic metres. Pulpwood consumption is estimated at 3.5 million tonnes or 5.3 million cubic metres per annum. The recorded harvest of industrial wood from the forests is 12 million tonnes or 13.5 million cubic metres per year.

Details regarding various wood-based industries are given in Table 5.

TABLE 5
Modern Sector Wood-Based Industries Capacity & Demand for Wood

	name of industry	no. of reg. units	installed capacity per annum (millions tonnes)	annual raw material requirement (millions tonnes)	annual production (millions tonnes)
i.	Paper & paperboard	271	2.65	3.5	1.5
ii.	Newsprint	4	0.28	0.52	0.27
iii.	Rayon grade pulp	4	0.176	–	–
iv.	Paper grade pulp	1	0.04	–	–
v.	Plywood & veneer	297	172.5	1.2	88.7
				(millions cu.metres)	(millions cu.metres)
vi.	Fibre board & particle board	12	0.117	1.01	0.05
			(millions metric tons)	(millions cu.metres)	(millions metric tons)

5. TRADE

The import of timber and wood products is placed on Open General Licences (OGL). The main items of import are round timber, waste paper, rayon grade pulp and wood pulp. The quantity of timber imported during 1989-90 was about 45 million cubic metres costing about Rs.4,500 million as opposed to 35 million cubic metres in 1988-89 costing about Rs.3,000 million. Wood was imported from Malaysia, Burma, Vietnam, Africa, Australia, Papua New Guinea and Brazil.

As regards paper and pulp, about 0.251 million tonnes of newsprint costing about Rs.1,850 million was imported in 1987-88. The figures for 1986-87 were 0.234 million tonnes and Rs.1213 million respectively.

0.59 million tonnes of waste paper costing Rs.1,912 million was imported during 1986. Wood pulp imports for 1987-88 totalled 0.254 million tonnes valued at Rs.1682 million while 0.067 million tonnes of rayon grade pulp worth Rs.457.5 million was imported during the same period.

Appendix 1

Surveys on fuelwood and charcoal

Name & date of survey Publication reference	Implementing authority	Coverage	Frequency/ measurement units
State of Forest Report, 1987.	Forest Survey of India, Dehradun.	Whole India/household	—
NSSO Survey report for 1983-84.	National Sample Survey Organisation	"	Quinquennial cu.m.

Appendix 2

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Not available.

MEASUREMENT UNIT: Million cubic metres.

METHOD OF SURVEY & COVERAGE: Sampling; covers whole of India.

FREQUENCY: -

OFFICE RESPONSIBLE: Forest Survey of India, Dehra Dun.

PUBLICATION: State of Forest Report.

PRODUCT: PLYWOOD

DEFINITION: Veneer and plywood.

MEASUREMENT UNITS: Square metres (4mm basis).

METHOD OF SURVEY & COVERAGE: Indian Plywood Industries Research Institute(IPIRI) Field Survey and data collected from the Director General Technical Development and from the Plywood Manufacturers Association; covers whole of India.

FREQUENCY: -

OFFICE RESPONSIBLE:

i. Survey and Utilisation Division of Ministry of Environment and Forests, New Delhi.
ii. IPIRI, Bangalore.

PUBLICATION:

i. India's Forests.
ii. IPIRI Research Reports.

PRODUCT: PARTICLE BOARD & FIBREBOARD

DEFINITION: Not available.

METHOD OF SURVEY & COVERAGE: Information collected from the Manufacturers Association; covers whole of India.

FREQUENCY: -

OFFICE RESPONSIBLE: Survey and Utilization Branch, Ministry of Environment and Forests, New Delhi.

PUBLICATION: India's Forests.

PRODUCT: PULP & PAPERBOARD

DEFINITION: Not available.

METHOD OF SURVEY & COVERAGE: Information collected from the Paper Makers Association; covers whole of India.

FREQUENCY: -

OFFICE RESPONSIBLE: Survey and Utilization Division, Ministry of Environment and Forests, New Delhi.

PUBLICATION: India's Forests.

Indonesia

Bagio Widjanarko & Petrus Gunarso

1. INTRODUCTION

Indonesia is well endowed with land, water and energy resources. Yet these resources are under considerable stress due to the rapidly increasing population and economic growth. At the some time, however, Indonesians have begun to recognize that the abundance of the country's natural resources is not limitless.

There are about 140 million hectares of forest land in Indonesia, covering approximately seventy percent of the country area. This renewable source has been managed according to the principle of sustained yield utilization that allows for a reasonable exploitation while providing for the continued productivity of the forests and their preservation as a vital national asset.

Forest industries are developed through the system of forest concession holders (HPH) and timber estates (HTI) with concession holders required to establish nursery areas for reforestation and enrichment programmes.

Along with these utilization practices, massive programs of forest rehabilitation, protection and conservation have also been executed. The establishment of a network of national parks, recreation forests and game reserves has promoted the use of natural conservation areas for resource base activities.

Today, forestry contributes significantly to foreign exchange earnings and thus to national economic development as well as providing a tremendous amount of employment.

As forestry development in Indonesia enters the industrial era, the need for professional management supported by appropriate technology becomes more acute. Among other requirements, a comprehensive system of information is required to assure that complete and accurate data on forests can be acquired in real time, so that forest management and planning can become more efficient and appropriate.

2. POLICY AND ORGANISATION

Five policies have been underlined to achieve the goal of forestry development. These include forest inventory, forest utilization, land rehabilitation and reforestation, forest protection and nature conservation, and forest research development. The policies are reflected in the structure of organization of the Ministry of Forestry of the Republic of Indonesia (see figure 1). Each Directorate-General (DG) within the Ministry has its own field offices called Technical Executing Units.

At provincial level, forestry is handled by the Regional Forestry Office. This office coordinates and manages the Technical Executing Units.

3. STATISTICAL ORGANISATION

The importance of statistics in ensuring proper forestry planning, monitoring and evaluation has been recognised in national forestry policy in Indonesia.

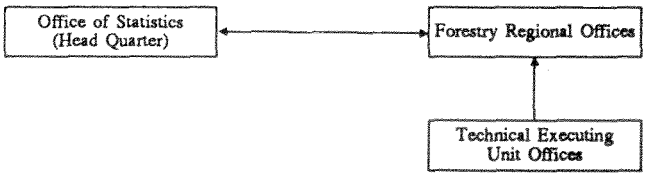
The office of Forestry Statistics was established by the Ministry of Forestry Decree # 116/Kpts-II/1989. The office is attached to the Bureau of Planning of the Secretary General of the Ministry of Forestry. This unit is responsible for the collection, compilation, analysis and publishing of national forestry data on a regular basis. Efforts are also currently under way to develop a management information system.

3.1 Data acquisition and processing

Forestry data are acquired through the dissemination and subsequent collection of standardised data collection sheets by the Office of Statistics at the Ministry of Forestry to the Regional Forestry Offices. These provincial statistics are collected and processed by the Office of Statistics at headquarters level (see Figure 1).

Figure 1

Forestry Data Network System.



Data collection sheets are designed for each of the programmes being implemented by the Ministry of Forestry. These programmes are as follows:

- Forestry administration (employment, finance and inspection)
- Forestry education & training
- Forest research development
- Forest management
- Forest production
- Markets and marketing
- Forest product royalties
- Reforestation and land rehabilitation
- Forest inventory
- Forest protection and nature conservation

Examples of the data collection sheets are shown in Appendix 1.

Data compilation and analysis is carried out in regional forestry offices and at headquarters. Data processing at headquarters is done using a mini computer HP 3000/42 and PC base Geographic Information System. Several computer programmes have been utilized, depending upon the needs and purpose, ranging from simple data base systems to advanced statistical programmes like SAS.

3.2 Publications

The annual report of forestry statistics of Indonesia is produced and distributed by the Offices of Forestry Statistics of the Ministry of Forestry.

The publications are disseminated to the Regional Forestry Offices, the Technical Executing Unit, other ministerial offices and government agencies, universities, and international agencies. In addition, the statistics are also made available to anyone concerned with forests and forestry in Indonesia through the Bureau of Public Relations of the Ministry of Forestry.

Several examples of forestry statistical data from Indonesia are presented in the appendices.

Appendix 1
Sample data sheets.

1. Forest Inventory and Land use.

Province :
Month :
Year :

Code	Activities	Unit	Planning	Implemented
A01	Preliminary Survey			
A02	Aerial Photo			
A03	Area Allocation For Agriculture			
A04	Implementation of Forest Boundary			
A05	Stock Inventory and so forth			

2. Forest Production

Province :
Month :
Year :

Code	Activities	Unit	Planning	Implemented
B01	Log			
B02	Sawn			
B03	Plywood			
B04	Charcoal			
B05	Rattan			
B06	Silk yarn and so forth			

3. Research Development

Province :
Month :
Year :

Code	Activities	Unit	Planning	Implemented
C01	Silvics Research			
C02	Agroforestry			
C03	Forest Phatology			
C04	Forest Fire			
C05	Forest disease and so forth			

Republic of Korea

Cho Yon-Hwan

1. FORESTS AND FOREST PRODUCTION

1.1 Land Utilization

Forest land in Korea amounts to 6,484,704 hectares or 65% of the total land area. However, forest land is decreasing due to the rising population and the effects of economic development. The trends in land utilization over the last ten years are shown in Table 1.

TABLE 1

Trends in land utilization: 1973-89

Year	Total Area	Forest Area	%	Farm Land Area	%	Other Land Area	%
'73	9 875 769	6 586 183	67	2 241 253	23	1 048 332	10
'74	9 875 769	6 640 839	67	2 238 432	23	996 498	10
'75	9 979 907	6 635 352	67	2 239 691	23	1 004 863	10
'76	9 987 907	6 613 455	67	2 238 219	23	1 028 233	10
'77	9 885 851	6 593 069	67	2 231 196	23	1 061 586	10
'78	9 896 292	6 578 322	66	2 222 000	22	1 095 970	12
'79	9 896 624	6 570 663	66	2 207 071	22	1 118 890	12
'80	9 899 234	6 567 772	66	2 195 822	22	1 135 640	12
'81	9 901 599	6 562 885	66	2 188 268	22	1 150 446	12
'82	9 902 244	6 553 713	66	2 180 084	22	1 168 447	12
'83	9 902 243	6 546 829	66	2 167 022	22	1 188 392	12
'84	9 909 106	6 539 558	66	2 152 357	22	1 217 191	12
'85	9 914 331	6 531 102	66	2 144 415	22	1 238 814	12
'86	9 917 326	6 523 966	66	2 140 995	22	1 252 365	12
'87	9 922 177	6 499 082	66	2 143 430	22	1 279 665	12
'88	9 923 658	6 491 494	65	2 137 947	22	1 294 217	13
'89	9 926 263	6 484 704	65	2 126 721	22	1 314 838	13

1.2 Forests

Tables 2 and 3 show the forest land area and stock volume in Korea by ownership and forest type respectively. As can be seen from Table 2, with private forests making up 72% of total forest land, their management and productivity is of importance. The average stock volume per hectare is 36 cu.m.

TABLE 2

Forest land area and stock volume by ownership

Ownership	Area (1 000 ha.)	%	Stock Volume (1 000 cu.m.)
Total	6 485	100	233 970
- National Forest	1 333	20	81 319
- Public Forest	490	8	17 074
- Private Forest	4 642	72	135 576
- Unsurveyed	19	-	-

1.3 National Economy and Forest Production

The relative contribution of forest production to the gross national product has decreased over the last two decades. This has not, however, been due to any decrease in forest production, but rather due to the more rapid growth of secondary and tertiary industries in Korea over this period. Forest production has, in fact, increased steadily over this period.

Due to its high net income, forest production in Korea should be encouraged and supported.

2. FORESTRY STATISTICS

2.1 General Observations, Organization and Procedures

The Forest Administration is responsible for the collection and publication of forest and forest product

TABLE 3
Forest land area and stock volume by forest type

Forest Type	Area (1 000 ha.)	%	Stock Volume (1 000 cu.m.)	%
Total	6 485	100	233 970	100
Stocked:				
- Coniferous	3 191	49	107 310	46
- Deciduous	1 292	20	60 194	26
- Mixed	1 790	28	66 466	28
- Bamboo	6	-	-	-
Unstocked	187	4	-	-
Unsurveyed	19	-	-	-

statistics. It establishes the statistical methods, standards and procedures which are designed to produce the relevant data for the beginning of each year.

These data are principally found in administrative records and returns. The Ministry of Commerce and Industry maintains records of pulp and paper production while the Customs Administration of the Ministry of Finance maintains records of imports of round sawlogs and sawn woods.

The Forest Administration also supervises the collection of domestic forest products data. In this it is aided by Provincial, County and City administrations.

2.2 Sources and methods of collection of data on traditional forest products

Data are collected, on a routine basis, on 10 product groups which are themselves divided into 50 classes of goods.

i. Round wood
ii. Bamboo
iii. Farming materials (3 classes)
iv. Fruits and nuts (13 classes)
v. Others (8 classes)
vi. Mushrooms (5 classes)
vii. Resin products (3 classes)
viii. Tannin (3 classes)
ix. Medicinal products (4 classes)
x. Others

The methods used to collect data on different products vary considerably depending on the product groups and classes and the time of year when production is in progress. Table 4 gives sources and collection methods for modern sector products.

The classes of raw materials and forest products and the form of measurement to be used are all defined in the relevant statutes. In principal, the metric system is followed but the use of traditional measurement units is also permitted.

TABLE 4
Sources & Methods of Data Collection on Modern Sector Products

Agency	Survey item	Unit	Frequency	Survey method	Survey office		Subject	Capacity (thousand cu.m)
Forestry Administration	timber	cu.m.	annual	whole	local	-	felling & supply	-
	pulpwood	cu.m.	"	"	"	-	pulp production & supply amount	-
	pitprops	cu.m.	"	"	"	-	coal production & pitprop amount	-
	plywood	cu.m.	"	"	"	-	employment, capacity, production, supply & planned production & supply	1 437
	particle	cu.m.	"	"	"		"	184
	hardboard	cu.m.	"	"	"		"	209
	sawnwood	cu.m.	"	"	local	-	employment, log usage, production	13 476
	charcoal	m/t	"	"	"	-	producers, production, supply, value	-
	forest product prices	US$	monthly	sample	company		prices of plywood, timber & forest by-products	-
Ministry Commerce Industry	pulp	m/t	"	whole	"		employment, capacity	400
	paper & paperboard	m/t	"	"	"		"	4 674
Customs Administration	imported logs	cu.m.	"	"	C.A.		imports of logs & sawnwood	-

A list of traditional forest products is given in Table 5.

TABLE 5
Traditional Forest Products

Classes	Unit	Notes
– Timber	cu.m.	
– Bamboo	bundle	– 1 metre in length
– Farm materials	m/t	– green manure, composed forage
– Fuel	m/t	– firewood, charcoal, leaves & branches
– Nuts and fruits	kg.	– chestnut, walnut, jujube, pinenut, acorn seed, gingko nut, oil paulownia, canellia nut, torreyanut, raspberry pineseed
– Mushrooms	kg.	– pine mushroom, black fungus, oak mushroom, oyster mushroom, etc.
– Resin	kg.	– resin, oriental lacquer, etc.
– Tannin	kg.	– Chinese galls, alder cones, etc.
– Medicinal	kg.	– medicinal herbs, macrocar pium fruit, phellodendrum bark, etc.
– Fibre	kg.	– kuzu fibre, papermulberry bark, diptri bark, bush clover bark, etc.
– Oak cork	kg.	—
– Bamboo shoot	kg.	—
– Wild vegetable	kg.	—
– Oak leaves	box	—
– Smilax leaves	box	—
– Squirrels	number	—
– Soil land stone	cu.m.	—

2.3 Collection, analysis, publication and dissemination of data

The Forestry Administration collects and analyses data from various sources and publishes a forestry statistics yearbook at the end of each year. This publication is disseminated to universities, colleges and other relevant agencies. The Ministry of Commerce and Industry, the Customs Administration of the Ministry of Finance, and Provincial, County and City administrations all cooperate with the Forestry Administration in this activity.

2.4 Data on prices and industrial capacity

Wholesale prices of traditional forest products are researched by sample personal surveys among traders. The prices of modern forest products are collected through a survey of actual transactions between producers and consumers.

The capacity of the various industrial sectors consuming forest products is estimated from surveys conducted in the relevant industrial sectors. For productive capacity, producers are asked to state their maximum output of materials, based on 300 days of production per year.

2.5 Trade Statistics

Trade in forest products is monitored by the Forestry Administration and the Ministry of Finance. Statistics are compiled from import/export declarations including imports authorized for release and use before the issuance of an import permit. The statistics cover the region where Korean Customs Law is enforced.

Exports are counted in the month in which the vessel or aircraft carrying them departs from Korea while imports are counted in the month in which they are issued an import permit. In the case of imported goods authorized to be used freely before the issue of an import permit, they are counted in the month in which their use is authorized.

Goods are classified according to the "Customs Cooperation Council Nomenclature". Sub-groups are added to satisfy any special characteristics of Korean foreign trade.

Malaysia

Lockman M.Sirin

1. INTRODUCTION

Malaysia is a tropical country located north of the Equator within latitudes 1 to 7 North and longitudes 100 to 119 East. The total land area is approximately 32.9 million ha. with 13.2 million ha in Peninsular Malaysia, 7.4 million ha in Sabah and 12.3 million ha in Sarawak. Peninsular Malaysia is separated from Sabah and Sarawak by 720 km of the South China Sea.

The tropical rain forest of Malaysia is one of the most complex ecosystems in the world. It is a unique natural heritage which forms an important and valuable natural resource of the country and represents one of the few remaining extensive sources of quality tropical hardwoods in the world.

The total land under natural forest in Malaysia is estimated to be 20.1 million ha (61.1% of the total land area) with 6.2 million ha in Peninsular Malaysia, 4.5 million ha in Sabah and 9.4 million ha in Sarawak. Of the 20.1 million ha of forested land, 17.4 million ha are dipterocarp forests while the remaining 2.1 million ha and 0.6 million ha are freshwater swamp and mangrove forest respectively. A total of 12.7 million ha of the country's forest has been gazetted as the Permanent Forest Estate.

The production of sawlogs in Malaysia has more than doubled during the past two decades. The most significant increases have been seen in Sabah and Sarawak. For example in 1975 total production was approximately 19 million cu.m. of which 10 million cu.m. were produced in Peninsular Malaysia. By 1986 total production had shot up to 31 million cu.m. but Peninsular Malaysia's production declined to less than 10 million cu.m. Meanwhile Sabah and Sarawak increased their total production from 9 million cu.m. to approximately 22 million cu.m. In 1989 Malaysia's total production was still in excess of 30 million cu.m.

Wood-based industries were amongst the earliest processing industries to be established in Malaysia. There are now 947 sawmills in Malaysia of which 669 are located in Peninsular Malaysia, 152 in Sabah and 126 in Sarawak. As for the plywood and veneer industry, there are 53 mills in all, out of which 41 are in Peninsular Malaysia, 7 in Sabah and 5 in Sarawak. Virtually all the logs produced in Peninsular Malaysia are processed locally while for Sabah and Sarawak the bulk of the logs produced are exported. In 1989 approximately 1/3 of total log production was processed in Malaysia.

Significant progress has been achieved in downstream processing of timber in line with the government's efforts to secure higher value export earnings and provide more employment opportunities. There are about 2000 furniture/wood-working mills, 160 moulding mills, 13 block-board plants, 12 laminated board plants, 4 pastideboard plants, 3 wood-wool/wood cement board plants and 2 wood-chip plants in Malaysia. There is also a pulp and paper plant in Sabah with a rated capacity to produce 125,000 tonnes of paper per year, utilising mixed tropical hardwood.

The timber sector has always been an important source of foreign exchange to Malaysia. The development of timber industries for export first began in the 1950's and gained impetus during the 1960's and 1970's. With a total average earning of around M$4.5 billion during the first half of the 1980's, timber and timber products ranked among the top five most important export commodities. In 1988 the total export value of timber and timber products was M$6.8 billion, the highest recorded and represents 15% of the total gross export earning of Malaysia. In 1989, the total value of log exports was M$4.2 billion.

The forestry and wood-based industry sector provides significant direct and indirect employment opportunities. Direct employment of about 150,000 persons in the sector represents 2.6% of total employment.

2. FORESTRY SECTOR STATISTICS

The roles of the various forestry agencies are coordinated at the federal level by the Ministry of Primary Industries. The forestry agencies are as follows:

- The Forestry Department of Peninsular Malaysia.

- The Forestry Department of Sabah.
- The Forestry Department of Sarawak.
- The Forest Research Institute of Malaysia (FRIM).
- The Malaysian Timber Industry Board (MTIB).

The Forestry Departments of Peninsular Malaysia, Sabah and Sarawak are responsible for forest administration, management and development of the forest resources. However, the Forestry Departments of Sabah and Sarawak also have forestry research under their wings. FRIM is entrusted with research and development activities on forestry and forest-based industries at the national level. The MTIB is responsible for market promotion of timber products and assisting in the establishment of timber-based industries, which includes providing the necessary marketing and technological assistance to ensure their continued growth as a modern and thriving sector of the economy.

In order to ensure sound policy formulation and planning, the forestry sector agencies, with the Ministry of Primary Industries as the coordinating body, require very comprehensive and timely statistical information. Information is a prerequisite for decision making. Often the quality of decisions taken depends on the quantity and reliability of available statistical information and therefore is required not only by policy and planning bodies, but at all levels of management.

In Malaysia, all the forestry agencies mentioned above have specific functional units or sections within their organisation which carry out the functions of compilation, collation, analysis and publication of forestry and timber statistics. Besides these agencies, the Department of Statistics, Malaysia and the National Bank of Malaysia also compile and publish forestry and timber statistics.

The broad scope of forestry statistical information is indicated under the following 6 categories.

i. Forest Resources
   - Permanent forest estates
   - Other forests
   - Plantation
   - Forest types

ii. Forest Harvesting
   - Logging
   - Other produce
   - Licences

iii. Revenue
   - Royalties, Cess, Premium & other charges

iv. Industry
   - Log supply
   - Production
   - Non-wood based products

v. Research & Development
   - Silviculture
   - Management systems
   - Engineering

vi. Employment
   - Direct
   - Indirect
   - Age group, sex

Statistics covering these subject areas are gathered and analyzed by the forestry department which itself generates data on administration, planning and economics, forest management and inventory, industrial development and education and training.

The Forestry Department collects relevant information from other government agencies and in turn distributes forestry statistics to concerned agencies. In addition, the department is responsible for the publication of forestry statistics and their dissemination to non-governmental sectors and the public.

In this paper, whenever possible the discussions will try to cover Malaysia as a whole. Otherwise, the emphasis will be on Peninsular Malaysia.

The role of the Forestry Department has somewhat expanded to cover recreational and urban forestry, agro-social forestry, watershed management, and forestry for education, which includes forestry extension. These new functions make further demands on statistical information. The fact that we are now dealing more and more with forestry-and-people makes access to accurate and timely information all the more critical.

Within the Forestry Department, the Forestry Headquarters is responsible for the establishment and management of the forestry information system. Until now the compilation of statistical information has been carried out "manually", using a system of shuttle returns; sent to the headquarters on monthly, quarterly or annual basis. Forest resource information are compiled mainly from periodic inventory surveys and estimates. All the functional units in the headquarters are involved in the processing of this information. However, the Forestry Economic Unit is the "exchange" centre and it regularly publishes these statistics in the following publications:

i. Forestry In Malaysia – the FDPM Annual Report

ii. Forest Sector Review – an annual limited circulation.
iii. Perangkaan Perhutanan Semenanjung Malaysia. (Forestry Statistics For Peninsular Malaysia) – an annual publication.

The types of statistical information gathered by the Forestry Department can be categorised as follows:-

i. Forest Resources Information
ii. Forest Management Information
iii. Forest Production and Revenue Information
iv. Forest Development Information
v. Wood-based Industries Information
vi. Forest Administration Information

The outmoded manual system is currently being replaced by a computerized system. The target is to put the primary sources of data on-line with the central processing unit in the headquarters.

3. MODERN SECTOR PRODUCTS STATISTICS

The products included in this section are industrial wood (sawlogs), sawnwood (sawn timber), plywood, particleboard, fibreboard, pulp and paper (see Appendix 1).

The Forestry Department of Peninsular Malaysia regularly compiles statistical information for sawlogs, sawn timber and plywood. The information on the other products, especially pulp and paper and paper board are collected and compile annually and as and when required or being requested. The statistical information compiled on a regular basis, using standard questionnaires, is published in the Annual Report of the Forestry Department and other publications such as the Forest Sector Review and the annual statistical report, "Forestry, Statistics For Peninsular Malaysia".

4. TRADE STATISTICS

The national trade statistics for forest products are:

i. Export Volume and Value of Major Timber Products
ii. Export Volume of Sawlogs to Major Countries
iii. Export Value of Sawlogs to Major Countries
iv. Export Volume of Sawntimber to Major Countries
v. Export Value of Sawntimber to Major Countries
vi. Export Volume of Plywood to Major Countries
vii. Export Value of Plywood to Major Countries
viii. Export Volume of Veneer to Major Countries
ix. Export Value of Veneer to Major Countries
x. Export Volume of Sawlogs by Species
xi. Export Volume of Sawntimber by Species
xii. Export Volume of Round and Processed Wood
xiii. Export Value of Round Processed Wood
xiv. Export Volume of Pulp and Pulp Products
xv. Export Value of Pulp and Pulp Products
xvi. Import Volume of Round and Processed Wood
xvii. Import Value of Round and Processed Wood
xviii. Import Volume of Pulp and Pulp Products
xix. Import Value of Pulp and Pulp Products
xx. Import and Export of Minor Forest Products

The sources, publication and availability of these statistics are:

	Sources	Publications	Availability
i.	Malaysian Timber Industry Board	Maskayu (monthly)	The Malaysian Timber, Industry Board, 5th & 6th Floor, Wisma DNP, P.O.Box 10887, Jalan Ampang 50728 Kuala Lumpur.
ii.	Malaysian Timber Industry Board	Timber Trade Review (monthly)	The Malaysian Timber Industry Board, 5th & 6th Floor, Wisma DNP, P.O.Box 10887, Jalan Ampang, 50728 Kuala Lumpur.
iii.	Department of Statistics	Trade Summary (monthly)	Jabatan Perangkaan, Wisma Statistik, Jalan Cenderasari, 50514 Kuala Lumpur.
iv.	Bank Negara Malaysia	Monthly Statistical (monthly)	Secretary's Division, Bank Negara Malaysia, P.O.Box 10922, Kuala Lumpur.
v.	Ministry of Primary Industries Malaysia	Statistics on Commodities (annual)	Ministry of Primary Industries Malaysia, 6-8th Floor, Menara Dayabumi, Jalan Sultan Hishamuddin, Kuala Lumpur.

The main products imported and exported are:

i. Sawlogs
ii. Sawntimber
iii. Plywood
iv. Veneer
v. Mouldings

vi. Blockboard
vii. Chipboard
viii. Builders, Carpentry, Joinery
ix. Furniture
x. Fuelwood
xi. Charcoal
xii. Pitprops
xiii. Rattan
xiv. Gum
xv. Wood Pulp
xvi. Waste Paper & Paperboard
xvii Paper
xviii. Crafts

The major trading partners are:
i. Singapore
ii. Thailand
iii. Indonesia
iv. Japan
v. Taiwan
vi. Hong Kong
vii. China
viii. Republic of Korea
ix. United Kingdom
x. Netherlands
xi. Belgium
xii. Germany
xiii. Italy
xiv. United States of America
xv. Australia
xvi. Kuwait
xvii. United Arab Emirates
xviii. Oman
xix. Saudi Arabia
xx. Bahrain

The international coding system presently used in national trade statistics is the harmonized commodity description and coding system.

The measurement units in trade of the following major products are:

	Products	Units of Measurement
1.	Industrial Roundwood	cubic metres (m3)
2.	Logs	cubic metres (m3)
3.	Pulpwood	tonne
4.	Chips	tonne
5.	Sawnwood	cubic metres (m3)
6.	Plywood	cubic metres (m3)
7.	Pulp	tonne
8.	Paper	tonne

The national statistics of forest product prices are:
i. F.O.B. Unit Value of Major Timber Products
ii. C.I.F. Unit Value of Major Timber Products
iii. Average Domestic Prices of Logs
iv. Average Domestic Prices of Sawntimber
v. Average Domestic Prices of Plywood
vi. Export Prices of Logs by Species
vii. Export Prices of Sawntimber by Species

Appendix 1

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: "Roundtimber" or roundwood means any section cut from a tree, and having a diameter of not less than 30 cm at larger end "round timber" means any section cut from a tree, and having a diameter of not less than 30 centimetres at its larger end, which has not been prepared for use otherwise than by renewal of bark and branches and either rough squaring or longitudinal division into not more than four pieces in order to facilitate transport or conversion "timber" includes trees when they have fallen or been felled, and all wood whether or not cut up, fashioned or hollowed out for any purpose.
Interpretation: includes logs or sawlogs
(Nat. Forestry Act. 1984)

MEASUREMENT UNITS: Cubic Meters.

METHOD OF SURVEY & COVERAGE: Shuttle returns. The information are compiled from the "removal passes" issued by log checking stations and summarized in monthly abstract at the State Forest Department (State Revenue Officer) the shuttle returns are prepared from the monthly abstract.

FREQUENCY: Monthly

OFFICE RESPONSIBLE: State Forest Department and Forest Department Headquarters.

PUBLICATION:
(i) FDPM Annual Report
(ii) Forest Sector Review (biannual)
(iii) Forestry Statistics For P. Malaysia (annual).

PRODUCT: SAWNWOOD

DEFINITION: "converted timber" means wood which has been cut, sawn, hewn, split, shaped or fashioned into pieces intended for use for any purpose other than for fuel. Interpretation:this includes sawnwood, moulding, plywood, baulks, etc.

MEASUREMENT UNITS: Cubic Meters.

METHOD OF SURVEY & COVERAGE: Shuttle Returns. One for each Sawmill. The information are compiled from individual sawmills "log book" which contain records of individual sawlogs that enter the log yards and individual sawlogs which eventually get sawn; by species, measurements, dates, dimensions of output and volume.
FREQUENCY: Monthly
OFFICE RESPONSIBLE: Forest District Office and Forest Department Headquarters.
PUBLICATION:
(i) FDPM Annual Report
(ii) Forest Sector Review
(iii) Forestry Statistics For P. Malaysia.

PRODUCT: PLYWOOD
DEFINITION: Veneer from peeled logs, assembled, made up of layers of wood glued or cemented together under pressure with the direction of the grain of adjacent layers at right angles to one another.
MEASUREMENT UNITS: Cubic Meters.
METHOD OF SURVEY & COVERAGE: Shuttle returns. The procedure is exactly the same as for sawntimber.
FREQUENCY: Monthly
OFFICE RESPONSIBLE: District Forest Office, Forest Department and Forest Department Headquarters.
PUBLICATION: Same for sawntimber.

PRODUCT: PARTICLE BOARD
DEFINITION: Particle board or "chipboard" a board constituted from fragments of wood including chips, shavings and sawdust that have been partly or wholly comminuted and then consolidated by pressure, heat or otherwise with or without binders and supplementary materials.
MEASUREMENT UNITS: Cubic Meters.
METHOD OF SURVEY & COVERAGE: Annual survey of all mills as the information are required for the drafting of the FDPM Annual Report. Other surveys as and when required, which includes the preparation of the FAO questionnaire submitted annually to Rome.
FREQUENCY: Annual
OFFICE RESPONSIBLE: State Forest Department and Forest Department Headquarters.
PUBLICATION:
(i) FDPM Annual Report
(ii) Forestry Statistics For P. Malaysia.

PRODUCT: FIBREBOARD
DEFINITION: Fibreboard is constituted from wood that has been defibrated or pulped and then consolidated by pressure, heat or otherwise, with or without binders and supplementary materials.
MEASUREMENT UNIT: Cubic Meters.
METHOD OF SURVEY & COVERAGE: Annual survey of all mills. Similar to that for particle board.
FREQUENCY: Annual and occasional special surveys
OFFICE RESPONSIBLE: State Forest Department and Forest Department Headquarters.
PUBLICATION:
(i) FDPM Annual Report
(ii) Forestry Statistics For P. Malaysia.

PRODUCT: PULP AND PAPER
DEFINITION: PULP – defibrated wood fibres by mechanical or chemical processes.
PAPER – pulp converted by consolidation by pressure, heat or otherwise, with or without binders and supplementary materials.
MEASUREMENT UNITS: Tonnes.
METHOD OF SURVEY & COVERAGE: Annual survey of all mills, through the State Forest Department and direct to individual mills. No specific questionnaire used.
FREQUENCY: Annual, and occasional special surveys, and when information are required or requested.
OFFICE RESPONSIBLE: State Forest Department and Forest Department Headquarters.
PUBLICATION:
(i) Forestry Statistics For P. Malaysia.

PRODUCT: PAPER AND PAPERBOARD
DEFINITION: The product of pulp converted into boards by consolidation by press.
MEASUREMENT UNITS: Tonnes.
METHOD OF SURVEY & COVERAGE: Direct to mills. No standard or regular questionnaire used.
FREQUENCY: Mainly, occasional special survey, and when information is needed or requested.
OFFICE RESPONSIBLE: Forestry Department Headquarters.
PUBLICATION:
(i) Forestry Statistics For P. Malaysia.

Myanmar

Pe Thein

1. INTRODUCTION

1.1 Geography

The Union of Myanmar, situated in continental Southeast Asia, has a total area of 676,577 square kilometres. The country is traversed by mountain ranges and rivers, the north and north-western region being very rugged and mountainous and reaching an elevation of 5,800 metres. The eastern region is formed of a plateau while the central and southern regions are undulating and flat and are dominated by the Ayeyarwady valley and deltaic plains.

The climate is marked by three distinct seasons: the dry season from February to May, the wet season from June to October and the cool, dry season from November to January. About two-thirds of the country lies within the tropics and annual rainfall varies from about 5,000 mm in the northern mountainous region and southern coastal strips to about 500 mm in the central rain-shadow arid area. There is also a wide range of temperatures from less than -1 degree Centigrade in winter in northern Myanmar to 43 degrees Centigrade in the dry season in the central area.

1.2 Forest Type

About half the country is covered with forests. The standard forest types used by the Forest Department of Myanmar are shown in Table 1.

The best teak grows in mixed deciduous forests together with natural associate trees and bamboos.

TABLE 1
Forest Types and Relative Area

	Forest types	Relative extent of total forest area
i.	Tidal forests	4%
ii.	Beach & dune forests	
iii.	Swamp forests	
iv.	Evergreen forests	16%
v.	– moist upper mixed deciduous forest	34%
	– lower mixed deciduous forests	
	– dry upper mixed deciduous forests	5%
vi.	Dry forests	10%
vii.	Deciduous dipterocarp or "indaing" forests	5%
viii.	Hill & temperate evergreen forests	26%
Total		100%

1.3 Land use

The forests are administratively classified into reserved forests and unclassed (unclassified, unreserved or public) forests. The total reserved forest area, as of 1989-90, was 10.2 million hectares. The distribution of different types of land use is shown in Table 2.

TABLE 2
Land use

	Land use	million hectares	%
i.	Forests		
	– reserved	10.2	15
	– unreserved	23.7	35
ii.	Agriculture		
	– cultivated area	8.0	12
	– fallow land	2.1	3
	– area suitable for cultivation	8.4	12
iii.	Other land	15.3	23
	Total country area	67.7	100

1.4 Forest area

The Forest Department regurarly assesses forest cover in Myanmar using satellite imagery and air-photos. Table 3 shows changes in the area of different classes of forest.

The forests of Myanmar are managed according to their productive and protective functions and are grouped into different management units such as working circles. The forest working plans generally prescribe four working circles:

A polycyclic size-limit selection system with a felling cycle of 30 years is used for the management of Myanmar's forests.

	Working Circle	Hectares (millions)
i.	Teak Selection working circle	17.0
ii.	Non-teak Hardwood Selection working cycle	18.3
iii.	Local Supply working circle	1.6
iv.	Special working circles (i.e. Bamboo, Mine Timber, Cutch, Catchment Area, etc.)	2.7

TABLE 3
Changes in Area of Different Classes of Forest 1975 – 1980

Year	1	2	3	4	5	6	Total
1975	25.3	10.0	7.0	7.8	16.2	1.4	67.7
1980	22.7	10.1	5.9	8.9	19.2	0.9	67.7

Key: Class
1 – closed forest
2 – closed forest affected by shifting cultivation
3 – degraded forest
4 – degraded forest affected by shifting cultivation
5 – non-forest land
6 – water bodies

1.5 Wood Production

Various inventory surveys have been conducted in Myanmar since systematic forest management was initiated about 134 years ago. The methods adopted have included systematic strip sampling, subjective plot sampling, cent-per-cent enumeration, statistical random sampling and systematic plot sampling. Table 4 shows the systematic plot sampling inventories conducted by the Forest Resources Division of the Forest Department during the 1980s.

TABLE 4
Forest Sampling Inventories – 1980s

Year	Area of Forest (millions hectares)	State/Division covered
1981-82	0.77	Rakhine, Mandalay
1982-83	2.13	Mandalay, Bago, Yangon
1983-84	2.26	Mandalay, Sagaing, Ayeyarwady
1984-85	2.51	Sagaing
1985-86	2.16	Bago, Magwe
1986-87	0.88	Sagaing, Rakhine
1987-88	0.79	Chin
1988-89	0.61	Rakhine
Total	12.11	

The tree-number composition percentages of teak growing in various States and Divisions are shown in Table 5.

TABLE 5
Tree-Number Composition of Teak

State/Division	Tree-Number Composition of Teak (% – Reserves + Unclassed Forests)
Bago	10.7%
Mandalay	5.3%
Magway	4.7%
Sagaing	7.0%
Yangon	7.5%
Ayeyarwady	4.4%

The annual allowable cuts (AACs) for teak and other hardwoods are calculated using the above statistical data. The prescribed AACs are 335,000 Hoppus cubic tons (604,000 cu.m.) for teak and 1,336 million Hoppus cubic tons (2,408 million cu.m.) for non-teak hardwoods. The past production levels of teak and other hardwoods are shown in Table 6.

TABLE 6
Past Production

Period	Average Annual Production in log or log equivalent (cu.m.)	
	Teak	Other hardwoods
1918-30	917 440	912 290
1930-40	423 360	724 780
1940-46	NA	NA
1946-50	324 060	539 430
1950-60	331 100	1 085 760
1960-70	603 810	1 196 440
1970-80	651 580	918 270
1980-90	736 770	990 640
Average	569 640	908 230
AACs	604 000	2 408 000

The above table shows that the production of teak and other hardwoods has not decreased over the last 70 years. Although teak has been overcut during some decades, the overall average production is still well below the prescribed AAC.

1.6 Environmental conservation

Trees have considerable influence on the microclimate, soil quality, wind and water erosion, the flow of springs and streams and the water table.

Soil conservation activities, including demonstration plots, gully control, bench terraces and the planting of suitable tree species, were initiated in Shan State in 1937. Since 1981, forest plantations have been established in some catchment areas of streams and reservoirs. The Pilot Watershed Management Project for the Kinda Dam has been implemented with the aid of the United Nations Development Programme.

The activities of shifting cultivators in watershed areas have a considerable impact on environmental conditions. Statistics on the number of slash-and-burn cultivators, "taungya" acreage and actual "taungya" cutting cycles have not yet been collected.

1.7 Fuelwood and non-wood products

The estimated population of Myanmar in 1990 was about 40 million with a estimated growth rate of about 1.88% per year.

About 70% of the population live in rural areas and most of the rural, as well as some of the urban, population use firewood for food preparation. Firewood is collected from farm-side trees and nearby forests while people in arid, wood-scarce zones use leaves, branches and roots. The dry stunted thron forests become rapidly depleted.

About 10% of the population use charcoal for cooking with 90% of the total charcoal production of Myanmar being consumed in Yangon. 80% of charcoal production comes from the mangrove forest reserves of Ayeyarwady Division. A small amount of charcoal is also produced in non-mangrove areas.

The standard list of non-wood forests products, also referred to as minor forest produce, prepared by the Forest Department contains 21 items: bamboos, canes (rattans), cutch (dye extracted from Acacia catechu), tanning bark, shaw (fibres for rope-making), karamet (scent for cosmetics), indwe and pwenyet (rosins for caulking), thanatkha (scent for cosmetics), cardomoms, kanyin oil (resin for caulking and oil for lights), pine resin, roofing material, te fruit (dye), honey, bees' wax, bats' guano, orchids, thitsi (resin and lacquer), bonmayaza (medicinal roots), edible birds' nests and lac (for shellac, varnish, ink and insulation). These non-wood products generate income for people living outside the forests.

1.8 Industrial forestry

Industrial forestry is the most significant industrial sector in Myanmar, producing sawlogs and veneer logs, sawnwood, veneer, plywood, pulp and paper. Out of the over 1,000 hardwood species in the country, teak plays an important role.

Myanmar Timber Enterprise, the only government-owned logging agency, is responsible for the extraction, processing and marketing of teak and other hardwoods. Since 1989, private traders have been allowed to extract non-teak hardwoods.

1.9 Forests plantations

Apart from the management of natural forests, the Forest Department also sets up plantations of teak and other valuable species. These plantations fall into four categories: Commercial, Local Supply, Industrial and Catchment Protection. "Taungya" cutters are mainly employed in plantation operations. Table 7 shows the area of plantations established between 1963 and 1989.

TABLE 7

Forest plantations established 1963-1989

Type of plantation	Area (hectares)	% total plantation area
Commercial	176 863	58.2
Local Supply	76 403	25.1
Industrial	23 005	7.6
Catchment Protection	27 647	9.1
Total	303 918	100.0

1.10 Forestry and the economy

Forestry is the second most important sector in the Myanmar economy after agriculture, contributing about 2% of the total Gross Domestic Product. It generates annual foreign exchange earnings of over 100 million US dollars. A labour force of 175,000 is employed in the sector, mostly in rural areas and forestry operations also contribute to the improvement of rural infrastructure and communications.

2. FOREST SECTOR STATISTICS

2.1 Organization

The Forest Department and Myanmar Timber Enterprise, under the Ministry of Agriculture and Forests, are responsible for the collection of forestry and forest industry statistics. The Forest Department

keeps records of statistics relating to administration, management and production while Myanmar Timber Enterprise collects statistics on felling, transport, processing and marketing of industrial sawnwood. Statistics on pulp and paper are collected by the Ministry of Industry which owns pulp and paper mills in Myanmar.

Statistics on forestry and the forest industry are regularly reported to the Planning and Statistics Department of the Ministry of Agriculture and Forests and to the Planning Department and Central Statistical Organisation of the Ministry of Planning and Finance. Important publications on forestry and forest industry statistics are listed below.

Annual publications
- Notes on Forestry in Myanmar
  (Planning & Statistics Department, Ministry of Agriculture & Forests)
- Review of the Financial, Economic and Social Conditions for 19../....
  (Planning Department, Ministry of Planning & Finance)

Monthly publications
- Selected Monthly Economic Indicators
  (Central Statistical Organisation, Ministry of Planning & Finance)

2.2 Fuelwood and charcoal

Fuelwood and charcoal collected, produced and sold by local villagers, private traders and cooperative societies are inspected by township forest staff at specific inspection points and royalties collected. Through these inspections the Forest Department collects statistics on the quantity and revenue of fuelwood and charcoal.

2.3 Sawlogs and veneer logs

Statistics on sawlogs and veneer logs are collected by the relative agencies responsible for various forest operations. The Forest Department, responsible for 'girdling' and marking of teak trees, reports on the numbers of trees covered by these operations. The Myanmar Timber Enterprise reports on the volume of timber felled, put into rivers for transport, removed at rafting stations, arriving at and processed by sawmills and sold as logs or sawnwood.

2.4 Other industrial roundwood

The Forest Department collects statistics on poles and posts through the issuing of licences and permits and the collection of revenue. Poles and posts for making log rafts and for house building are extracted and sold by Myanmar Timber Agency and by private traders.

2.5 Sawnwood and sleepers

Myanmar Timber Enterprise operates both state-owned and hired sawmills. The sawmilling branch collects statistics on the volume of sawnwood and sleepers produced. Private traders run small "re-cutting" sawmills which are used to re-cut large sawn timber.

2.6 Veneer and plywood

Myanmar Timber Enterprise produces veneer and plywood at state-owned veneer and plywood mills and reports the quantity and value of production.

2.7 Pulp and paper

The Ministry of Industry owns pulp and paper mills and collects the statistics on the production and sale of pulp and paper in Myanmar.

2.8 Non-wood forest products

Private traders, co-operatives and state-owned agencies extract non-wood forest products. The Forest Department issues permits and licences and collects revenue and statistics. Territorial forest staff report the statistics to headquarters in their quarterly reports.

Table 8 shows the average production over 23 years of non-wood forest products.

2.9 Prices

Myanmar Timber Enterprise, the Central Statistical Organisation and the Ministry of Industry record the prices of selected forest products. The Forest Department does not have a price-recording unit.

2.10 Recorded and unrecorded production

While a proportion of the production of all forest products is recorded by concerned departments, some forest products are utilized but not recorded.

Villagers living near forests are allowed to extract and utilize some products without paying royalties or reporting. These products are called unreported production and estimates are reported in forestry statistics.

Unrecorded production includes non-teak hardwood timber, fuelwood, bamboos, canes, shaw

(bast) and roofing materials. Table 9 shows estimated rates of domestic consumption per rural family.

TABLE 8

Average production of non-wood forest products 1967-89

Product	Unit of measurement	Average production (1967-1989)
- Bamboo	million pieces	700
- Cane	"	47
- Cutch	thousand viss (1 viss = 1.63 kg.)	167
- Bark	"	410
- Shaw	"	231
- Karamet	"	57
- Indwe - pwenyet	"	477
- Thanatkha	"	153
- Hpala	"	11
- Kanyin oil	"	6
- Pine resin	"	148
- Roofing material	million pieces	664
- Te fruit	thousand viss	63
- Honey	"	20
- Bees - wax	"	4
- Bats' guano	"	165
- Orchids	thousand nos.	17
- Thitsi	thousand viss	46
- Bonmayaza	"	9
- Birds' nests	"	0.7
- Lac	"	48

TABLE 9

Estimated rates of domestic consumption of "unrecorded" forest products

Product	Estimated yearly rate of consumption per family
- Non-teak hardwood t imber	0.069 Hoppus cubic tons (0.124 cu.m.)
- Fuelwood	2.4 Hoppus cubic tons (4.3 cu.m.)
- Bamboo	90 culms
- Cane	2.5 pieces
- Shaw (bast)	0.0234 viss (0.0382 kg.)
- Roofing material	95 pieces (4-6 foot length)

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood

Fuelwood used in urban areas is usually purchased at markets and comes under recorded production. However, rural people generally collect fuelwood for their own use in the forests and this production goes unrecorded.

Industrial fuelwood, which is occasionally recorded, is used in brick kilns, jaggery-boiling, tanning and in some cottage industries.

Fuelwood comes in round or split pieces of varying sizes. It is measured in stacked volume but the recording unit should be the solid volume excluding air spaces.

3.2 Fuelwood supply and demand

No accurate calculations of fuelwood supply in Myanmar have been made but some estimates are possible based on areas covered by sampling inventories. The annual allowable cuts (AACs) for fuelwood used by a recent World Bank study are shown in Table 10.

TABLE 10

Estimated AACs of fuelwood by forest class (see Table 3 for key to forest classes)

	Class 1	Class 2	Class 3	Class 4	Total
Estimated fuelwood supply area (million ha.)	1.770	6.719	5.873	5.427	19.789
Estimated mean annual increment (cu.m./ha)	1.78	0.58	0.58	0.35	
Estimated AAC (million cu.m.)	3.184	3.930	3.435	1.904	12.453

No large-scale energy consumption surveys have been conducted in Myanmar and accurate per capita consumption rates are not available. However, based on old records and studies, the following consumption rates can be estimated.

These rates are assumed to include charcoal consumption. Total estimated yearly demand of fuelwood is estimated at about 31 million cu.m.

	yearly consumption	
	per 5-member family	per capita
Urban (25%)	2.53 cu.m.	0.50 cu.m.
Rural (75%)	4.33 cu.m.	0.87 cu.m.

3.3 Charcoal

All charcoal production is recorded and it is assumed that rural people do not consume charcoal for cooking. The estimated charcoal recovery rate on a weight-for-weight basis is about 10%. Charcoal statistics are always reported in Hoppus cubic tons (solid) and in wood-equivalent form. One 90-lb (40.8

kg.) bag of charcoal requires about 16 Hoppus cubic feet (solid) or 28.8 cu.m. of wood.

A recent study indicates that the AAC of mangrove species in Ayeyarwady, Rakhine and Dawe areas is about 360,000 cu.m.

Information on surveys of fuelwood and charcoal is given in Appendix 1.

3.4 Non-wood Forest Products

Production of non-wood products or "minor forest produce" is reported by territorial staff in quarterly reports.

Information on bamboo resources is available for inventoried regions as inventory teams enumerate bamboos along with tree species. Important bamboo areas and estimated AACs for bamboos are shown in Table 12.

TABLE 12
Bamboo areas and AACs

Region	Area (hectares)	AAC available for industrial use (tons/air-dry)
- Bago	597 000	164 000
- Rakhine	506 000	2 444 000
- Tanintharyi	187 000	234 000
Total	1 290 000	2 842 000

In Rakhine, 'kayin'(melocann bambusoides) bamboo grows in pure stands and extends into Chin State, covering over 3,000 square miles (800,000 hectares).

Bamboo plantations have been tried on an experimental basis.

For the other 21 non-wood forest products enumerated by the Forest Department, no AACs and little data are available. In the case of some products, such as cutch, shaw (bast) and thitsi (for lacquer), the trees from which the products are obtained are inventoried.

4. MODERN SECTOR PRODUCTS

4.1 Types of product

Of modern sector forest products, industrial roundwood, sawnwood, plywood and pulp and paper are produced in Myanmar.

4.2 Units of measurement

Foresters in Myanmar have measured roundwood in Hoppus since 1856. The Hoppus measure assumes that the cross-sectional are of a log is derived from the square of one-quarter of the circumference or girth of the log (rather than pie times the square of the radius). Therefore, the Hoppus measure is a reduced unit of true measure.

All roundwoods are measured in Hoppus units and the volume is expressed in Hoppus cubic feet. Roundwood volumes are expressed in larger units of 50 Hoppus cubic feet or 50 true (international) cubic feet. The former is called one Hoppus cubic ton and is equivalent to 63.6620 international cubic feet. The latter is one true cubic ton.

5. TRADE

Myanmar Timber Enterprise is responsible for the processing and marketing of timber and timber products both for domestic and export markets. It exports logs and sawnwood of both teak and other hardwoods, plywood, veneer, furniture, mosaic, parquet, etc. In 1988-89, the total export value was 702 million kyats (US$ 33 million). In the same year, the total volume of timber exports was 330,371 cu.m. while 285,535 cu.m. were sold on the domestic market.

Myanmar imports pulp and paper. In 1988-89, the volume of pulp and paper imports stood at 19,000 metric tons valued at 116 million kyats (US$ 17.9 million).

No international coding systems have been adopted in Myanmar.

The following publications contain statistics on the import and export of timber from Myanmar.

- Trade bulletins prepared by the Central Statistical Organisation.
- Notes on Forestry in Myanmar for the Year ....
- Departmental reports prepared by Myanmar Timber Enterprises.

6. FOREST PRODUCT PRICES

6.1 Prices

Myanmar Timber Enterprise reviews and fixes the prices of wood and wood products. It regularly publishes a pamphlet entitled "Export Prices of Myanmar Teak and Hardwoods".

The weighted average export prices of teak and other hardwoods derived from production and value data are shown in Table 13.

Table 14 shows weighted average local prices (government) of teak and other hardwoods derived

from production and value data.

TABLE 13

Weighted average export prices for teak and other hardwoods

Year	Teak (kyat/Hoppus cu.ton)	Other hardwoods (kyat/Hoppus cu.ton)
1984-85	3 573	1 723
1985-86	3 748	1 570
1986-87	3 654	1 173
1987-88	3 181	866
1988-89	3 576	972

TABLE 14

Weighted average local prices (government) for teak and other hardwoods

Year	Teak (kyat/Hoppus cu.ton)	Other hardwoods (kyat/Hoppus cu.ton)
1984-85	537	418
1985-86	547	394
1986-87	837	357
1987-88	666	443
1988-89	797	462

6.2 Publications

The following publications contain information on the prices of timber, fuelwood and charcoal, and pulp and paper.

- Price list published by Myanmar Timber Enterprise
- Export and local sales by quantity and value tabulated in "Notes on Forestry in Myanmar for the Year ...."
- Retail prices of fuelwood and charcoal in Yangon in "Selected Monthly Economic Indicators".
- Import prices of pulp and paper recorded by the Central Statistical Organisation.

7. COMPUTERS

The National Forest Management and Inventory Project is carrying out forest inventories and using computers in data processing. It has one U.S.-made Vax 11-750 mini-computer with a 7 megabyte memory and 5 Commodore PCs and a variety of software and accessories.

8. SUMMARY AND CONCLUSIONS

The forestry statistics collected by forestry organisations for policy formulation, planning and management of the forestry sector can be classified as follows:

i. Conservation statistics
ii. Forest Management statistics
iii. Logging statistics
iv. Processing statistics
v. Marketing statistics
vi. Consumption statistics.

Basic forest statistics include area, growing stock, growth and used or unused mortalities. The annual allowable cuts (AACs) of both major and minor forest products indicate their potential supplies.

The Forest Management and Inventory Project is carrying out sampling inventories in natural forests while the Myanmar Timber Enterprise keeps records of logging, processing and marketing statistics. However there are still some areas to be developed to achieve complete data coverage.

Wildlife and other resource surveys, plantation inventories, consumption surveys and marketing statistics on value-added finished products are required. Supply-demand statistics of forest products would also be useful for the formulation and implementation of forestry plans.

The following recommendations indicate the priorities for forestry statistics in Myanmar.

i. calculated or estimated AACs of forest products
ii. consumption surveys of forest products
iii. market studies of value-added finished products and lesser known species
iv. prices and costs of forest products

The Planning and Statistics Directorate of the Forest Department will be mainly responsible for these studies and surveys and should therefore be properly equipped with appropriate data recording and processing facilities.

Appendix 1
Surveys on fuelwood and charcoal

	Name & date of survey Publication reference	Authority carrying out survey	Coverage
-	The possibility and advisability of establishing integrated forest industries within the Union of Burma. 1952	Dr.von Monroy, FAO	Whole Myanmar/household & industry/fuelwood & charcoal
-	The fuelwood situation in Burma. 1959.	U Thein	Whole Myanmar/household & industry/firewood & charcoal
-	A preliminary evaluation of wood chip potential of the tidal forests along the fringes of the coast of Burma. 1972.	Forest Department	Whole Myanmar/industry
-	Notes on Myanmar Mangrove Forests.1989.	Pe Thein	Whole Myanmar/household/firewood & charcoal
-	Recent study by the World Bank. 1990. (not yet published)	Mr.Paul Ryan	Whole Myanmar/household/firewood & charcoal

Appendix 2
Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Sawlogs and veneer logs
MEASUREMENT UNITS: Hoppus cubic tons (volumetric weight equal to 63.6620 cubic feet.
METHOD OF SURVEY & COVERAGE: Information obtained from departmental reports of Myanmar Timber Enterprise.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Myanmar Timber Enterprise
PUBLICATION:

i. Review of the Financial, Economic and Social Conditions for the Year .....
ii. Departmental reports.

PRODUCT: SAWNWOOD

DEFINITION: Sawn timber and sleepers.
MEASUREMENT UNITS: True cubic tons.
METHOD OF SURVEY & COVERAGE: Myanmar Timber Enterprise reports.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Myanmar Timber Enterprise
PUBLICATION:

i. Review of the Financial, Economic and Social Conditions for the Year ....
ii. Notes on Forestry in Myanmar for the Year ....
(Planning & Statistics Department, Ministry of Agriculture & Forests).
iii. Departmental reports.

PRODUCT: PLYWOOD

DEFINITION: 3-ply plywood of 6'x3' and 8'x4' size.
MEASUREMENT UNITS: cu.m. or cu.ft. or sq.ft.
METHOD OF SURVEY & COVERAGE: Myanmar Timber Enterprise reports.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Myanmar Timber Enterprise
PUBLICATION:

i. Selected Monthly Economic Indicators for the month .....
(Central Statistical Organization).
ii. Departmental reports.

PRODUCT: PULP AND PAPER

DEFINITION: Pulp and paper include newsprint and printing and writing papers.
MEASUREMENT UNITS: metric tons.
METHOD OF SURVEY & COVERAGE: Departmental reports of the Ministry of Industry.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Ministry of Industry.
PUBLICATION:

i. Selected Monthly Economic Indicators for the Month .....
(Central Statistical Organisation).
ii. Departmental reports.

Nepal

E.R.Sharma & M.D.Rajbhadari

1. INTRODUCTION

1.1 Background

In Nepal, forests provide the bulk of household energy needs, a substantial proportion of food and bedding for livestock, timber for houses, furniture and agricultural implements as well as organic nutrients for farms. The forests of Nepal are under intense pressure due to the increasing population of the country As a result of this pressure, the forest area has been reduced and site quality degraded. This in turn has aggravated the already serious problems of environmental degradation and declining farm yields on the scarce agricultural land in the country.

With a view to nationalizing the forestry sector, His Majesty's Government of Nepal put into operation the Master Plan for Forestry Sector Project (MPFSP) in early 1986. During the preparation of this plan, the MPFSP has developed an information base which provides a macro-picture of the forestry situation.

1.2 Nation-wide Forest Resource Inventories

The first attempt at a country-wide forest resources inventory was carried out in 1963-65. Aerial photography was used to cover most of Nepal but excluding the Himalayas and portions of high mountains. This Forest Resources Survey Project published four series of statistical booklets which indicate that about 45.5% of country's land area was covered by forests in 1964.

A more complete country-wide survey using aerial photography was carried out in 1978-79 and, based on these aerial photographs, the Land Resources Mapping Project (LRMP) produced land use maps. Forest area as compiled from these maps totalled 38% of total land area as of 1978-79.

MPFSP updated the LRMP data by incorporating the known and estimated land-use changes during the intervening seven years and its estimate of forest areas as of 1986 stands at 5,424,000 ha. which amounts to 37% of the total area of Nepal (Appendix 1). According to the UNDP/World Bank report "Nepal: Issues and Options in the Energy Sector"(1983), since 1964 the area under agriculture has increased from 1.7 million to 3.1 million ha. and apparently much of this area used to be forest.

1.3 MPFSP Data

The forest resource information prepared by MPFSP is derived by combining LRMP land utilization data and Forest Resources Survey inventory plot data. The focus of the data has been on land use and important forest products namely fuelwood, timber and fodder. The scenarios depicting statistics related to household and industrial consumption of fuelwood, timber consumption, and the target animal feed requirements expressed in metric tons of total digestible nutrients (TDN) are given in the Master Plan for the Forestry Sector Nepal, Land-Use Forest Management and Supply of Plan Forest.

TABLE 1

Land Use In Nepal, 1985-86 ('000 ha.)

	High Himalaya	High Mountains	Mid Mountains	Siwaliks	Terai	Total	Percent
Natural forests	155	1 629	1 762	1 433	445	5 424	37
Forest Plantations	0	5	30	4	30	69	0
Enriched forests	0	5	19	1	0	25	0
Shrubland & degraded forest	67	176	404	29	30	706	5
Grass lands	885	508	278	16	58	1 745	12
Non-cultivated inclusion	1	148	667	59	123	998	7
Farm lands	8	244	1 223	269	1 308	3 052	21
Other lands	2 234	245	59	75	116	2 729	19
Total	3 350	2 960	4 442	1 886	2 110	14 748	100

Household fuelwood consumption for 1986 was estimated by MPFSP to be 11.7 million metric tons corresponding to the projected population of 17.15 million. Industrial fuelwood consumption for 1986 was 158,800 mt. The total timber consumption for 1986 was estimated to be 685.9 thousand metric tons on the basis of the per capita timber consumption rate of .040 mt./cap/ year. Livestock TDN requirement for 1985 was estimated to be 6.035 million metric tons when the aggregate livestock population was projected to have reached 7.79 million.

Supply falls short of demand by 24% for wood consumption and 3% for livestock feed consumption.

2. FOREST SECTOR STATISTICS

Over the years the Forest Survey and Research Office (FSRO) has been establishing and measuring inventory plots. In the sixties, this was in connection with the nation-wide forest inventory and, later, in connection with the preparation of management plans. The recently established Forest Survey and Statistics Division (FSSD) of the Ministry of Forest and Soil Conservation, organizational successor of FSRO, is responsible for providing national statistics on forest resources by undertaking a continuous forest inventory programme.

Collection and dissemination of forest industry statistics, on the other hand , is the responsibility of the Management and Utilization Division of the Department of Forests. So far the quality of its coverage is limited.

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood

Fuelwood is consumed in two sectors, the household and industrial. Per capita consumption of fuelwood in households varies from one physiographic zone to another because of climatic, economic, and other differences. The Integrated Development Systems (IDS)/Water and Energy Commission Secretariat (WECS) Study in fact indicates that other factors overshadow climatic effects, resulting in higher per capita consumption in some areas in the warmer terai than in the hills.

The MPFSP estimate of industrial fuelwood consumption for 1986 was 158,000 mt., based on the 1983 UNDP/World Bank study. A study carried out by the Industrial Service Centre (ISC) indicated the consumption of 108,064 mt. for 1985/86.

The Community Forest Development Project (CFDP) commissioned a survey of 900 households and 180 ward leaders in its project districts in four development regions. The households surveyed are located mainly in the middle mountains, at elevations from 1090 to 3000 m. MPFSP has used these data for household fuelwood consumption projections which total 11.17 million mt for 1985/86.

3.2 Charcoal

There is a lack of data regarding national consumption of charcoal, particularly in the domestic sector. There is no doubt that a significant amount of charcoal, when available in the market, is utilized domestically for heating and cooking purposes. This is particularly true during winter.

A study carried out by the Industrial Service Centre (ISC) has shown that, during 1985/86, there was an annual national consumption of around 11,000 mt of charcoal in the industrial sector alone. This means that roughly one tenth of the fuelwood needs of the industrial sector are fulfilled by charcoal.

Information on surveys of fuelwood and charcoal is contained in Appendix 1.

3.3 Forest Products other than wood

i. Resin: Pine trees have been tapped for resin for several decades for domestic use and for export. Recently two resin processing plants have been established for manufacturing resin and turpentine. At full quota utilization they produce 4400 mt of resin and 975 mt. of turpentine.
ii. Sal seed oil: Sal seeds are collected from sal forests and they are processed to extract oil. There are four sal seed using industries and their total production capacity is 2600 mt. of oil. The average composition of dry seed is 23% wing, 30% pod and 47% kernal.
iii. Lokta paper bark: FSRO of the Department of Forests conducted a survey of lokta vegetation in 1984. The sustainable yield is 3215 metric tons, out of which 118 mt are being used in the western hills by Bhaktapur Craft Industries to manufacture cards which are being sold abroad under UNICEF guidance.
iv. Medicinal and aromatic plants: FAO, 1986 estimates show that the annual export, which consists of about 80 varieties of medicinal and aromatic plants, totals more than 1000 t, but

the data source is not known. MPFSP quotes a figure of 6,232 mt which was obtained from the Foreign Trade Statistics of the Department of Customs, Ministry of Finance. Export of crude drugs was banned in 1986 and exports dropped to 361 t.

v. Katha and cutch: Katha and cutch are extracted from the heartwood of Acacia catechu trees. The total annual allowable cut of such trees is 8392 cubic meters. In 1986-87 the production of Katha was 650 t and of Cutch, 700t. Cutch is seen as a by-product of Katha processing. It is used in tanning and dyeing. Katha, on the other hand, is used as an important ingredient in chewing Pan (betel leaves).

Information on surveys of non-wood forest products is contained in Appendix 2.

4. MODERN SECTOR PRODUCTS

Readily available information on the production of wood-based industries in Nepal is scarce and scattered, and the available data are mostly incomplete, inaccurate and out of date. However, MPFSP data given in the Forest Based Industries Development Plan is the most recent and comprehensive, because it has made a major effort to collect the basic data from various official, as well as industrial and other unofficial sources for its master planning process. The Utilization and Management Division of the Forest Department is supposed to have up-to-date data but it has not conducted any surveys and often its data is incomplete. The proformas on modern sector products were completed with the help of data given in MPFSP publications (see Appendix 3).

5. TRADE

5.1 Timber

In the past export of wood used to be in the form of round timber and sawn timber, the latter in the form of railway sleepers for Indian Railways. At present, there is no official record of timber exports. However, some thefts of timber in the form of roundlogs and sawn timber along the Indian border are still reported.

5.2 Plywood

Demand for plywood in Nepal for 1986 stood at 1,034,000 sq.m. of which 623,000 sq.m (60% of consumption) was met by Nepalese production and the remaining 411,000 sw.m. (40% of consumption) might have been imported from India.

5.3 Paper

According to report in Pulp and Paper International in July 1982, the consumption of paper and board in Nepal in 1986 was 18,300 tons.

In-country paper mills using sabai grass and straws could supply 13,400 tons of paper when operating to full-capacity. The deficit 4,900 tons are imported from abroad.

6. FOREST PRODUCT PRICES

Table 2 shows the value of exports of forest products from Nepal for the years 1976 to 1988 according to the Statistical Yearbook of Nepal, 1988. Table 3 shows the royalties charges on selected major tree species, in US dollars per cubic metre, according to the Department of Forests.

TABLE 2

Value of exports of forest products in 1000 U.S. dollars

Year	Products				
	Timber	Herbs	Catechu	Cutch	Salseed oil
1976	8 305	506	–	–	–
1977	11 783	522	–	–	–
1978	–	–	–	–	–
1979	11 437	2 647	–	–	–
1980	19 008	1 387	–	–	–
1981	7 328	538	–	–	–
1982	2 198	450	–	–	–
1983	549	556	–	–	–
1984	1 577	1 712	–	–	–
1985	–	943	4 756	523	1 165
1986	–	384	5 152	531	801
1987	–	752	4 835	413	2 610
1988	–	574	1 855	140	1 515

7. COMPUTERS

Micro computers are being installed for compiling inventory data and other forest statistics.

8. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Given the depletion and degradation of forest resources in Nepal due to heavy pressure from man and cattle, it becomes imperative that the available forest resources are brought under a proper management

TABLE 3
Royalties for standing timber (major tree species) (US $ per cubic metre)

Year	Species				
	Sal	Acacia	Teak/ Juglans	Sissoo	Laurel (Asna)
1985	40.1	90.3	68.2	60.2	22.1
1986	33.5	75.3	56.9	50.2	18.4
1987	32.4	72.9	55.1	48.6	17.8
1988	82.7	180.3	142.8	127.7	37.6
1989	70.9	154.7	122.4	109.6	32.2

Year	Species				
	Bombay	Cedrella	Pine	Gmelina	Misc. sp.
1985	16.1	16.1	16.1	10.0	4.0
1986	13.4	13.4	13.4	8.4	3.3
1987	13.0	13.0	13.0	8.1	3.2
1988	21.0	21.0	21.0	27.0	15.0
1989	18.0	18.0	18.0	23.2	12.9

regime. For this, good and up-to-date forest statistics are needed.

Data on the resource base are not regularly updated, especially for minor forest products, but even for major forest products like timber.

Under the MPFSP, Institutional Strengthening Programme, FINNIDA is assisting FSSD to develop a Forestry Resources Information System to efficiently measure, store, update and analyze forest resource data.

To achieve the above objective, the following specific tasks are planned to be carried out in the period 1990-1995.

i. Inventory
Field work to compile the inventory will cover five to nine districts in 1990-1992 by making use of new 1:25000 scale aerial photographs. By the end of 1992, it will be decided whether to start using two phase sampling where the first phase sample consists of the plots inventoried in the field during 1990-1992.

ii. Analysis of Field Data and Map Preparation
To increase the accuracy of analysis of field data, computer software will be used. The forest maps will be digital to make updating and scale transformation easier, and to make the map data compatible with the other data in the Geographical Information System (G.I.S.).

iii. Geographical Forest Resource Information System
A Geographical Information System will be implemented in the third year. This will store information in a way that many types of information can be assigned to each pair of coordinates. The information will include forest variables such as species composition, maturity, stand density, and other relevant information such as soil type, altitude, rainfall and population density. The themes will be processed and analyzed to produce new information such as growth predictions, firewood balances and erosion estimates.

iv. Research
Research activities include biomass and growth studies. The information is designed to be collected by establishing part of the inventory plots as permanent, and measuring them at regular intervals.

v. Training
Training activities include in-service training for field personnel. Short courses on forest inventory, data analysis, remote sensing and computer technology will be arranged.

vi. Data on industrial utilization of forest resources
Besides forest resource information, updated information relating to the utilization of forest resources by industries is also needed. It is recommended that F.A.O. provide the necessary support for incorporating these aspects so that it can provide relevant statistics on utilization to concerned agencies.

Appendix 1
Surveys on Fuelwood and Charcoal

	Name & date Survey Publication reference	Authority Carrying out Surveys	Coverage Geographical districts	Remarks Frequency, Measurement Units
a.	Nepal, Issues and options in the Energy Sector Report, August, 1983.	Joint UNDP/World Bank Energy Sector Assessment.	Country wide, Household/Industry/ Fuelwood/charcoal/Both.	Occasional Metric ton.
b.	Forest Development Plan for the Supply of Main Forest Products December, 1988	Master Plan for the Forestry Sector Project (MPFSP) of HMGN/ADB/FINNIDA.	Development Regionwise Household/Industry Fuelwood.	Statistics collected for master planning. metric ton.
c.	Land use, Forest Management and supply of Main Forest Produce Kathmandu, Dec.1988.	Master Plan for the Forestry Sector Project (MPFSP) of HMG-N/ADB/FINNIDA.	Development Region-wise Household/Industry Fuelwood.	Statistics collected for master planning. metric ton.
d.	Industrial Energy Survey, 1987.	Industrial Service Centre. Kathmandu, Nepal.	Physiographic regions like, Terai, hills and mountains. Industry Fuel wood/charcoal/Both.	Occasional. mt
e.	An evaluation of Charcoal Production technology in Nepal. Report No. 4/1/301188/6/1 November, 1988.	Water and Energy Commission, Ministry of Water Resources, HMGN.	Country wide Household/Industry Charcoal only.	Special mt.

Appendix 2
Forest Products Other than Wood (Non-wood forest products)

Product	Estimated quantity	Survey Name and date	Coverage	Publication reference
Resin	4400 mt.	MPFSP, Dec. 1988.	Country-wide.	Forest Based Industries Development Plan. MPFSP of HMG N/ADB/FINNIDA, Dec. 1988.
Turpentine	975 mt.	MPFSP, Dec.1988.	"	"
Sal seed oil.	2600 mt.	"	"	"
Lokta paper bark.	3215 mt.	FSRO Survey 1984.	"	FSRO publication.
Medicinal and Aromatic plants.	3617	MPFSP, 1988	"	Forest based Industries Development Plan MPFSP of HMGN/ADB/FINNIDA, Dec.1988.
Katha	650 mt.	MPFSP, Dec.1988	"	"
Cutch	700 mt.	"	"	"

Appendix 3

Modern sector products

PRODUCT: INDUSTRIAL ROUND WOOD

DEFINITION: Any log which has not shown any visible defect or decay and which is at least 3 feet long and 2 feet in circumference or girth qualifies as industrial round wood.

MEASUREMENT UNITS: Cubic feet but all publications convert them into cubic meters.

METHOD OF SURVEY & COVERAGE: Based on official, as well as industrial and other unofficial sources.

FREQUENCY: Special survey for master planning process.

OFFICE RESPONSIBLE: MPFSP of HMGN/ADB/FINNIDA

PUBLICATION: Forest-Based Industries Development Plan,Dec.1988.

PRODUCT: SAWNWOOD

DEFINITION: Any sawnwood timber without defect having at least 3 feet length but of any size qualifies as sawnwood.

MEASUREMENT UNITS: Cubic feet but all publications convert to cubic meters.

METHOD OF SURVEY & COVERAGE: Based on official, as well as industrial and other unofficial sources.

FREQUENCY: Special survey for master planning process.

OFFICE RESPONSIBLE: MPFSP of HMGN/ADB/FINNIDA

PUBLICATION: Forest-Based Industries Development Plan, Dec.1988.

PRODUCT: PLYWOOD

DEFINITION: Plywood produced in Nepal is 3-plY and of 4 mm thickness. Maximum panel size is 122 x 244 cm.

MEASUREMENT UNITS: Square meters.

METHOD OF SURVEY & COVERAGE: Same as above for industrial roundwood.

FREQUENCY: Special survey for master planning process.

OFFICE RESPONSIBLE: MPFSP of HMGN/ADB/FINNIDA

PUBLICATION: Forest-Based Industries Development Plan, Dec. 1988.

PRODUCT: PAPER AND PAPERBOARD

DEFINITION: Nepal's paper industry is based on non-wood materials such as sabai grass and straw. The paper produced is for printing and writing.

MEASUREMENT UNIT: Metric tons

METHOD OF SURVEY & COVERAGE: Based on official, as well as industrial and other unofficial sources.

FREQUENCY: Special survey for master planning process.

OFFICE RESPONSIBLE: MPFSP of HMGN/ADB/FINNIDA

PUBLICATION: Forest-Based Industries Development Plan, Dec. 1988.

Pakistan

Mohammad Amjad

1. INTRODUCTION

Statistical information is of vital importance both for policy making and planning activities. The role of statistical information in forestry sector planning is of even greater importance because of the close linkages of forestry with other sectors of the economy and relatively longer planning horizon. Notwithstanding the enormous importance of statistical information for policy formulation and planning,it is unfortunate that not enough effort has been undertake in Pakistan to build up forest statistical data base. Glaring gaps exist in forest statistical information which act as constraint on policy formulation and planning in forestry sector. Some of the areas where statistical information is required to be collected on priority basis are discussed below.

2. PRIORITY AREAS OF FOREST STATISTICS

2.1 Forest resource statistics

An appraisal of existing forest resources is the starting point for planning exercise in forestry sector. However this appraisal can be undertaken only if basic data on forest resource is available. Unfortunately no national forest resource inventory has so far been conducted in Pakistan to provide much needed statistical data on forest resources. The only information available is the data collected during the course of preparation of working plans. The existing working plans hardly cover 50% of the forest area and they have differing reference dates. It is imperative that quantitative data on forest resources be collected on a priority basis to provide bench mark information for long range planning in forestry sector.

2.2 Statistics on tree growth on farmlands

In addition to forest areas, farmlands in Pakistan carry substantial tree growth. According to some estimates, farmlands supply 90% of fuelwood and 40-50% of timber consumption in Pakistan. Hitherto no quantitative data on tree growth on farmlands is available and in order to ensure a sound basis for forest planning, statistical data need to be collected.

2.3 Timber supply statistics

At present statistics on timber supply are collected only for state-controlled forests. No statistics are available on the production of timber from farmlands. In order to provide a realistic picture, it is essential that statistics on timber supply from farmlands are also collected regularly. To ensure sound planning, it is imperative that statistical information regarding potential supplies both from state controlled forests and farmlands is also developed.

2.4 Timber demand statistics

The major end-users of timber are housing, packaging, coal mines, transport and communications sector, rural sector and a host of wood-based industries. Time series data on timber consumption in various end-uses is highly essential for drawing up realistic forest development plans. At present these statistics are not collected regularly. Some special surveys were conducted in the past to collect the requisite information. It is proposed that these statistics be collected annually on regular basis. Statistics on prospective demand in various end-uses will help the planners to formulate realistic targets for forest production. This information may also be collected periodically.

2.5 Afforestation and regeneration statistics

At present statistics on afforested and regenerated areas are collected for state-controlled forests only, with private lands going un-reported. To build up a realistic picture of the forest resource, it is proposed that statistics on afforestation and regeneration on private farmlands may also be collected.

2.6 Watershed statistics

The importance of proper management of watershed areas cannot be over emphasized in Pakistan. Agriculture contributes nearly 30% of GDP and employs about 55% of the labour force. On account of arid conditions and erratic rainfall, 70% of agricultural production takes place in irrigated areas. The quantity and quality of water flowing from watershed areas is thus of vital importance for the

economy of Pakistan. Statistical information on vegetation cover and land-use patterns in watershed areas is of immense importance but has hitherto been available in sketchy form only. It is imperative that this information and statistical information on sediment flow, quantity and quality of water be available for the formulation of development programmes. It is proposed that this information be collected at least periodically if not annually.

2.7 Range land statistics

Nearly 60% of the total land area of Pakistan consists of grazing lands, only a small part of which has been surveyed. Statistical information on availability of forage and fodder in these areas and on animal population grazing these lands would help in preparing sound policy for development of these lands. Very little attention has been given to the collection of this statistical information.

2.8 Environmental statistics

The rapid growth in population has placed unbearable demands on the natural resource base causing soil erosion, deforestation and desertification. No statistical information is available on these environmental problems. Statistical information on these aspects, including wildlife, needs to be collected on a regular basis, to permit proper planning for the environment.

2.9 Fuelwood statistics

Wood is the main fuel used in rural areas for domestic energy needs. Some information has been collected through special surveys on production and consumption of fuelwood in the country. However fuelwood statistics need to be collected on a regular basis to plan future programmes for energy plantations in the country.

2.10 Forest industries statistics

Forest industries statistics are far from satisfactory. For major industries such as pulp and paper, statistics on capacity and production are collected by the Central Statistics Office regularly on annual basis. However, most forest industries operate in the unorganized sector and very little information is available about their production, employment and capacity. In particular, information on consumption of wood is lacking and statistics on small scale wood based industries need to be improved.

2.11 GDP statistics

Statistics on value-added originating in the forestry sector are collected by the Central Statistical Office but leave much to be desired. Fuelwood production from farmlands is totally overlooked as is value-added originating in rangelands. Intangible benefits are also not accounted for. This grossly underestimates the contribution of the forestry sector towards GDP and needs to be rectified.

2.12 Price statistics

Price statistics on forest products help to determine their relative scarcity in the economy. Price statistics on some forest products are collected regularly by the Central Statistical Office but these relate to the market prices. Data on stumpage prices is not collected. The collection of this data can help in rational management of the forest resource.

2.13 Trade statistics

Statistics on foreign trade in forest products are collected by the Central Statistical Office. These are quite comprehensive in coverage and conform to the international practice. No change in their pattern is called for.

In the context of the present stage of development through which Pakistan is passing, highest priority should be accorded to the collection of statistical information on forest resources, supply and demand for timber, fuelwood consumption, and on the conditions of watersheds.

3. ORGANIZATION

3.1 General Forestry statistics

In Pakistan the management and development of forest resources is the responsibility of the provincial forest departments. Forestry statistics become available as a by-product of the working of the provincial forest departments. Each provincial forest department is divided into a number of circles and each circle into a number of forest divisions. Each forest division is required to prepare its Annual Administration Report at the close of the year. These reports are the main source of statistical information on forestry sector in Pakistan. The Annual Administration Report is divided into a number of chapters and each chapter contains a number of sections. The typical Annual Administration Report contains the following chapters and sections.

At the close of the fiscal year (July – 30th June),

Chapter	Title	Sections
I	Constitution of forests	– Alteration of area
		– Distribution of area by legal categories
		– Distribution of area by vegetation types
		– Distribution of area into merchantable & unmerchantable forests
		– Forest settlement
		– Demarcation of forests
		– Forest survey
II	Management of forests	Regulation of management
		– Preparation & control or working plans
		– Communication & buildings
		Protection of forests
		– Protection from fire
		– Protection from cattle
III	Silviculture	– System of management
		– Natural regeneration
		– Artificial regeneration
		– Afforestation
		– Tending
		– Nurseries
IV	Exploitation	Major Forest Produce
		– Extraction of timber
		– Extraction of firewood
		Minor Forest Produce
		– Grazing
		– others
V	Financial results	– Revenue
		– Expenditure
VI	Research and Experiment	
VII	Soil conservation	– Works
		– Afforestation
VIII	Game Preservation	
IX	Administration	
X	Development schemes	

each Divisional Forest Officer sends report in respect of his division to the Chief Conservator of Forests (CCF) office where a consolidated report for the province is prepared. The Pakistan Forest Institute, Peshawar collects these reports from the provinces and consolidates them to formulate national report on the forestry sector.

The national report embodies statistical data on area under forests, distribution of area by ownership classes, classification of forests by vegetation types, area covered under management plans, area afforested and regenerated, production of nursery plants, extraction of timber, firewood, resin, mazri and Ephedra, revenue earned by provincial forest departments, development and non development expenditures of the provincial forest departments. The coverage of the report is limited to the state controlled forests only. The quality of the statistics is fairly good as these are based on official records.

At present no agency exists to collect similar information for farmlands and other non-forest areas. The production of timber and firewood from the farm lands has to be estimated.

3.2 Price data

Data on forest products prices is collected by the Federal Bureau of Statistics through its field offices in major cities and towns. The data are collected fortnightly and then an average is worked out for the year. The Federal Bureau of Statistics collects price data on timber, fuelwood and charcoal, various grades of paper and on safety matches. The quality of the data is fairly good as it is based on field reports.

At present price data on plywood, particle board, fibre board and other wood manufactures is not collected regularly.

3.3 Trade statistics

The Federal Bureau of Statistics collects and publishes foreign trade statistics including data on forest products. The Bureau follows the international classification standards and its coverage is quite comprehensive. The Bureau records the quantities and values as given in bill of landing. Except for over or under invoicing the data are fairly reliable.

3.4 Forest Industries

Forest industries statistics are collected by the Provincial Bureau of Statistics in each of the four provinces of the country. It conducts a monthly survey of industrial production and employment covering only large scale industrial units. Of the forest industries only paper and board mills are covered by this survey. The statistics on plywood and fibreboard are collected by the Pakistan Forest Institute directly from the manufacturing units. At present, data on sawnwood production is not collected by any agency.

The Federal Bureau of Statistics periodically conducts a Census of Manufacturing Industries (CMI) to collect information on value-added in various industries. The CMI also includes statistics on forest industries including paper mills, furniture factories, plywood factories, sports goods manufacturing units.

The coverage of CMI is restricted to the units which are registered under Factories Act 1934. Thus small scale units and un-registered units are excluded. One of the limitations of the data is that production is not given in quantitative units. Only value of the production is reported in money terms. It however gives the number of units in operation. Usually CMI is conducted every 5 years. The latest available CMI relates to year 1983-84.

In addition, the FBS also conducts a periodic survey of small and household industries. This survey covers the small and household wood-based industries. The main objective is to collect statistics on value-added and employment in these industries. The output is not given in quantitative units; only its value is reported along with the number of units in production. It is not possible to ascertain production capacity and actual production of the industries from the survey data. Also the survey is limited to urban areas only. The latest survey of small and house hold industries relates to year 1983-84.

The organization of forest statistics is summarized in Table 1.

3.5 Fuelwood and charcoal

The Annual Administration Report gives the figures on fuelwood production is the main source of statistics on fuelwood production in state-controlled forests. However, it is widely believed that in addition to recorded production, a lot of un-recorded production also takes place in the state-controlled forests which usually goes un-reported. The people living around forests have rights of fuelwood collection from the forest and collect a sizeable quantity of fuelwood to meet their needs. In addition illicit removal of fuelwood also takes place. No statistics are available on the un-recorded production of fuelwood.

However the bulk of fuelwood consumed in the country is produced not in the forests but on private farmlands and waste lands. It is estimated that 90% of total fuelwood supplies come from this source. No agency collects statistics on fuelwood production from the approximately 4 million farms in the country occupying about 20 million ha of land area. To collect data on fuelwood removals from farmlands is a well- nigh impossible task.

3.6 Fuelwood consumption surveys

In view of the great importance of fuelwood in providing for domestic energy needs for cooking and heating, special surveys have been conducted in the past to collect statistics on fuelwood consumption by different agencies.

i. Fuel consumption survey 1974-75
This survey was conducted in 1974-75 by a consultancy firm under the patronage of the Directorate General of New and Renewable Energy Resources, Govt. of Pakistan. The survey was quite comprehensive and some 8000 households, commercial and industrial establishments were included in the sample. Detailed data on the consumption of various types of fuels in domestic commercial and industrial

TABLE 1
Organization of forestry statistics

	Product/item	Agency	Frequency	Remarks/Scope
1.	Sawlogs & veneer logs output (State Forests)	Provincial Forest Departments	Annual	Coverage limited to recorded Production
2.	Fuelwood output (State Forests)	Provincial Forest Departments.	Annual	"
3.	Minor Forest Products output (Resin, Mazri & Ephedra)	Provincial Forest Departments	Annual	"
4.	Sawlogs & Veneer logs output from farm lands.	Nil	—	Estimated
5.	Fuelwood output from farm lands	Nil	—	Estimated
6.	Timber & firewood prices	Federal Bureau of Statistics.	Monthly	Several Species & several markets.
7.	Foreign trade Statistics	Federal Bureau of Statistics	Monthly	All forest products
8.	Output of Paper and board	Provincial Bureau of Statistics.	Monthly	Data reliable
9.	Output of plywood and fibre board	Pakistan Forest Institute	Annual	—
10.	Output of Sawn wood	—	—	Estimated
11.	Output of Charcoal	—	—	Estimated

sector was collected. The survey revealed that 10,945 thousand tonnes of fuelwood was consumed in the country. Of this total 10,494 thousand tonnes (96%) was consumed by the domestic sector, 361 thousand tonnes (3.3%) by commercial sector and the remaining 90 thousand tonnes (0.8%) by the industrial sector. The per capita consumption of firewood worked out to be 148 kg.

ii. World Bank Survey 1977-78

The World Bank conducted a survey of the forestry sector of Pakistan in 1977-78 which also made estimates of fuelwood consumption in the country. It did not carry out any sample survey to determine the per capita consumption of fuelwood but based its estimates on per capita consumption figures of other countries having conditions similar to Pakistan. It estimated per capita consumption of fuelwood at 0.2 cu.m. which corresponds to 150 kg (one cu.m.= c.750 kg). This figure has been used extensively for estimation of fuelwood consumption in the country.

The data supplied to FAO is also based on this figure.

iii. Fuel consumption survey, 1983-84

This survey was conducted on a country-wide basis and was properly stratified. It was conducted under the patronage of DGNRER. It mainly focused on fuel consumption patterns in the domestic sector. The survey revealed that there is great disparity in per capita consumption of fuelwood in different climatic zones. The average per capita consumption of fuelwood in different zones is shown in Table 2. This survey has reported a higher per capita consumption than the earlier survey. As it was properly stratified, this figure seems to be more reliable.

TABLE 2

Fuelwood consumption by climatic zone

Zone	Per capita fuelwood consumption (kg)
i. Irrigated plains (Urban)	114
ii. Irrigated plains (Rural)	143
iii. Sub-mountainous areas	148
iv. Hilly areas	448
v. All areas	206

3.7 Publications

The following publications give the findings of the surveys mentioned above.

i) Pakistan Forestry Sector Survey (1978)-World Bank Staff Working Paper No.284.

ii) Energy Yearbook 1985
Directorate General of Energy Resources, Ministry of Petroleum and Natural Resources, Govt. of Pakistan, Islamabad.

3.8 Charcoal

No data are collected on charcoal production. However, per capita consumption of charcoal is estimated at 0.6 kg per annum.

4. NON-WOOD PRODUCTS

The forests of Pakistan besides supplying timber and firewood also supply considerable quantities of non-wood products generally termed " minor forest products". These include resin, lac, mazri, medicinal plants and mushrooms. Statistical information on their production is collected either regularly, as in the case of resin and mazri or periodically in case of all other products.

4.1 Resin

Resin is obtained by tapping chir pine trees. The data on resin extraction is collected regularly on annual basis from the Annual Administration Reports. The data are fairly reliable. The extraction of resin during the last 5 years is given in Table 3.

TABLE 3

Resin production 1984-89

Year	Unit	NWFP	Punjab	Total
1984-85	Tonnes	1 200	1 320	2 520
1985-86	Tonnes	1 000	1 318	2 308
1986-87	Tonnes	1 000	1 669	2 659
1987-88	Tonnes	1 500	604	2 104
1988-89	Tonnes	1 500	–	1 500

4.2 Mazri

Nannorrhops ritchieana, locally known as mazri, is a dwarf palm. Its leaves are used to make ropes, hand fans, sandals, baskets and brushes. Leaves are collected by local population on payment of a royalty to the Forest Department. The production of mazri leaves is reported regularly in the Annual Ad-

ministration Report. The data for last 5 years is given in Table 4.

TABLE 4
Mazri production 1984-89

Year	Unit	Balochistan	NWFP	Total
1984-85	Tonnes	30 320	1 870	32 190
1985-86	Tonnes	15 889	1 900	17 789
1986-87	Tonnes	14 350	1 900	16 250
1987-88	Tonnes	37 768	1 900	39 668
1988-89	Tonnes	35 603	1 900	37 503

4.3 Medicinal Plants
A considerable quantity of medicinal plants is collected annually from the forests of Pakistan by the local population. These plants are used to make drugs for the indigenous system of medicine. There are about 320 species of medicinal plants growing in different climatic zones of Pakistan. Of these only a few are exploited commercially. Data on Ephedra which is used in production of Ephedrine is reported regularly. Its production in 1988-89 was about 812 tonnes. For the rest only estimates are available. According to one estimate, 1640 tonnes of different plants such as Artemisia martina , Berberis lycius, Dioscorea deltoidea, Paconia emodi and Rheum emodi are collected annually.

4.4 Honey
Another non-wood product obtained from forests is honey. No statistical information is collected on honey. According to one estimate about 137-175 tonnes of honey are collected annually.

4.5 Mushrooms
A variety of edible mushrooms are found naturally growing in the forests of Pakistan. However, only the black mushrooms (Morchella spp) are collected. The annual estimated collection is 50,000 kg.

4.6 Wild fruits and nuts
A large variety of edible and non-edible fruits is collected from forests. The annual collection is estimated around 100-200 tonnes.

4.7 Gum
Acacia arabica trees exude gum which is used in sizing of paper, preparation of paints and varnishes, drugs etc. Its annual collection is estimated around 2000 kg.

4.8 Publications
The only publication available is the report on minor forest products prepared by M.I. Sheikh for FAO. Surveys on non-wood forest products are shown in Appendix 2.

5. MODERN SECTOR PRODUCTS

The forest industry is still in a nascent stage in Pakistan. Information on forest industries is mainly collected by the Federal Bureau of Statistics through its Census of Manufacturing Industries and Survey of Household and Small Scale Industries. The review of data collection on modern sector products is given below.

5.1 Industrial roundwood
The industrial round wood production takes place both on state controlled forests and private farmlands. Reasonably good statistics are collected annually on production from forests and reported in the Annual Administration Reports of Forest Departments. However no information is available about industrial wood production taking place on private farmlands and only estimates are available.

5.2 Sawn wood
About 7,000 small sawing units are in operation in the country producing a considerable amount of wood. However, there is no agency responsible for collection of statistics on production of sawn wood. The survey of small and household industries conducted by the Federal Bureau of Statistics gives the number of sawing units but does not report data on sawnwood production.

5.3 Plywood
There are 17 plywood factories working in the country and data on the plywood industry is collected by the Census of Manufacturing Industries. The Pakistan Forest Institute collects data on production from the manufacturing units directly.

5.4 Particle Board
About 12 plants are engaged in production of particle board. The Federal Bureau of Statistics collects fairly reliable data on particleboard production annually.

5.5 Fibreboard

There are 3 units engaged in fibreboard manufacturing and data on production are collected directly by Pakistan Forest Institute from the manufacturing units.

5.6 Pulp and paper

23 units are engaged in paper and paperboard production. The data on production is collected by the Federal Bureau of Statistics. There is a discrepancy in the data reported by Federal Bureau of Statistics and the Provincial Bureau of Statistics. Some of the units do not report data to the Federal Bureau of Statistics.

The review of collection of statistics on each of the product is attached on the prescribed proforma.

6. TRADE STATISTICS

Pakistan imports wood and wood products in considerable quantities to meet its growing demand for forest products. She also exports a small quantity of wood manufactures especially wooden furniture articles and sports goods.

The data on imports and exports are collected by the Federal Bureau of Statistics and are compiled on a monthly, quarterly and annual basis. The data is published in "Foreign Trade Statistics" which is available from the Federal Bureau of Statistics office at Karachi (Pakistan).

Table 5 shows the quantities and values of major items of imports and exports of forest products in 1988-89. It also indicates the major trading partners.

6.1 International coding systems

The Pakistan Standard Trade classification is an adaptation of UN Standard Trade classification. Since 1981 PSTC R2 has been in vogue.

6.2 Measurement Units

The following are the measurement units.

Product	Unit
Industrial roundwood	cu.m.
Logs	cu.m.
Pulpwood	tonne
Chips	tonne
Sawn wood	cu.m.
Plywood	tonne
Pulp	tonne
Paper	tonne

TABLE 5

Imports and exports of forest products 1988-89

Imports

Item	Unit	Qty	Value (Million Rs.)	Major Trading Partners
A. Timber round & Sawn	cu.m.	157 644	162.6	
i. Sawlogs and Veneer logs conifer	„	1 456	1.8	Burma, Singapore, Malaysia
ii. Sawlogs and Veneer logs non-conifer	„	31 537	34.3	
iii. Railway sleepers	„	459	0.5	
iv. Timber Sawn planed Conifer	„	933	1.0	
v. Timber Sawn planed non-conifer	„	121 020	321.4	
vi. Pulp wood including wood waste	„	544	1.9	
vii. Poles, pilings, posts	„	1 695	3.7	
B. Wood manufactures	tonnes	1 509	30.1	
i. Veneer sheets	„	641	12.7	Malaysia, Indonesia
ii. Plywood	„	159	1.6	
iii. Manufactures of wood n.e.s.	„	356	7.8	
C. Pulp and Paper	„	321 396	3055.6	
i. Pulp including waste paper	„	58 859	383.0	European countries Brazil
ii. Newsprint paper	„	52 690	625.8	
iii. Other printing & writing paper	„	44 824	748.4	
iv. Kraft paper & paper board	„	115 541	449.1	
v. Other paper and paper board	„	41 962	635.2	
vi. Fibre board including building board	„	1 429	11.3	
vii. Articles made of pulp, paper and paper board	„	6 091	202.9	
D. Miscellaneous	„	3 866	35.9	
i. Resins	„	746	17.3	Asian countries, Netherlands.
ii. Cork raw & waste	„	104	1.7	Portugal
iii. Cork manufactures	„	174	5.8	Portugal
iv. Bamboos	„	2 308	6.4	Bangladesh, Singapore
v. Canes & rattan	„	454	4.7	Malaysia, Singapore.
Grand total	—	—	3284.2	

Exports

Item	Value
i. Veneer, plywood, board improved or re-constituted wood and other wood worked	1.6
ii. Wood manufactures	11.7
iii. Paper and Paperboard	4.3
iv. Articles made of pulp, paper and paper board	9.2
v. Sports goods (wood based)	359.8
vi. Furniture articles	13.4
Total	400.0

6.3 Coverage
The detail of coverage is as follows.

Product		Sub divisions	Species detail	Trading partners
Sawlogs, Veneer logs	i.	Conifer	Deodar, fir, Spruce	—
	ii.	Non-conifer	Teak, Gurjan	Burma, Malaysia, Singapore.
Sawnwood	i.	Conifer		
	ii.	Non-conifer		
Plywood		Plywood sheets of wood	—	Malaysia, Indonesia
Pulpwood	i.	In round	—	—
	ii.	In chips		
Pulp	i.	Mechanical	—	Brazil, Sweden
	ii.	Chemical	—	USA, Canada
	iii.	Semi chemical	—	
	iv.	Other than wood	—	
Paper	i.	Newsprint		Australia, Brazil
	ii.	Other printing & writing paper		Canada, China, Sweden & other
	iii.	Kraft paper		European countries.
	iv.	Other paper		

7. FOREST PRODUCT PRICE STATISTICS

The forests of Pakistan produce a number of products including timber, firewood, resin, medicinal plants and many other goods. The movements in their prices affect the revenue of the forest departments on the one hand and the consumers budgets on the other. The relevant forest product price statistics are the stumpage, wholesale and retail prices of these products. The consumers are also affected by price movements in forest industries products such as plywood, sawnwood, particleboard fibreboard. Market and ex-mill prices of paper are also important as they have implications for consumers' welfare.

The price statistics of forest products are mainly collected by the Federal Bureau of Statistics and the Pakistan Forest Institute. The currently available price series are the following.

- Wholesale prices of various species of timber at Karachi market.
- Wholesale prices of Coniferous timber at Havalian market.
- Auction prices of shisham and mulberry logs by quality classes at changa Manga sale depot.
- Whole sale prices of fuelwood in various cities.
- Auction prices of fuelwood of shisham and mulberry by quality classes at Changa Manga sale depot.
- Retail prices of fuelwood and charcoal in various markets.
- Wholesale price index of timber.
- Wholesale price index of fuelwood.
- Retail prices of plywood, particleboard and hardboard at Peshawar market.

These data are being collected on annual basis. The Federal Bureau of Statistics publishes the data in its annual publication "Pakistan Statistical Year Book". The PFI publishes the data in its publication "State of Forestry in Pakistan".

8. USE OF COMPUTERS

In recent years, the use of Computers in Pakistan has multiplied rapidly. The Pakistan Forest Institute, Peshawar has set up its own computer laboratory. It is equipped with 6 computers. These are all IBM computers. The PFI Computer Laboratory has access to most of the main software packages such as LOTUS, DBASE, SAS, WORDSTAR and WORDPERFECT.

9. SUMMARY AND CONCLUSIONS

9.1 Problems

The organization of Forest Statistics in Pakistan is not up to the mark. A number of problems and constraints afflict this sector.

i. Lack of infrastructure for collection of data on timber and firewood production from farmlands.
ii. Lack of an agency for collection of data on sawn wood production and output of small and

household industries working in the un-organized sector.
iii. Lack of co-ordination among various data collecting agencies.
iv. Lack of cooperation from wood-based industries in furnishing the requisite data.
v. Lack of inventory data on forest resources.
vi. Lack of data on fuelwood and charcoal production and consumption.

9.2 Priorities
i. Collection of data on timber and firewood production from farmlands on regular basis.
ii. Collection of data on timber consumption in various end-uses through periodic surveys.
iii. Collection of forest resource data.
iv. Collection of data on fuelwood and charcoal consumption in various sectors.

9.3 Recommendations for action
i. Creation of infrastructure for collection of data on wood production from farmlands.
ii. Conduct of a forest resource inventory.
iii. Strengthening of statistical services at provincial and federal levels.

Appendix 1
Surveys on fuelwood and charcoal

Name and date of Survey publication reference	Authority carrying out survey	Coverage	Remarks
		(Geographical districts Household/industry Fuelwood/charcoal/both)	(Frequency Measurement units)
1. Fuelwood consumption Survey, 1974-75. Energy Yearbook, 1978	Directorate General of New and Renewable Energy Resources	Whole of Pakistan; Households, Commercial & Industrial establishments; both fuelwood and Charcoal	Fuelwood Consumption 148 kg/capita Charcoal consumption 0.6 kg/capita
2. Forestry Sector Survey of Pakistan 1978. World Bank Staff Working Paper No. 284.	World Bank	Estimates of fuelwood consumption in households	Per capita consumption of firewood: 0.2 cu.m.
3. Fuel Consumption Pattern Survey in household Sector, 1983-84 Energy yearbook, 1985.	Directorate General of New and Renewable Energy Resources	Properly Stratified sample covering whole of the country; only household Sector; fuelwood	Per capita consumption of firewood: 206 kg.

Appendix 2
Surveys on forest products other than wood (Non-wood forest products)

Product	Estimated quantity	Survey Name and Date	Coverage – by product – geographical	Publication reference
Resin	1988-89 1500 tonnes	Data collected from Annual Administration Reports of Provincial Forest Departments	All provinces	State of Forestry in Pakistan
Mazri	1988-89 37 503 tonnes	"	"	"
Ephedra	1988-89 800 tonnes	"	"	"
Wild fruits and nuts	100-200 tonnes	Report on minor forest produce	"	Report on minor forest produce prepared by M.I.Sheikh for FAO.

Appendix 3
Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD
DEFINITION: Timber including saw logs
MEASUREMENT UNITS: Cubic metre
METHOD OF SURVEY & COVERAGE: Data on production collected from Annual Administration Reports of the Provincial Forest Departments. For private farmlands estimates are made.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Pakistan Forest Institute, Peshawar.
PUBLICATION: State of Forestry in Pakistan.

PRODUCT: SAWNWOOD
DEFINITION: Sawn wood
MEASUREMENT UNITS: Cubic metre
METHOD OF SURVEY & COVERAGE: No survey is carried out. Only estimates are made.
FREQUENCY: —
OFFICE RESPONSIBLE: —
PUBLICATION: —

PRODUCT: PLYWOOD
DEFINITION: Plywood, block board
MEASUREMENT UNITS: Square metres
METHOD OF SURVEY & COVERAGE: Data collected from the operating units directly through questionnaire.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Pakistan Forest Institute, Peshawar.
PUBLICATION: State of Forestry in Pakistan.

PRODUCT: PARTICLE BOARD
DEFINITION: Chip board
MEASUREMENT UNITS: Tonnes
METHOD OF SURVEY & COVERAGE: Data collected directly from the operating units through questionnaire.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Federal Bureau of Statistics
PUBLICATION: Pakistan Statistical Year book.

PRODUCT: FIBREBOARD
DEFINITION: Soft and hard board
MEASUREMENT UNITS: Tonnes
METHOD OF SURVEY & COVERAGE: Data on production collected directly from the manufacturing units.
FREQUENCY: Annual
OFFICE RESPONSIBLE: Pakistan Forest Institute, Peshawar
PUBLICATION: -

PRODUCT: PULP AND PAPER
DEFINITION: Writing, printing and wrapping paper
MEASUREMENT UNITS: Tonnes
METHOD OF SURVEY & COVERAGE: Data are collected by the Provincial Bureau of Statistics from the manufacturing units through a questionnaire on production and employment.
FREQUENCY: Monthly
OFFICE RESPONSIBLE: Provincial Bureau of Statistics of each province.
PUBLICATION: Monthly Survey of Industrial Production and Employment.

PRODUCT: PAPER AND PAPERBOARD
DEFINITION: Writing, printing and wrapping paper packaging board.
MEASUREMENT UNITS: Tonnes
METHOD OF SURVEY & COVERAGE: The Provincial Bureau of Statistics of each province collect data from the manufacturing units working in the province through a questionnaire. The data is collected on production and employment.
FREQUENCY: Monthly
OFFICE RESPONSIBLE: Provincial Bureau of Statistics of each province.
PUBLICATION: Monthly Survey of Industrial Production and employment.

Papua New Guinea

Kini Karawa

1. INTRODUCTION

Papua New Guinea occupies the eastern half of the island of New Guinea, as well as three other major islands (New Ireland, New Britain and Bougainville) and various smaller islands.

The country has a population of over 3.5 million of which 87% live in rural areas and the other 13% in developing urban centres. This distribution is reflected in the limited demand for industrial processed timber as the majority of the population satisfies their requirements by direct extraction from the forests.

The country is divided into 19 provinces each with their provincial government and departments administering all activities in the province in consultation with the national government. This includes forestry and the timber industry.

The country has a total land area of 46 million hectares, of which 36 million hectares is considered closed forest area. The lowland rain forest (under 1,000 metres altitude) comprises approximately half the forest cover and constitutes the major forest resource.

With considerable forest resources per capita, there is a relatively small domestic market and a heavy reliance on the export of forest produce for national growth and revenue in the forest industry sector.

2. PNG FOREST INDUSTRY

Over the years, the forest sector has increasingly become one of the leading sectors in the country, providing employment to a growing workforce, education and training, infrastructural development, an important source of income in rural areas and a major foreign exchange earner.

The timber industry is made up of about 36 log exporters, 71 sawmills, 1 plywood mill and 1 woodchip mill. The wood processing industry is composed of 98 factories (including sawmills, furniture factories, joineries, etc.)

The sector employs over 5,000 people with a total capital investment of some US$ 12.8 million. In 1989, total royalties collected from all these operations amounted to 5.7 million kina (c.US$ 6.6 million).

The forest industry in 1989 earned about US$ 78 million in export of forest products, which is approximately 9% of total national export earnings. The major items of export are round logs, sawn timber and wood chips. Other minor products exported were ebony flitches and rattan cane. The major export markets are Japan, South Korea, Taiwan, Australia and New Zealand. The government earned about 8 million kina (US$ 9 million) in export duty from log exports in 1989.

On the domestic front, the industry assists in making significant savings on imports of building materials. It is estimated that 100,000 cubic metres of sawn timber and 10,000 cubic metres of plywood were used locally in 1989.

3. FORESTRY STATISTICS

Statistics are most essential to any organisation for sound policy formulation and both short-and long-term strategic planning and decision making. The National Department of Forests, which is responsible for forest management, basically requires four types of statistical data on forestry and forest industries. These are:

i. Forest Resource Inventory Data
ii. Production
iii. Trade
iv. Industrial

The first three data types are collected by the National Department of Forests in collaboration with the provincial departments through the Provincial Forests Offices. The fourth data type, on industrial statistics covering employment, wages, earnings, construction activities, investment and establishment is sought from the National Statistics Office.

3.1 Forest resource inventory data

This data type is very important for the country as a whole and for each province's assessment of what resources are available for development. In brief, Provincial Governments, assisted by the National Government, carry out resource surveys of potential forest areas. After the surveys, a resource assessment

is made and the rights to harvesting the timber of potential forest areas is purchased by the National Government, after which potential investors are invited to submit proposals to the government for the development of the area.

3.2 Production data

Information on the production of forest products covers logs, sawn timber, woodchips and plywood.

All logging companies operating in the country record their log harvests on "Log Classification and Measurement Forms" which give details of the measured data, log number, species, species classification, length (metres), centre diameter (metres), gross volume and defects. This information is sent to the Provincial Forest Office where the royalty payments are assessed and the company debited. The log harvest figures are used to monitor logging companies' log harvest quota.

Sawntimber, plywood and woodchip production figures are collected by the Department of Forests. This information is received regularly through a circular instruction to companies and Provincial Forest Offices. Data on sawntimber production is not always complete as some small operators do not keep records of their production and operate on an occasional basis.

Further-processed timber, such as mouldings, window frames and floor boards, are classifies as sawntimber. Data on production of minor forest products such as joinery and furniture components are very irregular as the industry is small and the data collection system is not yet properly established.

3.3 Trade data

Trade statistics covering exports, imports and domestic consumption are collected by the Department of Forests.

i. Export statistics are collected for sawntimber, plywood, woodchips and other minor products such as sandalwood, flitches and rattan cane. The information covers exporters, product and species, grades, volumes, FOB value, price per unit, destination and date of shipment.
   For logs it is a requirement that all log exporters, after each shipment, submit to the department a full set of their shipping documents comprising:
   - Summary of Forest Produce for Export
   - Log Tally
   - Bill of Lading
   - Time Sheet
   - Commercial Invoice
   - Export Entry Forms
ii. Import statistics on timber related products are collected through the National Statistical Bulletins put out by the National Statistical Office. The major items covered are paper and paperboard, plywood, veneer panels and block boards, mouldings and wood manufactures. The data received are mainly on the items, value and country of origin.
iii. Domestic data on timber and timber product consumption (excluding imported products) covering volume (cu.m.), value (in kina) and price per cu.m. are collected. However the system of information collection is not yet very effective. Items covered in this area are rough and dressed sawntimber, plywood, mouldings, furniture, furniture components, prefabricated housing and firewood.
   At present, data in this area has been estimated. Attempts to request the industry to provide information have not been successful and not all companies keep records of their sales.

4. EXISTING ORGANISATION AND PROCEDURE

Since the decentralisation of government in 1978, forestry and timber operations have become the responsibility of Provincial Governments. The Provincial Forest Officer in each province is responsible for nearly all forestry statistics, in close liaison with the National Office of Forests.

All timber companies are requested to send relevant data, on a monthly basis, to the Provincial Forest Officer who then forwards copies to the Department of Forests. In the case of log export information, companies are also requested to submit copies of their log shipping documents to the Department as these are required for timely export market evaluation and monitoring.

Information covering production, export and domestic sales of all forest products are received by this means. These statistics from the timber companies and Provincial Forest Offices are received through requests from the Department of Forests by circulars, memorandums and through using companies' and Provincial Forest Offices' reports.

The Bureau of Customs, Department of Finance,

assists in having their Provincial Customs Offices submit export entry forms to the Department of Forests for all forest products exported from the province. The export entry forms are filled in by all exporters, giving details on the shipper, port of shipment, product, volume and value, date of shipment and destination.

Another major source of statistics is through the National Statistical Office (NSO) which is the government organisation responsible for the nation's statistical collection. All other government departments and statutory authorities provide information to this office constantly. This is tabulated and published and all information concerning import of timber-related products, industry employment, wage and construction activities are received through NSO's quarterly and yearly statistical supplements.

5. TABULATION AND DISSEMINATION

All information received from the timber companies and Provincial Forest Offices, National Statistical Office and other government departments are collated, published and disseminated by the Department of Forests through its various publications.

Production information and other statistical information on the forests and forest industry are collated and published in the "Compendium of Statistics". This publication presents statistical information, including the following:

- forestry land and timber rights purchases
- timber permits and licences
- log harvest and royalties
- exports and imports of forest products
- processing plants
- forest plantations
- staffing and training of the Department of Forests.

This publication is distributed free to all government departments and statutory bodies in the country, to PNG embassies abroad and to international organisations such as UNDP, FAO and CFTC.

"Facts and Figures", a general introductory booklet on forestry and the timber industry sector is also put out by the Department of Forests yearly. This publication aims mainly to acquaint potential investors and others with forestry and developments in the forest industry. It briefly covers:

- forest policy
- forest resources
- major potential forest development areas
- forest products and their uses
- the timber industry
- major existing operations
- forest legislation
- export legislation and minimum export price control
- investment guidelines
- the structure of the Forest Ministry and contact addresses of those concerned with forestry and the timber industry.

Export statistics covering all forest products exported are collated, analyzed and published on a monthly basis in the "Timber Digest". This publication presents progressive data on a monthly and cumulative basis on the volume, FOB value, price per cu.m. and destination. For comparative purposes, figures for the previous year and cumulative period is also given. For log and sawntimber exports, the exporters are also mentioned.

Appendix 1

Modern Sector Products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Logs in round form with bark after trimming and docking.

MEASUREMENT UNITS: Cubic metres (Brereton scaling)

METHOD OF SURVEY & COVERAGE: Data collected from company returns completed on FD66 forms and submitted to Provincial Forests Offices.

FREQUENCY: Monthly returns

OFFICE RESPONSIBLE: Provincial Forests Offices

PUBLICATION: -

PRODUCT: SAWNWOOD

DEFINITION: Sawntimber, mouldings.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Circular to companies and Provincial Forests Offices.

FREQUENCY: Yearly.

OFFICE RESPONSIBLE: Forest Headquarters, Provincial Forests Offices.

PUBLICATION: -

PRODUCT: PLYWOOD

DEFINITION: Venner sheets glued together for interior and outdoor. 5mm, 10mm, 15mm and 36mm thicknesses.

MEASUREMENT UNITS: Square metres.

METHOD OF SURVEY & COVERAGE: Monthly reports from plywood manufacturers.

FREQUENCY: Monthly.

OFFICE RESPONSIBLE: Forest Headquarters, Provincial Forests Offices.

PUBLICATION: Timber Digest.

Philippines

Dolores R.Catindig

1. INTRODUCTION

Forest sector in the Philippines has played an important role in the socio-economic development of the country through the years through the income it generates and the employment opportunities it provides to the people. The forest is the source of raw materials for wood processing industries, fuelwood for the people, habitat for wildlife and a host of other beneficial uses.

1.1 Forest resources

As of 1989, forest lands comprised about 15.88 million hectares or 53% of the total land area of the country. Out of these forest lands, 15 million hectares have been classified as permanent forests which are further categorised into the categories shown in Table 1.

TABLE 1

Use categories and areas of permanent forest

Category	Area ('000 hectares)	%
– Established forest reserve	3.270	21.80
– Established timberland	10.020	66.80
– National Parks, Game Refuges, Bird Sanctuaries and Wilderness Areas	1.340	8.90
– Military reservation	0	0
– Civil reservation	0.165	1.10
– Fishponds	0.075	0.50
Total	15.000	100.00

Forest areas are estimated to cover 6.31 million hectares of which 4.51 million hectares are considered commercial, composed of dipterocarp and pine forest. Dipterocarp forest totals 4.27 million hectares of which 0.922 million hectares or 22% are old growth (virgin) forest and 3.35 million hectares or 78% are residual forests. Pine forests add up to 0.238 million hectares. Timber volume in commercial forests is estimated to be 719 million cubic metres.

1.2 Forest industries

From being a raw material export-oriented industry in the 60's and 70's, the wood industry has gradually shifted its focus towards catering to the domestic market. This is primarily because of recent policies adopted by the government to conserve the remaining forest.

In 1989, there were 113 timber licensees covering an aggregate area of 4.6 million hectares with an annual allowable cut of 6.6 million cubic metres, producing a total of 3.1 million cubic metres of logs. The 171 sawmills in the country had a total daily rated capacity of 8,311 cubic metres and annual lumber production reached 0.975 million cubic metres. There were 48 plywood mills and 17 veneer plants with daily rated capacities of 7,188 and 687 cubic metres respectively and a combined annual production of 0.405 million cubic metres. 0.181 million cubic metres or 45% of this were exported. The traditional processed wood products produced by these plants (lumber, veneer and plywood) generated foreign exchange earnings amounting to US$ 198 million in 1989.

Apart from these major wood processing plants there were 26 wood-based panel plants producing particleboard, fibreboard and blockboard. Smaller quantities of wood-based commodities such as panel boards, furniture, builder's woodworks, handicrafts and other secondary and tertiary wood processed products were also exported. It is envisaged that exports of non-traditional commodities with high value-added will be developed as part of a strategy to rationalise wood-based industries.

1.3 Forest management

Reforestation efforts are vigorously pursued as part of the development programme of the forestry sector. Under this programme some 1.4 million hectares of open and denuded areas will be reforested between 1987 and 2000. It is hoped that, in the next few years, the country will have a sufficient supply of wood for its domestic requirements and, at the same time, enough to cater to export markets for

the foreign exchange needed to boost the country's development programme.

2. FOREST SECTOR STATISTICS

The magnitude and contribution of the forestry sector to the Philippine economy cannot be ignored. Therefore careful planning is necessary to achieve the overall development objectives of the sector. Statistics play a vital role in providing a sound basis for the formulation of forestry plans and policies.

The Forest Management Bureau (FMB) of the Department of Environment and Natural Resources (DENR) compiles information on forestry which is published annually in the Philippine Forestry Statistics Yearbook. This statistical information is categorized into 5 groups.

2.1 Forest resources

Information on forest resources (area and volume) are based on the results of the Second National Forestry Resources Inventory Project of the DENR which was concluded in 1988.

2.2. Forest products utilization

Production and forest industry statistics are obtained from periodic reports of all forest licensees obtained through the administrative and regulatory functions of the DENR.

2.3 Trade

Trade and price data are obtained from the National Statistics Office (NSO) where import and export data are compiled from recorded trade transactions. Price data are based on a monthly survey which the NSO regularly conducts within Metro Manila. To get wider coverage, the FMB has started, since January, 1990, a price monitoring survey on forest products in the 14 regions of the country.

2.4 Revenue derived from forests

Revenues (forest charges) are based on monthly reports and, where reports are not available, estimates of the volume of timber cut and the prevailing rates of forest charges per cubic metre.

2.5 Other forestry-related statistics.

Other forestry related information like the gross value-added in forestry, the contribution of forestry to GNP, etc. are obtained from the National Statistical Coordination Board.

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood and charcoal

Statistics on fuelwood and charcoal are based on reports submitted by licensees and are published in the Philippine Forestry Statistics Yearbook. Published production however is incomplete as it omits fuelwood cut by unlicensed gatherers and no estimates have been made in the absence of any reliable basis.

However, a World Bank assisted survey on household fuelwood and charcoal consumption covering Metro Manila and another 6 provinces was recently conducted by the Office of Energy Affairs. Survey results are currently being processed and final results should be available by the end of 1990. These results can be used in the future as a basis for estimating future consumption and supply of fuelwood and charcoal.

The FMB and the National Statistics Office are presently preparing a survey on the consumption of fuelwood and charcoal in the industrial sector which will include bakeries, tobacco flue-curing plants, sugar centrals and other identified fuelwood-using plants. The actual survey is expected to start in 1991.

3.2 Forest produces other than wood

Statistics on the production and export of important non-timber forest products such as rattan, almaciga resin, elemi and bamboo are also published in the Annual Forestry Yearbook covering the whole country. Production data are based on reports of licensees only and are thus incomplete. Once again, no estimates on total production have been made due to the lack of any reliable basis for such estimates. Export data, however, is available from the National Statistics Office.

The latest survey conducted on rattan and bamboo which was published in 1988. The survey was part of the Forest Resources Inventory Project (1979-88) jointly conducted by the Forest Management Bureau, the Department of Environment and Natural Resources and the German Government.

4. MODERN SECTOR PRODUCTS

Table 2 shows the number and capacity of processing mills in 1989.

TABLE 2
Wood processing mills

Type	Number	Rated capacity	
Sawmills (active)	171	8.311	cu.m./day
Plywood	48	7.188	cu.m./day
Particleboard	3	266	cu.m./day
Fibreboard	1	not available	
Pulp and paper			
– pulp mills	10	333	mt/year
– paper & paperboard mills	32	691	mt/year

5. TRADE

Trade statistics are obtained from the Foresign Trade Statistics of the National Statistics Office and are published in the Philippine Forestry Statistics Yearbook. These include import and export of forest products indicating the volume and traded by country of destination or origin. In Philippine trade statistics, commodities are classified in accordance with the 1977 Philippine Standard Commodity Classification. This classification scheme is basically patterned after the United Nations' Standard International Trade Classification Revised 2 (SITC Rev.2) and follows a coding scheme up to the sub-group level (4 digits). Modifications, however, have been made to meet local requirements.

5.1 Imports

i. Wood pulp

Imports of mechanical ground and chemical wood pulp has averaged 49.1 million kg. during the period 1980-89, with an estimated value of US$ 20.3 million. Mechanical wood pulp came mostly from Finland, Germany and New Zealand while chemical wood pulp was predominantly imported from New Zealand, Canada, U.S.A. and Swaziland.

ii. Paper and paperboard

Imports of paper, paperboard and paperboard products represented 47% of total imports of wood-based products value-wise during 1980-89 with an average volume of 69.4 million kg. worth US$ 39 million. The major importers were U.S.A., Japan, Finland, Germany, Sweden and Korea.

iii. Rattan

Rattan is fast becoming a major imported forest product due to diminishing local supply, From 1985-89, an average volume of 2.58 million kg. costing US$ 3.3 million were imported, mostly from Indonesia.

5.2 Exports

i. Logs

Until 1986, logs were one of the top ten exports from the Philippines. However, exports of logs from natural forests were banned in August, 1986 in order to conserve the remaining natural forests. Exports of logs from plantations are still permitted and these have been primarily of pulpwood over the last three years. From 1980-86, an average volume of 730,000 cu.m. per year of sawlogs and veneer logs were exported, valued at US$ 70.9 million. The dominant species (70% of the total) was white lauan and the largest buyers of logs were Japan, Taiwan, Korea and France.

Since the log export ban of 1986, exports have averaged only 163,000 cubic metres per year with a value of just US$ 7.7 million.

ii. Sawnwood (lumber)

The bulk of lumber exports from 1980-89 were of non-coniferous species, particularly red lauan, white lauan and apitong. An average of 587,000 cu.m. per year amounting to US$ 132.8 million were exported, mostly to the U.K., Spain, Japan, U.S.A., France and Japan. It is expected that lumber, like logs will cease to be a major export item due to the ban on lumber exports imposed during the latter part of 1989.

iii. Veneer and plywood

Over the last ten years, veneer and plywood constituted one of the largest value-added sectors of the Philippine timber industry. An average of 92,000 cu.m. per year of veneer with an estimated value of US$ 20.4 million were exported, mainly to the U.S.A., Japan and Australia. Plywood was mainly exported to U.S.A., the U.K., Hong Kong, Belgium and the Netherlands. The average volume of plywood exported 1980-89 was 256,000 cubic metres valued at US$ 72 million.

6. FOREST PRODUCT PRICES

Wholesale and retail domestic prices of forest products are obtained from the National Statistics Office and published in the Philippine Forestry Statistics Yearbook. Prices are available for a number of products such as logs, lumber, plywood, rattan and bamboo. These data are, however, based on a survey conducted only in Metro Manila.

The Forest Management Bureau has started to collect monthly provincial and regional price data of forest products. This monthly survey is being undertaken by field personnel and includes the prices of logs by species, lumber by species and grade, plywood and non-timber forest products such as rattan and bamboo.

Average export prices of forest products are also obtained from the National Statistics Office.

7. COMPUTERS

Micro-computers are mow widely used for the storage, access and processing of forestry statistics in the Central Office. The Statistics Unit has one IBM PC-AT compatible unit equipped with a 40 megabyte hard disk, 1.2 megabyte disk drive, 360 kilobyte disk drive and a math co-processor. Other units with similar features are used occasionally. In the field, computers are limited to regional and provincial offices.

Spreadsheets are the most widely utilized application software packages for storing and processing statistical data, including Lotus Rel.2.1 and Symphony Rel.2. Microstat is commonly used in making statistical analyses.

8. CONCLUSIONS AND RECOMMENDATIONS

The importance of statistics for sound planning and policy formulation is widely recognised. Though statistics on forestry are available, improvements are required in terms of collection and processing and filling in gaps in data.

Several technical problems face statistical activities in the forestry sector.

i. Lack of technical expertise in data collection and handling at field level.
ii. The time-lag of 2-3 months in the release of data due to late reports or high non-response rates in surveys. Follow-ups to increase the response rate cause long delays in data processing and release of survey results.
iii. Inadequate financial resources and logistical support in transport, communications and other facilities including computers hamper statistical activities.

The following are priority areas for development in forestry statistics:

i. Strengthening the monitoring system and coordination between the Central Office and the field units to ensure timely submission of reports.
ii. Development of an effective data validation system.
iii. Establishment of statistical units in field offices and training of personnel in data collection, statistical techniques and computer skills.
iv. Provision of computers to field units to facilitate data storage and processing.
v. Provision of adequate financial support for statistical activities especially in field offices.

Appendix 1

Modern Sector Products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Industrial roundwood – wood in its natural state as felled or otherwise harvested, with or without bark, round split, roughly squared or other forms (e.g.roots, stumps). It may also be impregnated (e.g.telegraph poles) or roughly shaped or pointed. It comprises wood obtained from the forests such as sawlog/veneer logs, pulpwood, poles and piles.

Sawlog/veneer logs – logs whether or not roughly squared to be sawn lengthwise for the manufacture of sawnwood.

Pulpwood – wood in the rough for pulp, particleboard or fibreboard.

MEASUREMENT UNITS: Cubic metre.

METHOD OF SURVEY & COVERAGE: Production of sawlogs/veneer logs, pulpwood, poles and piles are based on monthly reports from licensees and DENR field offices. Coverage includes all licensees throughout the country.

FREQUENCY: Monthly.

OFFICE RESPONSIBLE: Forest Management Bureau.

PUBLICATION: Philippines Forestry Statistics Yearbook.

PRODUCT: SAWNWOOD

DEFINITION: Solid wood not further manufactures other than sawing, resawing and passing lengthwise through the standard planing machine cross-cut to length.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Sawmills are required to submit monthly production reports. Data is based on these reports. Coverage is complete.

FREQUENCY: Data is presented by month and incorporated in the annual publication listed below.

OFFICE RESPONSIBLE: Forest Management Bureau.

PUBLICATION: Philippine Forestry Statistics Yearbook.

PRODUCT: PLYWOOD

DEFINITION: An assembled product made of layers of veneer held together by an adhesive, the chief characteristics if which is the alternate cross layers, distributing the longitudinal wood strength. It consists of three or more layers of veneer, firmly glued together with the grain direction of the middle layer at right angles to that of the two parallel outer layers.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Data are obtained from production reports of plywood plants or sometimes from special surveys conducted if reports are not received.

FREQUENCY: Monthly, incorporated in the annual publication.

OFFICE RESPONSIBLE: Forest Management Bureau.

PUBLICATION: Philippine Forestry Statistics Yearbook.

PRODUCT: FIBREBOARD

DEFINITION: A panel manufactured from fibres of wood or other lingo-cellulosic materials with the primary bond deriving from the felting of the fibres and their inherent adhesive properties. Additives may also be added to improve some properties of the product.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: The FMB/DENR has no controlover these plants. Data are obtained through special surveys involving those with timber concessions at the end of the year. Responses, however, are not complete.

FREQUENCY: Annually.

OFFICE RESPONSIBLE: Forest Management Bureau.

PUBLICATION: Philippine Forestry Statistics Yearbook.

PRODUCT: PARTICLE BOARD

DEFINITION: A sheet material manufactured from small pieces of wood or other ligno-cellulosic materials agglomerated by use of an organic binder together with one or more of the following agents: heat, pressure, humidity, etc.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: No production has been recorded since 1987. The FMB/DENR has no influence over the two identified plants. No other agency collects statistics on particle board.

FREQUENCY: -

OFFICE RESPONSIBLE: -

PUBLICATION: -

PRODUCT: PULP & PAPER

DEFINITION: Wood pulp – commodities included are mechanical and chemical wood pulp, bleached and unbleached.

Mechanical wood pulp – wood pulp obtained by grinding or milling into their fibres, coniferous or non-coniferous, rounds, quarters, billets, etc. or through refining chips.

Chemical wood pulp – included are sulphate (kraft) and sulphite wood pulp, bleached and unbleached.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: The FMB/DENR has no control over pulp and paper plants. Production data are obtained from the Pulp and Paper Manufacturers of the Philippines (PULPAPEL).

FREQUENCY: Annually.

OFFICE RESPONSIBLE: Pulp and Paper Manufacturers of the Philippines (PULPAPEL).

PUBLICATION: Annual production of paper and paperboard is included in the Philippine Forestry Statistics Yearbook.

PRODUCT: PAPER & PAPERBOARD

DEFINITION: Commodities included are newsprint, printing and writing paper, other paper and paperboard.

Newsprint – uncoated paper, unsized (or only slightly sized), containing at least 60% mechanical wood pulp, usually weighing not less than 40 g/sq.m. and generally not more than 60 g/sq.m. of the type used mainly for the printing of newspapers.

Printing and writing paper – paper except newsprint suitable for printing and business purposes, writing, sketching, drawing, etc. made from a variety of pulp blends and with various finishes. Included are paper used for books and magazines, stationery, onion skin, etc.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: Paper and paperboard production are compiled by the PULPAPEL based on the reports submitted to them by paper and paperboard plants.

FREQUENCY: Annually.

OFFICE RESPONSIBLE: Pulp and Paper Manufacturers of the Philippines (PULPAPEL).

PUBLICATION: Annual data is included in the Philippines Forestry Statistics Yearbook.

Solomon Islands

Chris Turnbull

1. INTRODUCTION

Some 90% of the Solomon Islands is forest covered. Of this, only 10% is considered to be commercial or productive forest. This unusually high non-productive area is due to the steep mountainous terrain and the widely dispersed distribution of the forests. The forestry sector reflects the overall economy in that there are two distinct components: a subsistence sector which depends on the forests for a wide range of products, and a commercial sector involved in the growing and harvesting of mostly timber for economic return. Forests also play an important role in the environment and ecological stability of the 992 islands that make up the Solomon Islands.

1.1 Subsistence activities

Forests are a vital part of the country's cultural heritage and contribute to the welfare and livelihood of some 85% of the population who live in rural areas. Housing materials, fuelwood, food, medicinal herbs and a host of other customary uses of forests contribute to the people's living standards and maintenance of the social fabric. There is little information available on subsistence forestry activities even though they provide an important contribution to the livelihood of the majority of the population.

1.2 Commercial activities

Forest industries play a significant role in the Solomon Island economy. Nine logging companies together with commercial and public sector reforestation operations employ 10% of the labour force. Exports of forest products (mostly as logs or sawn timber) have consistently been the second most important source of foreign exchange earnings (after fish), averaging between 20 and 30% over the last ten years. The contribution to government revenue from export duties and levies on log exports has averaged between 4 and 8% over the last five years.

2. FOREST SECTOR STATISTICS

The main body responsible for the collection of forest statistics is the Forestry Division of the Ministry of Natural Resources. Separate sections within the Division compile information on the natural forest, plantation forest resource and industry activities. In addition, The Customs and Excise Division of the Ministry of Housing and Government Services collects information on trade in forest products which is compiled by the Statistics Section of the Ministry of Finance and Economic Planning.

The resources of the Forestry Division are limited. The last comprehensive survey of the natural forest resource was carried out in the late 1960's. A new national forest survey is planned to commence later this year with Australian assistance. There is good information available on the extent and current status of plantation forests. Forest industry statistics still require further development. Information is derived mostly from monthly returns submitted by logging and sawmill licence holders. Some checking of data and data collection is carried out by the Division, but there is too much reliance placed on the accuracy and honesty of the reporting companies. Compilation and availability of statistics has recently been improved by the introduction of computer processing techniques to the Forestry Division.

Very few surveys have been carried out on the subsistence sector. Those that have been done are limited in coverage and have produced conflicting results. For example, there was more than a fivefold difference in fuelwood consumption per capita reported by two different surveys. There have been no surveys of forest products other than timber. Some resource data may be collected as part of the proposed national forest inventory and information is available on exports, though to date this includes only rattan cane.

3. INFORMAL SECTOR PRODUCTS

3.1 Fuelwood and charcoal

There have been only two surveys of energy consumption, both carried out for the Energy Division of the Ministry of Natural Resources. The major features of these surveys are summarised in Appendix 1. Both surveys covered only areas of particular interest; fuel deficient areas in 1983 and Honiara

(the capital) and a "typical" rural area in western Solomons in 1987. The findings of these surveys vary substantially. The results of the 1983 survey are suspect because, as admitted in the survey report, field teams were poorly trained and the survey format was complex and difficult to understand. The significance of such surveys for the forest sector is questionable. Most fuelwood used in rural areas is a by-product of land clearing for gardening. The collection of fuelwood does not therefore have a significant impact on the forest resource.

The findings of the 1987 Household Energy Consumption Survey have been used to revise FAO data. This estimate of per capita consumption is the best available, but the figures should be regarded as approximate.

3.2 Forest products other than wood

Rattan cane is the only forest product for which quantitative data is available. There are no estimates of the resource or of annual removals. The Customs and Excise Division collects information on exports of rattan can as a raw material and as processed furniture.

Interest is developing in the commercial potential for honey and nuts from the forest. As these industries develop, production data will become available.

The subsistence economy is a major user of non-wood forest products including building materials (leaves, posts, poles), food (animal and plant), medicines, etc. While these usages have been documented at various times there has been no quantitative survey carried out on either the availability or usage.

4. MODERN SECTOR PRODUCTS

Industrial production is comparatively well surveyed and documented. Data collection occurs automatically as a requirement of operating licences or as part of documentation for export. Perhaps the greatest weakness is in the ability of collecting organisations to monitor and control the quality of data received. Neither the Customs and Excise Division or the Forestry Division have adequate trained manpower to check the type and quality of exports or the accuracy and completeness or production data submitted by companies. In the case of many smaller owner-operated sawmills little training has been given on log and timber measurement procedures. A second drawback is that there have been no supplementary surveys carried out that could give a more complete picture of forest product utilisation. Examples are the extent of undeclared waste from logging operations and the amount of sawn timber produced that is of high enough quality to be sold. There are inevitably discrepancies between reported sawmill output and reported sales. To an extent this situation will be improved by a new project due to start early in 1991 aimed at strengthening the capacity of the Division to monitor and control logging and sawmill operations.

Logging and sawmilling are the only forest industries in the Solomons. A veneer mill was operating until 1981 but closed due to management and technical problems.

5. TRADE

All trade statistics are compiled by the Statistics Office of the Ministry of Finance and Economic Planning. A Trade Report is published annually which gives detailed information for imports and for the broad categories of exports (logs and sawn timber are the only forest products recognised). Log and timber exports are identified by volume, value and destination and imports by tariff code, volume, value and country of origin. A summary of exports and imports is given over the page. Major trading partners are given in Table 1.

TABLE 1

Major trading partners for imports and exports of forest products

Exports		
Type	Destination	% volume of trade
Logs	Japan	72
	South Korea	21
Sawn timber	Australia	29
	New Zealand	39
	United Kingdom	19
Imports		
	Origin	% volume of trade
	Australia	24
	New Zealand	48
	Hong Kong	19
	Singapore	6

TABLE 2
Forest product prices in SI$ & US$ per cu.m.

	1985		1986		1987		1988		1989	
	SB$	US$	SB$	US$	SB$	US$	SB$	US$	SB$	US$
Logs	71	45	80	42	125	63	132	62	150	63
Sawn timber										
– export	263	167	335	175	415	208	433	204	652	272
– domestic	230	146	242	126	272	136	376	178	474	198

National trade statistics use the SITC (Review 1) coding system. Since April, 1990 the HS system has been introduced for imports and will soon be adopted for exports.

Cubic metres are used for measurement of the modern forest products traded, namely industrial roundwood, logs, chips, sawnwood and plywood.

6. FOREST PRODUCT PRICES

Forest product prices are compiled by the Forestry Division of the Ministry of Natural Resources. Coverage includes log exports and sawn timber domestic and export sales. A summary of prices is published in the Division's Annual Report. Average prices only are published. Variation in price is more often attributed to the company and country of destination than species or grade of product.

A summary of prices for 1985 to 1989 is given in Table 2.

7. COMPUTERS

The Forestry Division has only been using computers for the compilation of industry statistics since the beginning of 1990. The Division has standardised with IBM-AT or compatible computers. Statistical data is compiled on a programme developed by the Division based on dBase III+ (by Ashton Tate) which provides a user-friendly interface for data entry and editing and production of standard Forestry Division report forms.

The Statistics Section of the Ministry of Finance and Economic Planning also used IBM-AT compatibles and has recently switched from dBase III+ to a programme developed in New Zealand to run on Paradox.

8. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Little quantitative information is available on the informal forestry sector despite the important contribution it makes to the rural economy and livelihood of a large proportion of the population.

The modern or industrial forest sector is relatively well studied. It is simple in structure and relatively small additional inputs could provide us with a comprehensive understanding of its operation. Several new developments within the Forestry Division will improve the quality, coverage and availability of modern sector statistics.

i. A new Policy, Planning and Evaluation Unit has been created within the Division that will be responsible for monitoring and recording of the sector and for the publishing and supply of information. This will be the first time that the responsibility for statistics has been allocated to a single unit headed by senior qualified staff.
ii. A timber control project is expected to commence early next year that will improve the Division's capability to monitor and control logging and sawmilling operations. The project should result in improved quality and coverage of industry statistics.
iii. A national forest inventory is due to start at the end of this year. As well as providing an up-to-date assessment of the type and quantity of forest resources the project will provide a means by which information can be regularly updated. The inventory will also be able to quantify the availability of non-timber forest products.

A major task for the Policy, Planning and Evaluation Unit will be to ensure that statistics are used effectively as a planning tool and do not merely represent a historical record of sector activity. To achieve this it is important that appropriate comparisons are made with the state of the forest sector and forest industry in other countries and that up-to-date market information is available. A major constraint in this task will be access to current information on prices and volumes of trade.

The new work to be carried out under the projects mentioned above will greatly improve the coverage and quality of forest statistics. These developments will fully utilise resources within the Division (particularly manpower) for the next two years. After this time, a further review should be made of forestry statistics to identify areas requiring further study.

Appendix 1

Surveys on fuelwood and charcoal

Name and date of Survey publication reference	Authority carrying out survey	Coverage	Remarks
		(Geographical districts Household/industry Fuelwood/charcoal/both)	(Frequency Measurement units)
1. "Fuelwood Study-Solomon Islands" & "Second Fuelwood Study – Solomon Islands" prepared for South Pacific Bureau for Economic Co-operation, Suva, Fiji by FORTECH, Canberra Jan.1983 & Sept. 1983.	Ministry of Lands, Energy and Natural Resources.	100% of households in 8 villages in Malaita & 6 villages in Guadalcanal. Usage of fuelwood by households and for the drying of copra.	Air-dry kg. per person per day. Metric tonnes air-dry per metric tonne dry copra. Household consumption = 6.03 kg/cap/day.
2. "Report of the 1987 Household Energy Survey – Honiara." UNPEDP, Suva, Fiji, Feb.1988.	UNPEDP	300 or c.10% of households in Honiara.	Air-dry kg. per capita per day. Household consumption = 1.2 kg/cap/day.
3. "Household Energy Consumption Survey – Marovo Lagoon Area, Western Province, Solomon Islands" UNPEDP, Suva, Fiji. Jan.1988.	UNPEDP	20% of households in Marovo Lagoon area.	No quantitative data collected.

Appendix 2

Modern forest products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: All round logs at present produced by logging of natural forest areas are classified as industrial roundwood. For statistical purposes there is no separation of data into product types. This reflects the practice of log exporters – the only grading carried out is according to buyers specifications which may vary from shipment to shipment. All industrial roundwood is categorised as "sawlogs and veneer". Since 1979, when logging of kauri (Agathis macrophylla) finished, all log production has been non-coniferous.

MEASUREMENT UNIT: All logs are measured in cubic metres as determined by the Brereton formula.

METHOD OF SURVEY & COVERAGE: Monthly returns of round log production are submitted by all companies as a condition of logging and sawmill licences. These returns are compiled by the Forestry Division as they are received. Statistics on log exports are also available from the Customs and Excise Division of the Ministry of Housing and Government Services. Customs and Excise Division returns are used by the Forestry Division to cross-check data from company monthly returns.

Data coverage is complete for all industrial production of roundwood. Not included is roundwood removed for private usage or felling as part of clearing for gardens, etc. The latter is significant because of the 87% of land that is under customary tenure.

FREQUENCY: Data collected and compiled by the Forestry Division is circulated monthly within the Division (un-published). A summary of data is published annually in the Division's Annual Report.

OFFICE RESPONSIBLE: Statistics Section, Forestry Division, Ministry of Natural Resources.

PUBLICATION: -

PRODUCT: SAWN TIMBER

DEFINITION: Sawn timber describes all timber produced by sawmills. For the purposes of forestry statistics there is no segregation into product types by dimension or quality.

MEASUREMENT UNIT: All timber is measured in cubic metres.

METHOD OF SURVEY & COVERAGE: Monthly returns of mill input and sawn timber production are submitted by all companies as a condition of sawmill licences. Returns are compiled by the Forestry Division as they are received.

Data coverage is complete for all production of sawn timber. Any sawmill, whether it is for private or commercial use, must be licenced and all licences are required to submit monthly returns to the Forestry Division.

FREQUENCY: Data collected and compiled by the Forestry Division is circulated within the Division (un-published). A summary of data is published annually in the Division's Annual Report.

OFFICE RESPONSIBLE: Statistics Section, Forestry Division, Ministry of Natural Resources.

PUBLICATION: -

Sri Lanka

W.R.M.S.Wickramasinghe & M.P.A.U.S.Fernando

1. INTRODUCTION

1.1 General

Sri Lanka is a tropical island with a total land area of 65,610 km^2 including inland waters which make up about 958 km^2. The island has varying climatic conditions – wet, montane, dry and arid. The temperature range is between 3°C and 36°C while the average temperatures are 26.7°C in coastal regions and 19.17°C in the hill country. In the wet zone of the country, in the south and west, rainfall is well distributed, ranging from 1900 to 5000 mm per year. In the dry zone, rainfall is generally below 1900 mm per year.

According to provisional estimates, the country's population stood at 16.8 million in 1989. Per capita GNP was Rs.13,267 (US$367) in 1989.

1.2 Vegetation

The natural vegetation follows the pattern of the country's climatic zones and one of its striking characteristics is the large proportion of tree cover compared with other countries in the region. Large extents of the country are covered by natural forests, man-made forests, scattered non-forest trees and traditional home gardens with domestic trees. These home gardens, found particularly in the South and West, carry fruit, fuelwood, timber, fodder, shade and ornamental trees. In most of these home gardens and rubber and coconut plantations the canopy cover is dense with a canopy closure of over 75%.

1.3 Forest cover and land area

Tropical rain forest occurs in the wet zone of the island with tropical highland rain forest and tropical montane forests at higher elevations. The dry zone is characterised by tropical dry evergreen forests.

The natural forest area has been shrinking over the last 25 years, primarily due to clearing of land for agricultural development, illicit felling and shifting cultivation. According to the FAO/GOSL Forest Inventory of 1986, the total forest land area is estimated at about 2.5 million ha. including scrub land.

This represents 39% of the country's total area, down from 46.5% in 1956. The area of natural high forest fell by almost 42,000 ha. per year between 1956 and 1983 with losses concentrated in dry zone forests. Fairly small areas of forest are left in the wet zone where forest cover is about 9% of total land area.

TABLE 1
Forest land area by forest type and zone

Forest type/zone	Total area (ha.)	Production area (ha.)
Natural high forest		
– wet zone, up country	278 000	119 000
– dry zone	1 471 000	954 000
Total natural high forest	1 749 500	1 073 000
Other forests		
– scrubland	663 800	533 500
Forest plantations	104 000	97 650
Mangrove forests	7 900	
Total forest land	2 525 200	1 704 150

With the exception of small areas of unlogged forest, the growing stock of natural forests per ha. is very low.

The composition of tree species in forest plantations is as follows:

Teak	–43%
Pinus	–19%
Eucalyptus (saw log species)	–9%
Other hardwoods	–8%
Fuelwood species	–21%

1.4 Non-forest wood resources

Non-forest wood and biomass resources cover 2.9 million ha. or 45% of the total area of Sri Lanka. These resources supply a large amount of the country's timber, fuelwood and biomass fuel. Non-forest wood resources consist mainly of the major plantation crops (rubber, coconut and tea), homestead gardens and areas classified as mixed trees and other perennial crops. Other non-forest wood resources include woody material on sparsely used lands and lands used for crops other than paddy, urban

and roadside trees. Biomass fuel is also available from the residue of agricultural crops. The studies carried out for the Forestry Master Plan in 1986 estimated that about 50% of industrial logs and 80% of fuelwood is derived from these sources. Since then, no assessments have been made and available statistics appear to be out-dated.

1.5 Structure of ownership

The forests of the country are mainly state-owned. Private ownership is limited to small plots of plantations which are generally included in other land-use categories. State Corporations such as Janatha Estates Development Board and Sri Lanka State Plantations Corporation also possess a major proportion of the non-forest wood resources.

Apart from the state sector's involvement, the private sector also plays an important role within the forestry sector. About 80% of the sawn wood used in Sri Lanka comes from private sawmills. Besides this, the private sector controls almost all secondary processing industries such as joinery, furniture, parquetry, production of match sticks and other wood products.

1.6 Forestry in the economy

Unprocessed wood products contributed about Rs.4.7 billion to the country's economy in 1988, or about 4.2% of GDP. Industrial processing of timber and paper products contributes an additional 1.4 billion. These figures underestimate the real contribution because a great proportion of forest produce is freely or illegally collected wood which does not appear in the statistics. The production value of fuelwood has always been underestimated. Fuelwood is the main source of energy in Sri Lanka, providing 94% of the energy used in households and 61% of energy for industries. This amounts to 71% of total energy consumption.

1.7 Demand for wood and wood products

Demand for all wood products is increasing, mainly as a result of population increase and other domestic factors.

The projected demands for domestic and industrial fuelwood according to the 1985 Wood Demand and Market Survey done under the Forest Resources Development Project are shown in Table 2.

The project availability of fuelwood from existing sources is shown in Table 3.

TABLE 2
Projected fuelwood demand 1986-2020

Period	Fuelwood demand (1000 tonnes/year)		
	Domestic	Industry	Total
1986-1990	8 356	1 164	9 520
1991-1995	8 969	1 208	10 177
1996-2000	9 473	1 269	10 742
2001-2010	9 909	1 277	11 186
2011-2020	10 158	1 241	11 399

TABLE 3
Projected fuelwood availability 1986-2020

Source	Fuelwood availability (1000 tonnes)				
	1986-1991	1991-1995	1996-2000	2001-2010	2011-2020
Non-forest	9 060	8 830	8 465	8 392	9 051
Natural forest incl.shrub land	1 916	1 848	1 780	1 683	910
Forest industry residues	271	319	361	435	533
Existing forest plantations	468	770	393	335	273
TOTAL	11 715	11 767	10 999	10 845	10 767

Per capita consumption of fuelwood for domestic purposes in 1985 was 523 kg./person and is forecast to decline from 1990 onwards while fuelwood consumption by industries was 1.1 million tons. Fuelwood is preferred by industries as it is 50-60% cheaper than other normal types of energy although its use is subject to availability and technical suitability. Additional demand for fuelwood will depend predominantly on the development of non-traditional industries. Industrial demand could increase much less than household demand.

Four studies of firewood consumption have been carried out by the Ministry of Power and Energy, the Ceylon Electricity Board, the Natural Resources Energy & Science Authority of Sri Lanka and researchers and international development organisations.

This data is based on a review of available earlier studies of firewood supply and consumption. A very extensive field survey was also commissioned, covering household and industrial, commercial and institutional users of firewood.

1.8 Forest industry products

The demand, supply and consumption patterns of forest industry product are discussed in this section.

The information has been obtained by reviewing available secondary information and extensive primary research.categories.

i. Sawn wood

Sawmills sell about 73% of their output in the region where they operate. Sawmills estimate that about 65% of their output goes to the building industry, 25% to the furniture industry and the rest to other end-uses.

There is no time series data about the consumption of sawn wood in Sri Lanka as production data is not available. Consumption in 1984-85 was estimated at about 380,000 m^3. Future demand as estimated under the Forestry Master Plan is as follows:

Year	Future demand ('000 m^3)
1991	461
1996	529
2001	601
2011	755
2021	961

ii. Plywood, particle board and veneer

Plywood is produces only by the Ceylon Plywood Corporation and a private company called LAK PLY(pvt)Ltd. and is the major wood industry in Sri Lanka. At full capacity utilization the log requirement of the Ceylon Plywood Corporation would be about 113,000 m^3/year but average intake is only 50%.

Tea chests seem to account for about 90% of plywood consumption while the rest is mainly used for furniture and joinery. Future demand forecast is as follows:

Year	Future demand ('000 m^3)
1991	29.4
1996	30.4
2001	31.5
2011	33.0
2021	34.7

Particle board, used for furniture, joinery, partitioning and ceilings, is not yet popular as people are more used to solid wood and plywood. The high cost of plywood, reduction in availability of indigenous hardwoods and the need to improve productivity in wood-working factories is expected to lead to greater acceptance and higher demand for particle board.

Year	Future demand ('000 m^3)
1991	5.0
1996	6.3
2001	7.8
2011	11.3
2021	15.5

iii. Poles and posts

Wood poles and posts are needed for low voltage overhead lines and telephone lines. State Timber Corporation (STC) sold 22-38,000 overhead transmission poles annually during the period 1980-88. Present demand is around 60,000 poles per year which are obtained from both state and private lands. Demand for fencing posts and building poles have not been assessed and they are usually used in rural areas and obtained locally.

iv. Other wood products

Sri Lanka Railways uses about 2480 sleepers per kilometre of railway. Annual demand for replacing sleepers is about 100,000 pieces. Transmission poles and railway sleepers are the main types of impregnated wood currently in use.

v. Pulp and paper

Rice straw and waste paper is the major raw material for pulp although local wood pulp has been in use since the mid-1980s. The total installed capacity of the paper industry is 37,500 tons/year but the utilization rate is about 60%. About 40% of the fibre requirement of the paper mills is imported and data on this is available from customs reports. Future demand for paper and paperboard is as follows:

Year	Future demand ('000 m^3)
1991	101.9
1996	123.9
2001	151.2
2011	207.2
2021	271.7

Today the paper mills have a capacity of 300 m^3 of wood per day for pulp production but no sound programme has been formulated to optimize the supply of wood raw material. As a result, the major source of pulp is from imports.

2. FOREST SECTOR STATISTICS

One of the main constraints in forestry sector development is lack of data. Proper inventories and a limited number of forest maps are available for only 119,000 ha. of natural forests and about 60,000 ha. of plantations. The basic data required to manage the remaining 600,000 ha. of natural forest and about 35,000 ha. of young plantation are not available.

Even where inventories have been completed and management plans prepared, the reliability and accuracy of the information obtained is very low.

2.1 Collection of statistics

The two main institutions involved in the collection and reporting of statistics are the Central Bank of Ceylon and the Department of Census and Statistics. Their reports are published annually. Statistics on forestry are included as part of the GNP data, and classified under Industrial Production, Timber Production and Agriculture, Fishery and Forestry. These statistics are collected through the relevant State organizations and the Department of Statistics. However the accuracy of these data is debatable.

2.2 Individual production and sales-cum-consumption statistics

As far as production and sales statistics are concerned, they are available from the respective agencies concerned who publish the statistics in their annual reports. Table 4 shows some of the agencies who publish forestry related statistics in their annual reports.

All trade statistics relating to forest products are recorded by the Ceylon Customs and are published annually in the customs returns.

TABLE 4
Agencies publishing forestry related statistics

Agency	Production type
i. State Timber Corporation	Logs, sawn wood, poles and posts, railway sleepers, firewood and charcoal and pulpwood.
ii. Ceylon Plywood Corporation	Plywood, particle board and plywood products such as tea chests & furniture.
iii. Ceylon Paper Corporation	Wood pulp, paper and paper products.
iv. Forest Department	Extent of areas reforested, harvested, thinned and subjected to other types of scientific management.
v. Department of Wild Life Conservation	Extent of area managed for protection of fauna & flora.

2.3 Statistics on the private sector

While the above statistics are available on the state sector in some form or another, very little data is available on small-scale industries involved in sawing, furniture making, fuelwood supply, etc. Although the contribution of each of these units may be small, their aggregate production is significant and generally goes unrecorded. No institution is responsible for collection of statistics from these small private enterprises.

2.4 Production forecasts

Production forecasts are mostly bases on secondary information and are not reliable for two major reasons:

i. Management plans are not available for all state forests and, where available, are often based on unrealistic figures due to shortcomings in inventories and field surveys.
ii. Lack of realistic information on non-forest wood products. With increasing awareness among the general public on tree planting, a significant increase in non-forest wood resources can be expected. It is difficult to estimate such increases due to the fragmented nature of planting and harvesting patterns of such resources.

Most production forecasts available are based on the results of comprehensive surveys conducted during 1984-85 in preparation of the Forestry Master Plan. The studies conducted were:

i. Assessment of Non-Forest Wood Resources
ii. Logging and Transport Study
iii. Wood Demand and Market Study
iv. Forest Industries and Wood Utilization Study
v. Resin Extraction and Processing Study

These studies were based on secondary informa-

tion, field surveys, localized case studies and interviews. The information obtained has not been updated for the past 4-5 years and fresh estimates need to be made frequently to ensure that statistics do not become obsolete.

Some research organizations and research units also possess important statistics collected during intensive surveys. However these are not documented on a regular basis.

2.5 Units of measurement

The measurement units used in collection of statistics in Sri Lanka are shown in Table 5.

TABLE 5

Units of measurement

Product	Unit of measurement	Remarks
i. Logs	cu.m.	Mid-girth in metres & volume in cubic decimal. Length in metres & cross-section in millimetres.
ii. Sawn wood	cu.m.	
iii. Poles, posts & sleepers	nos.	
iv. Fuelwood	cu.m.	
v. Pulpwood	metric tons	
vi. Charcoal	metric tons	
vii. Plywood	cu.m.	

3. Informal sector products

3.1 Fuelwood and charcoal

i. Fuelwood

Energy consumed in Sri Lanka comes from biomass, oil, electricity and a small quantity of coal. The domestic sector consumes 67.5% of total energy while the industrial and commercial sector consumes 20.3% and the transport sector 12.2%. The energy supply pattern in 1984 is shown in Table 6.

In 1982/83, by contrast, the contribution of fuelwood to total energy supply was only 55%. The rise in the proportion of energy supplied by fuelwood is due to the large quantities of fuelwood extracted from areas clearfelled for development schemes. 94% of households use fuelwood as their source of energy.

49% of fuelwood for industry comes from rubber plantations, 36% from natural forests, 7% from other non-forest sources, 6% from coconut and 2% from forest plantations.

Table 7 shows the 6 largest fuelwood consuming industries.

TABLE 6

Energy supply – 1984

Energy source	%
i. Fuelwood	71.20
ii. Oil (non-electricity)	18.95
iii. Hydro-electricity	8.50
iv. Oil-powered electricity	0.69
v. Coal	0.66

TABLE 7

Major fuelwood consuming industries

Energy source	% of industrial fuelwood consumption
i. Tea	33
ii. Hotels and eating houses	15
iii. Bricks and tiles	13
iv. Coconut	11
v. Tobacco	10
vi. Bakeries	8

Responsibility for collection of data on energy consumption lies with the Central Bank and the Department of Census and Statistics, however little attention is paid to collection of statistics on fuelwood and no regular procedures have been defined. Information on surveys of fuelwood is shown in Appendix 1.

ii. Charcoal

Wood charcoal is used for energy on a very small scale in Sri Lanka. Demand for charcoal is for domestic cookers mainly in urban areas and for some industries. The balance of supply is imported. At present the State Timber Corporation is the sole producer and accurate production data can be obtained from the Annual Report of the State Timber Corporation.

3.2 Forest products other than wood

The main forest products other than wood are resin and medicinal plants. Resin is produced in very small quantities by one private company which commenced operations only in 1987 and collects resin from Pinus cariabea plantations owned by the Forest Department. Production figure for this industry are shown in Table 8.

TABLE 8
Resin production

Year	Production (kg.)
1987	10 117
1988	112 110
1989	156 566

No data has been collected on the production of rattan and medicinal plants.

The bamboo/rattan project funded by the International Development Research Centre (IDRC) and implemented by the Forest Department has initiated a survey on consumption and supply of rattan in Sri Lanka and results are expected in December, 1990.

4. MODERN SECTOR PRODUCTS

For information of modern sector products see, Appendix 2.

4.1 Production statistics

TABLE 9
Production of modern sector forest products 1987-89

Item	Unit	Year		
		1987	1988	1989
i. Logs (other than peeler)	m^3	109 796	54 710	19 919
ii. Peeler logs	m^3	4 283	1 210	160
iii. Sawn timber	m^3	24 388	15 247	8 567
iv. Sleepers	nos.	65 661	64 874	81 976
v. Tr.poles	nos.	16 793	5 045	5 529
vi. Firewood	m^3	426 452	318 210	273 620
vii. Pulpwood	m^3	10 686	22 242	6 967
viii. Poles	nos.	520 070	393 974	419
ix. Fence posts	nos.	360 769	318 584	482 000
x. Charcoal	m.t	1 514	991	1 157
xi. Door frames	nos.	1 149	14	–
xii. Window frames	nos.	463	78	486
xiv. Window sashes	nos.	159	43	–
xv. Wall panelling	l.m.	518 860	317 925	208 785
xvi. Veneer slashes	m^3	9 230	4 795	10 200
xvii. Plywood	m^3	3 075	1 600	3 400
xviii.Chipboard	m^3	1 901	654	2 718

4.2 Exports

Since 1987 no wood or wood products have been exported.

4.3 Wood-based panel industries

TABLE 10
Plants, capacity & production of wood-based panel industries 1987-89

Item	Unit	Year		
		1987	1988	1989
i. Veneer sheets				
– operating plants	no.	1	1	1
– estimated capacity	'000m^3	40	40	40
– annual production	'000m^3	9.23	4.795	10.20
ii. Plywood				
– operating plants	no.	2	2	2
– estimated capacity	'000m^3	13	13	13
– annual production	'000m^3	3.075	1.6	3.4
iii. Chipboard				
– operating plants	no.	1	1	1
– estimated capacity	'000m^3	8.7	8.7	8.7
– annual production	'000m^3	1.9	0.654	2.718
iv. Fibre board				
– operating plants	no.	3	3	3
– estimated capacity	'000m^3	61.7	61.7	61.7
– annual production	'000m^3	14	15.095	22.3

5. TRADE

No wood products are exported from Sri Lanka. Import items include pulp and paper, sawn timber and plywood.

The Central Bank of Sri Lanka and the Department of Census and Statistics collect data annually but their accuracy is debatable. These data are published in the annual reports of the two institutions. All imports are documented in the Annual Report of the Sri Lanka Customs but these data are not categorised and therefore it is not possible to obtain information on individual items.

The units of measurement used in trade are as follows:

Item	Unit of measurement
Sawnwood	m^3
Plywood	'000 board feet
Pulp	metric tonnes
Paper	metric tonnes

6. PRICES

Domestic prices of wood products are determined by the various institutions holdings monopolies on those items. These institutions are as follows:

i. Sri Lanka State Timber Corporation for the harvesting and marketing of logs and sawn timber.
ii. Ceylon Plywood Corporation for plywood production.
iii. Ceylon Paper Corporation for paper and paper products.

However no annual price series are available other than the price lists produced by the above institutions from time to time. No single institution is responsible for collecting data.

Prices of imported products such as sawn timber and paper and paper products varies with the different qualities of products and no records are available of these prices.

Royalty rates are determined by the Forest Department of Sri Lanka and have not been revised for the last 8 years. These rates are scheduled for revision in 1991.

For the purposes of customs duty, sawn timber and plywood fall into the category of building materials and duty amounts to 20% of CIF value of the product.

7. USE OF COMPUTERS

Computers are being used in various forestry and forestry related activities. The equipment and its uses are given below.

7.1 Forest management & economic analysis

i. Equipment
- IBM PC-AT with colour monitor, 20Mb hard-disk and 1.2 Mb 5.25" diskette drive
- TANDY 2000 microcomputer with green monitor, 10Mb hard-disk and 720Kb diskette drive.
- NEC P7 letter quality 132-character carriage printer.
- TANDY DMP 420 near-letter quality dot matrix printer.
- CANON A200ii Dual Floppy.

ii. Work performed
- Forest Management System (FMS)
  This programme uses growth models to predict the yield estimates and treatment criteria for forest plantations. Future predictions by species, group, site and class on silvicultural treatment to be performed is identified by this programme. Also based on height, growth patter, diameter, and the growth model, volumes of timber expected per hectare are computed and the saw log percentage expected indicated.
- Natural Forest Management
  A data base for natural forests has been created categorized by: district, reserves, compartment, slop class, division, range, beat, type, growth area and commercial area. For each group, data pertaining to species group, stand table and stocking volume further categorized into eight forest types is indicated.
- Economic analysis
  A spread sheet-based computer programme has been developed to aid economic analysis decisions using criterias such as "net present value" and "internal rate of return".

7.2 Plantation management

i. Equipment
  IBM System 2 Model 60 with 44 Mb hard-disk, 1.44Mb 3.5" internal diskette drive, 1.2Mb 5.25" external disk drive with colour monitor.

ii. Work performed
  This computer is being used for developing the forest plantation management plans. The computer-based growth models predict the yield that can be expected from plantations and this information is used in determining management plans. At present, a computerized inventory of natural forests is being prepared and efforts are being made to use the computer extensively for natural forest management.

7.3 Financial management

i. Equipment
  IBM System 34 minicomputer with 128Kb memory, 63.9Mb of disk storage and 2 dot-matrix printers 160 LPM 50.

ii. Work Performed
- Maintenance of the timber sales ledger of the State Timber Corporation. It allows purchases against advances and credit purchases.
- Analysis of monthly depot sales and production data. This includes both physical and financial figures.

– Computation of the royalty payable to the government, based on the volume felled by the Corporation. Data related to every log felled in a particular coupe is maintained physically in the field and these are entered in the computer.

8. SUMMARY CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary conclusions

At present there is no institution responsible for the collection of national statistics on the forestry sector and no systematic approach to the collection of such data. What data is available is of doubtful accuracy. In addition, as data are collected by different agencies, the objectives for the collection of statistics are often different from agency to agency.

This lack of coordination and organisation is a major constraint in forestry sector statistics in Sri Lanka

8.2 Recommendations

In order to overcome this situation, the following recommendations are made.

i. The responsibility for the collection of statistics on the forestry sector needs to be assigned to one institution.
ii. Methods need to be devised for the collection of statistics from the private sector as this is responsible for the bulk of forest product production. This may mean making new laws concerning reporting of production information.
iii. Production and consumption data need to be collected annually and forecasts for demand and supply once every five years.
iv. Statistics collected should be incorporated into the forestry information system being developed under the Forestry Sector Development Project.
v. Technical assistance and training is required to devise methods of collection of statistics.

Appendix 1

Surveys on fuelwood and charcoal

Name and date of Survey publication reference	Authority carrying out survey	Coverage	Remarks
1. Sri Lanka Energy Balance – 1984.	Ceylon Electricity Board Energy Unit.	–	–
2. Energy for the Tea Industry (seminar paper). Gaffar, N.M.Abdul & Samaraweera P., July, 1980.	Institute of Engineers Sri Lanka.	–	–
3. Fuelwood Supply & Demand Survey, 1987.	Forest Resources Development Project.	–	–
4. A sample study of biomass fuel consumption in Sri Lankan households. Wijesinghe, L.C.A. de S. Biomass 5 (1984).	Natural Resources, Energy & Science Authority.	–	–
5. Not yet available. 1990.	Regional Wood Energy Project (FAO)	–	–

Appendix 2

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Depending on the species, sawlogs are classified as super luxury, luxury, special, class 1, class 2 and class 3. The minimum mid-girth of the peeler logs is 450mm.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Surveys of supply and consumption are normally confined to the urban sector and are sometimes on a regional basis.

FREQUENCY: Annually and sometimes on an adhoc basis.

OFFICE RESPONSIBLE: Although no responsibility has been given to any institution, the Department of Census and Statistics and the Central Bank of Sri Lanka collect annual data. However the accuracy is debatable.

PUBLICATION:

i. Administration report of the State Timber Corporation.
ii. Annual Report of Central Bank of Sri Lanka.
iii. Annual statistical data of the Department of Census and Statistics.

PRODUCT: SAWNWOOD

DEFINITION: Sawnwood is sold by wood species, quality, dimension and length. The standard dimensions of the State Timber Corporation are 50/125 x 75/400mm, 50 x 50mm, 50 x 25mm, 50 x 13mm, 13/44 x 75/500mm.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Industrial surveys on supply and consumption of the whole country and sometimes regional.
FREQUENCY: Annual and sometimes adhoc surveys.
OFFICE RESPONSIBLE: No responsibility is given to any institution but the Central Bank of Sri Lanka and the Department of Census and Statistics collect data annually. The Customs of Sri Lanka record all imports.
PUBLICATION:
i. Annual Report of the Central Bank of Sri Lanka.
ii. Annual statistical data of the Department of Census and Statistics.
iii. Administration report of the State Timber Corporation.
iv. Annual report of the Sri Lanka Customs.

PRODUCT: FIBREBOARD
DEFINITION: -
MEASUREMENT UNITS: Thousand square metres.
METHOD OF SURVEY & COVERAGE: No surveys as there is no production in Sri Lanka. All imports are recorded by the Sri Lanka Customs.
FREQUENCY: Annual.
OFFICE RESPONSIBLE: Sri Lanka Customs and the Central Bank of Sri Lanka.
PUBLICATION:
i. Annual report of the Sri Lanka Customs.
ii. Annual report of the Central Bank of Sri Lanka.

PRODUCT: PULP AND PAPER
DEFINITION: The National Paper Corporation produces cultural grades of paper with the normal grammage being 60-150g./m. The grammage range of paper boards is 80-550g./m.
MEASUREMENT UNITS: Metric tonnes.
METHOD OF SURVEY & COVERAGE: Production data can be obtained from the National Paper Corporation and all imports are recorded by the Sri Lanka Customs.
FREQUENCY: Annual.
OFFICE RESPONSIBLE:
i. National Paper Corporation.
ii. Sri Lanka Customs.
iii. Central Bank of Sri Lanka.
PUBLICATION:
i. Annual Report of the National Paper Corporation.
ii. Annual Report of the Sri Lanka Customs.
iii. Annual Report of the Central Bank of Sri Lanka.

PRODUCT: PARTICLE BOARD
DEFINITION: The standard thickness of chipboard is from 6-25mm. The standard sheet sizes are 900/1800 x 900mm and 915/1830 x 915mm (unveneered chipboard).
MEASUREMENT UNITS: Thousand square metres.
METHOD OF SURVEY & COVERAGE: Not produced in Sri Lanka. Import statistics can be obtained from the Sri Lanka Customs and the Central Bank of Sri Lanka.
FREQUENCY: Annual.
OFFICE RESPONSIBLE: Central Bank of Sri Lanka and the Sri Lanka Customs.
PUBLICATION: Annual reports of the Central Bank of Sri Lanka and the Sri Lanka Customs.

PRODUCT: PLYWOOD
DEFINITION: The Ceylon Plywood Corporation produces plywood from 1.4mm thick veneers. The standard sheet sizes of plywood are 1220/1525/1830/2135 x 1220MM and 915/1830 x 915mm. The thicknesses of plywood are from 4.2 to 23.8mm.
MEASUREMENT UNITS: Thousand square metres.
METHOD OF SURVEY & COVERAGE: Data assembled annually by regular surveys and sometimes adhoc surveys. However accuracy of data is debatable.
FREQUENCY: Annually or sometimes adhoc surveys.
OFFICE RESPONSIBLE: Central Bank of Sri Lanka and Sri Lanka Customs.
PUBLICATION: -

Thailand

Pairote Niwasawat & Sa-nguan Kakhong

1. INTRODUCTION

Thailand is located in Southeast Asia with total area of 513,115 sq. km. and population of 55 million people. The majority of the population is Thai with a minority of less than 5 per cent composed of Chinese, Cambodian, Laotian, Malaysian, Burmese, Vietnamese and some small groups of hilltribes.

Climatic condition varies from very wet along the coastal area to comparatively dry in inland area. The south-west monsoon (May-October) brings heavy rainfall to the southern peninsular area and along the western side of the country (over 2,000 mm/annum). The north-east monsoon (November-February) brings cold, dry weather from mainland China and the temperature in the north and northeastern areas of the country can drop to under 10 degrees C. During the hot season (March-April) temperatures average 30-40 degrees C.

Topographically, the country area can be divided into 5 regions: the peninsular or southern region, the central alluvial plain or central region, the northern mountainous or northern region, the southeastern or eastern region and the northeastern high plateau.

Due to the range in temperature, humidity and topographic conditions found in the country, Thailand is covered with heterogeneous forest types. They can be grouped into two main forest types – evergreen forest and deciduous forest. Ecologically, soil humidity, soil structure and elevation seem to play the major roles in governing vegetation development and forest composition.

TABLE 1

Forest Area by Type and Region in 1982

Forest Type	Region (sq.km.)					
	North	Northeast	East	Central	South	Total
– Tropical Evergreen	25 568	9 305	6 216	12 449	14 323	67 861
– Mixed Deciduous	25 006	2 618	1 113	5 192	33 929	
– Dry Dipterocarp	34 318	13 819	253	540	–	48 930
Mangrove	–	–	418	335	2 119	2 872
Pine	2 018	144	–	–	–	2 162
Scrub	846	–	–	–	–	846
Total	87 756	25 886	8 000	18 516	16 442	156 600

Evergreen forests naturally existed along valleys, ravines, river banks, in coastal areas and the peninsular region where soils are saturated with high water content. Deciduous forests appear in drier areas such as mountainous slopes or far inland where soils are relatively dry. The existing forest types in Thailand are shown in Table 1.

1.1 Forest Land and Land Uses

According to 1988 data, forest land area covers 143 803.5 sq.km. or 30.01 per cent of the entire kingdom. Table 2 shows land use in the country.

TABLE 2

Land Uses and Forests in Thailand (1988)

Type	Area (sq.km.)	Per Cent
Forest Land	143 803.5	28.03
Residential	5 349.1	1.04
Paddy Field	118 706.6	23.13
Cash Crops Area	57 151.0	11.14
Tree & Fruit Orchards	31 255.4	6.09
Horticulture	1 348.4	0.26
Pasture	7 619.6	1.48
Wasteland	12 294.9	2.40
Others	2 755.2	0.54
Unclassified	132 831.3	25.89
Total	513 115.0	100.00

1.2 Timber Production

More than 150 tree species with commercial value are being harvested annually in Thailand and there

are a number of untouched or lesser used species.

The most common harvesting tree species are teak *(Tectona grandis), Dipterocarpus spp., Irvingia malayana, Anisoptera glaba, Rhizophora mucronata, R apiculata, Michelia champaka, Xylia kerrii, Hopea odorata, H. ferrea, Shorea gratissima, S. obtusa, Mesua ferrea, Pterocarpus macrocarpus, Dipterocarpus tuberculatus, D. obtusifolius, D. grandiflorus, Afzelia xylocarpa, Syzygium cumini, Dellenia spp.*, etc.

Annual timber production from 1981 to 1989 is shown in Table 3.

Note: The production of other species in the year 1989 was sharply reduced because of the stoppage of concessional operations throughout the country.

TABLE 3
Timber Production in Thailand (1981-1989)

Year	Volume (Thousand cu.m.)		
	Teak	Other Species	Total
1981	73.3	1 725.3	1 798.6
1982	58.1	1 711.3	1 769.4
1983	58.1	1 761.6	1 819.7
1984	48.2	1 983.5	2 031.7
1985	39.2	1 843.4	1 882.6
1986	67.6	1 947.1	2 014.7
1987	38.1	2 110.9	2 149.0
1988	46.9	2 001.2	2 048.1
1989	26.2	892.8	919.0

Due to the rapid development of the country since the early 1970s, Thailand has changed from a timber exporting country to a timber importer. This was the combined result of demand outstripping local supply, the reduction of indigenous resources and the cessation of forest concessions in 1989. The changes in timber imports are shown in Table 4. The countries which have supplied timber to Thailand are Burma, Laos, Indonesia, Malaysia, Vietnam, Singapore, Cambodia,and United States. Besides log and sawn timber, Thailand also imported large amounts of pulp and paper to feed her local market. The major sources are countries such as Sweden, Norway, Finland, Canada, Japan, China, and United States.

1.3 Natural and Wildlife Conservation

At present there are 60 established national parks located in the kingdom. Besides national parks, some scenic and forested areas is reserved as wildlife sanctuaries, forest parks and arboreta for local people. There are 50 forest parks and 42 arboreta, 78 forested areas set aside as 31 wildlife sanctuaries and 47 non-hunting areas.

TABLE 4
Imported Log and Sawn Timber (1976-1989)

Year	Volume (cu.m.)		
	Log	Sawn Timber	Total
1976	13 589	131 454	145 043
1977	65 914	254 901	320 815
1978	169 250	345 767	515 017
1979	227 031	806 079	1 033 110
1980	92 094	342 257	434 351
1981	151 649	423 927	575 576
1982	141 639	346 813	488 452
1983	231 784	398 591	630 375
1984	199 458	382 032	581 490
1985	172 100	246 140	418 240
1986	152 714	195 937	348 651
1987	282 928	442 292	725 220
1988	438 932	620 344	1 059 276
1989	1 193 340	1 307 843	2 501 183

TABLE 5
Natural Conservation and Recreation in 1989

Type	Unit	Area (sq.km.)
National Park	60	31 816.18
Forest Park		50
Wildlife Sanctuary	31	24 683.97
Non-hunting Area	47	4 145.50
Botanical Garden	5	10.00
Arboretum	42	31.27

1.4 Forest Products

Forest products are play a vital role in the lives of Thai people, especially firewood for cooking which consumes a considerable amount of forest production per annum. Other forest products extracted from the

TABLE 6
Production of non-timber forest products

Year	Firewood	Charcoal	Wood Tar	Barks	Rattans	Bamboos
	1 000 cu.m.		1 000 litre	Ton	Ton	Mil. Pcs
1985	690.6	363.9	909.2	630.6	2 528.16	34.4
1986	437.9	348.8	682.4	201.0	3 146.9	37.9
1987	873.7	463.9	661.0	232.3	5 960.0	40.7
1988	588.5	561.1	533.8	62.1	3 358.0	60.8
1989	426.0	325.5	639.5	55.6	1 234.9	54.3

jungles include bamboos and shoots, rattans, barks, tars and charcoal. Table 6 shows the production per annum of non-timber forest products.

1.5 Wood Industry

The government has limited the number of sawmills in the country while trying to improve the quality of production. This is in order to ensure an adequate supply of raw materials for existing mills in the face of the drastically reduced timber supply. In addition, a programme of modernisation is being carried out in cooperation with the private sector.

TABLE 7

Sawmills and wood-based factories

Type	Number of Mills
Sawmills	585
Non-mechanised sawmills	83
Plywood factories	21
Veneer factories	34
Fiberboard factories	3
Particleboard factories	4
Non-mechanised woodworking plants	728
Pulp and paper mills	35
Sawn timber shops	2 679
Wood products shops	2 672

1.6 Trade in wood products

The price of timber in markets in the Bangkok area has increased nearly two-fold between 1985 to 1989. Table 8 shows the changes of timber prices in Thailand during this period.

TABLE 8

Timber Price in Bangkok and Sub-urban Area (Baht/cu.ft.)

Item	1985	1986	1987	1988	1989
Yang sawn:					
Wall	155	155	206	247	256
Lath	105	105	105	185	195
Floorings	140	140	194	222	228
Scantlings	122	125	152	175	203
Post	140	145	176	208	220
Mixed Hardwood sawn:					
Floorings	150	150	179	188	235
Plank	145	145	287	361	393
Teak sawn:					
Scantlings	300	300	337	354	397
Boards	440	440	547	645	718

2. FOREST SECTOR STATISTICS

The Forest Statistics Sub-Division of the RFD Planning Division in Bangkok is responsible for centrally collecting and publishing forestry statistical data. Appropriate questionnaire forms are sent to Regional, Provincial and District Forest Offices, National Parks and RFD Divisions and organizations. These are returned to the RFD Headquarters in Bangkok within a designated date. Where other organizations are involved, data may be collected directly by Sub-Division personnel or derived from documents of the relevant Divisions. The Sub-Division is currently developing the more reliable data collection and presentation system as shown in Tables 9 and 10.

The majority of data is obtained through the registration system of the 72 provincial forest offices and the 21 regional forest offices, which periodically deliver their reports containing forest statistical data to the Forest Statistics Sub-Division. The other 13 RFD divisional offices in Bangkok also supply statistical data to the Sub-Division, tabulated. Other statistical data comes from different outside agencies. For example, data on imports and exports of forest products comes from the Customs Department of the Finance Ministry, land-use data from the Office of Agricultural Economics, etc. The Sub-Division is also initiating sampling surveys to improve data collection although budgetary constraints may effect the validity of sampling.

2.1 Statistical publications

Since 1979, the Royal Forest Department of Thailand has issued an annual publication on forestry statistics entitled "Forestry Statistics if Thailand". The contents of Volume XI of the document, published in 1989, are as follows:

1. Forestry statistical data of Thailand (Tables 1-37)
   - 1.1 Forest land (Tables 1-5)
   - 1.2 Reforestation (Tables 6-7)
   - 1.3 Production and domestic consumption (Tables 8-15)
   - 1.4 Imports and exports (Tables 16-33)
   - 1.5 Wood industry (Table 34)
   - 1.6 Revenue and budget of RFD (Tables 35-36)
   - 1.7 Manpower (Table 37)

TABLE 9
Collection of forestry statistical data

	Agency		Type of data collected
1.	Provincial Forest Office (72 Offices)	1.1.	Production of timber, fuel-wood and charcoal, major forest products
		1.2.	Sawmills and wood product factories
		1.3.	Revenue of RFD
		1.4.	Forest products prices
2.	Regional Forest Office (21 Offices)	2.1.	Products of timber
3.	Forest Management Division	3.1.	Existing forest areas
		3.2.	Existing mangrove areas
		3.3.	Production of timber
4.	Silviculture Division, Watershed Management Division, and National Forest Land Management Division	4.1.	Forest plantation in the government and private sector
5.	Forest Control Division	5.1.	Wood industries
6.	Personnel Division	6.1.	Data on manpower
7.	Planning Division	7.1.	RFD budget
8.	Finance Division	8.1.	RFD revenue
9.	National Parks Division, Wildlife Conservation Division	9.1.	Nature conservation and recreation
10.	Business Economics Department of the Ministry of Commerce	10.1.	Timber construction price in Bangkok and sub-urban areas
11.	Office of the Agricultural Economics	11.1.	Land utilization
12.	Local Administration Department of the Interior Ministry	12.1.	Population and their localities
13.	Bank of Thailand, Office of the National Economic and Social Development Board	13.1.	The general data of the country's economy
14.	Department of Business Economics, Customs Department	14.1.	Imports and exports data
15.	Thailand Paper Industrial Association	15.1.	Domestic Production of paper

TABLE 10
Process of data presentation

External Agencies	
All RFD Divisions	72 Provincial Forest Offices
	21 Regional Forest Offices
	Forest Statistics Sub-division
	Planning Division
	Royal Forest Department
	Data Gathering
	Data Processing
	Analysis of Data
	Tabulating
	Publishing

2. Other statistical data relating to forestry (Tables 38-49)
   2.1 Population and locality (Tables 38-39)
   2.2 The economy (Tables 40-41)
   2.3 Land utilization (Table 42)
   2.4 World production (Tables 43-49)

3. INFORMAL SECTOR PRODUCTS

3.1 Charcoal Production

The most recent statistical data collection on charcoal production in Thailand was carried out by the government in 1983 with technical assistance from USAID. The survey covered charcoal production, distribution, and consumption as part of the Thailand Nonconventional Renewable Energy Project. The survey directly contacted the charcoal producers community, including legal and illegal collectors. Data from legal producers were drawn from official documents while those from illegal charcoal makers were carefully obtained by sampling techniques, questioning and evaluating method.

3.2 Forest products other than wood

Statistical data on forest products such as rattans, resin and bamboos originates from monthly questionnaires filled in by Provincial Forestry Offices for the Forest Statistics Sub-Division. These data do not cover the majority of non-wood forest products which are illegally collected. The data is also incomplete as it only covers forest products extracted from official forest reserves.

4. MODERN SECTOR PRODUCTS

Statistical data on production of each major modern sector product are collected directly from sawmills and factories. These figures are not totally reliable as production is often under-reported by producers in order to avoid taxes. Actual production figures are thought to be much higher than those reported.

For information on modern sector products, see Appendix 3.

5. TRADE

Data on imports and exports are obtained from the Customs Department of the Finance Ministry. The Business Economics Department(BED) processes and tabulates data from the Customs Department computers in a form that can easily be used by the general public. This is then revised to make it conformable with RFD use.

National trade statistics for forest products are as follows:

i. Imports of logs and sawn timbers
ii. Imports of wood products such as plywood, veneer sheet, blockboard, particle board, wood chips and particles, veneered panels, fiberboard, fuelwood, wood charcoal, parquet, wooden furniture, and other wood products
iii. Imports of paper and paperboard
iv. Imports of wood pulp and pulp other than wood pulp
v. Exports of logs and sawn timber
vi. Exports of wood products
vii. Exports of paper and paperboard
viii. Exports of wood pulp and pulp other than wood pulp
ix. Imports and exports of some forest products

The Customs Department is responsible for publishing the annual official report.

The main products imported are logs, sawntimber, paper and paperboard, wood pulp and pulp other than wood pulp.

The main products exported are sawntimber, wooden furniture, paper and paperboard.

The major trading partners are:

i. Malaysia
ii. Indonesia
iii. Myanmar
iv. Laos
v. Japan
vi. Canada
vii. USA

The international coding system presently used in national trade is the Harmonized System.

TABLE 11
Measurement Units in Trade

	Products	Units of Measurement
i.	Industrial roundwood	Cubic meter
ii.	Logs	"
iii.	Pulpwood	Metric ton
iv.	Chips	Kilogramme
v.	Sawnwood	Cubic meter
vi.	Plywood	Kilogramme
vii.	Pulp	Metric ton
viii.	Paper	"

6. FOREST PRODUCT PRICES

Some price data are drawn from the Business Economics Department(BED). Usually the forest product prices from RFD provincial forest offices are not reliable because of the different price levels of forest products in different localities. A par price for reference needs to be set in the future.

7. COMPUTERS

Data tables have been prepared for publication by hand up to now. The 1991, RFD has received one microcomputer for managing its information system. This will enable future publications on forestry statistics to be more rapidly developed.

8. SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The major problems facing national statistics in the forest sector are identified as follows:

i. Until recently, no computer system was available to effectively process data.
ii. The time consumed to collect and process data led to statistical publications being out of date. Delays occur not only at provincial level but also due to the lack of qualified statisticians.
iii. Data collected in the fields does not always conform to prescribed questionnaires or the requirements of the Forest Statistics Sub-Division.
iv. The Forest Acts presently in force render illegal many of the forestry activities engaged in by Thais. As a result, many sawmill and factory entrepreneurs and many of the rural poor extracting forest products are reticent to

cooperate with RFD personnel in producing effective statistical data on forestry affairs.

Major priorities for development can be identified as follows:

i. The improvement of the statistical data collection system coupled with a monitoring mechanism that can assist in effective updating of reports.
ii. The introduction of data sampling survey techniques to reduce workload in reporting.
iii. A training programme for producing statistical technicians in order to tackle the current ineffective and out-of-dated condition of forest statistics.
iv. The revision of ineffective and outdated laws and regulations in order to strengthen cooperation with the public. This would indirectly improve the effective collection of statistical information.

Appendix 1

Surveys on fuelwood and charcoal

Name and date of Survey publication reference	Authority carrying out survey	Coverage	Remarks
		(Geographical districts Household/industry Fuelwood/charcoal/both)	(Frequency Measurement units)
A survey on charcoal production, distribution & consumption. Published 1983.	Forest Economics Sub-Division, Planning Division, Royal Forest Department.	Country-wide both legal & illegal producers.	One survey in 1983. Kg.

Appendix 2

Surveys on forest products other than wood (Non-wood forest products)

Product	Estimated quantity	Survey Name and Date	Coverage – by product – geographical	Publication reference
Rattan	Not available	Provincial	Country-wide	Official use only
Resin Bamboo	Not available	Forest Offices Monthly		Not available

Appendix 3

Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: Wood in the rough. Wood in its natural state as felled or otherwise harvested, with or without bark, round, split roughly squared or other forms. Commodities included are sawlogs and veneer logs, pulpwood, other industrial roundwood (including pitprops) and fuelwood.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Provincial forest officers collect data directly from sawmills and factories.

FREQUENCY: Monthly.

OFFICE RESPONSIBLE: Provincial forest offices deliver data to Forest Statistics Sub-Division at RFD HQ, Bangkok.

PUBLICATION: Published annually for public use in "Forestry Statistics of Thailand".

PRODUCT: SAWNWOOD

DEFINITION: Plain sawnwood from sawmills.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Annual questionnaires are sent out to provincial forest officers who collect data from primary sources and report it to RFD.

FREQUENCY: Annually.

OFFICE RESPONSIBLE: RFD.

PUBLICATION: No publication pending the improvement of data collection and presentation methods.

PRODUCT: PLYWOOD

DEFINITION: Plywood, veneer plywood, core plywood, including veneered wood and blockboard.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: By questionnaires delivered directly to factories.

FREQUENCY: Once only in 1984.

OFFICE RESPONSIBLE: Forest Statistics Sub-Division.

PUBLICATION: Published in 1985 as "Report on Production of Plywood, Veneer, Particle Board and Fibreboard in 1981-83".

PRODUCT: PARTICLE BOARD

DEFINITION: A sheet material manufactured from small pieces of wood or other ligno-cellulosic materials (e.g.chips, flakes, splinters, strands, shreds, shives, etc.) agglomerated by use of an organic binder together with one or more of the following agents: hear, pressure, humidity, a catalyst, etc.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Questionnaires delivered directly to the factories.

FREQUENCY: Once only in 1984.

OFFICE RESPONSIBLE: Forest Statistics Sub-Division.

PUBLICATION: Published in 1985 as "Report on Production of Plywood, Veneer, Particle Board and Fibreboard in 1981-83".

PRODUCT: FIBREBOARD

DEFINITION: A panel manufactured from fibers of wood of other ligno-cellulosic materials with the primary bond deriving from the felting of the fibers and their inherent adhesive properties. Bonding materials and/or additives may be added.

MEASUREMENT UNITS: Cubic metres.

METHOD OF SURVEY & COVERAGE: Questionnaires delivered directly to the factories.

FREQUENCY: Once only in 1984.

OFFICE RESPONSIBLE: Forest Statistics Sub-Division.

PUBLICATION: Published in 1985 as "Report on Production of Plywood, Veneer, Particle Board and Fibreboard in 1981-83".

PRODUCT: PULP

DEFINITION: Pulp is produced from wood and/or bamboo chips, non-wood raw materials and wastes which have cellulosic fibers.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: Interviews of pulp factory-owners by The Thailand Paper Industrial Association

FREQUENCY: Annually.

OFFICE RESPONSIBLE: Thailand Paper Industrial PUBLICATION: Bank of Thailand Journal.

PRODUCT: PAPER AND PAPERBOARD

DEFINITION: Includes printing and writing paper, kraft paper, paperboard and packaging paper, household and sanitary paper.

MEASUREMENT UNITS: Metric tons.

METHOD OF SURVEY & COVERAGE: Interviews at paper factories by the Thailand Paper Industrial Association.

FREQUENCY: Annually.

OFFICE RESPONSIBLE: Thailand Paper Industrial Association and Bank of Thailand.

PUBLICATION: Bank of Thailand Journal.

Western Samoa

Malaki Tapoko

1. INTRODUCTION

Western Samoa has a total land area of about 284,342 hectares, 81% of which is customary land, 4% private freehold land, 4% belongs to the WSTEC and the 11% is government or public land.

Forest occupies almost 50% of the total land area and is considered a valuable natural resource, especially considering the lack of any mineral resources. 66.8% (103,000 ha.) of the total is considered commercial forest while the remaining 33.2% (51,000 ha.) is considered protection forest (national parks, reserves and water catchment areas).

The present land-use pattern has developed through a combination of two farming systems; subsistence village cropping and plantation cash cropping. No accurate information on land-use was available until the implementation of a comprehensive Land Resources Planning Study for the planning of optimal and sustainable development of the country's land resources. For this study, existing maps were updated with new aerial photographic coverage of Western Samoa at 1:50,000, 1:20,000 and 1:13,000 scale, dating from 1981 to 1987, and some limited field checking.

Proper land-use planning and the management and development of forest resources on a sustainable yield basis are essential for the economic development of the country. The forests also play an important role in protecting the environment and watershed areas.

97% of households use wood as a major source of energy in Western Samoa. Fuelwood consumption is between 1.6 and 2.2 kg. per capita per day. Cooking is done using "umu"(heated stone) or "tainafi" (open fire). About 50% of the wood is obtained free of charge from household plots, with the rest coming from local sawmills, coconut and small wood-using industries.

There is limited scope for the development and conservation of wildlife species. At present O Le Pupu-Pu'e National Park is home to about 51 species of wildlife.

The indigenous merchantable forests of Western Samoa are declining and plantation forests are expected to replace them as a source of industrial wood over the next 15 years.

Wood processing is centred around 5 sawmilling companies (2 stationary sawmills and 3 portable types). Log in-take has ranged from 24,000-34,000 cu.m./year over the last 5 years. The private sector has increased its involvement in sawmilling rapidly, with government production of sawntimber reducing from 97% of the total in 1985 to 47% in 1989.

Forest-based industries are part of the wood products and furniture sector. Sawmills produce more than 80% of this sector's output and employ 85% of its workforce.

2. FOREST SECTOR STATISTICS

Forestry is one division of the Department of Agriculture, Forests and Fisheries. There is no section specifically responsible for the collection of forestry statistics other than those responsible for the management of forest resources. These units are also responsible for the collection of whatever statistics are required for the formulation of appropriate policies and strategies for forest management.

Forestry industry statistics, particularly those on production for export and local consumption, are collected and compiled by the industry itself. The Forestry Officer who monitors a logging operation is responsible for the collection of statistics on logs extracted by a particular sawmill, for the purpose of royalty payments.

For imports of timber, the Customs Department is responsible for recording data on quantity and value.

There are several limitations in the collection of forestry statistics in Western Samoa, particularly in the areas of organization, collection methods and use of statistics. The Statistics Department of the Government is supposed to coordinate the collection of statistics by various government departments and assist in analysis, but most forestry statistics are not covered.

Several surveys of forest resources have been carried out over the last 20 years but the methods used have been inconsistent and there has been little follow-up. Above all, the forest service lacks qualified

personnel. These features create considerable uncertainty in the management of remaining natural forest resources.

3. FUELWOOD AND CHARCOAL

Only one special survey of production and consumption of fuelwood and charcoal has been carried out. This was implemented by the Forestry Division of the Department of Agriculture, Forestry and Fisheries in 1981 in view of the rapidly rising fuelwood prices in the capital Apia and the increased tree-felling in the water catchment areas around the town. The main objective was to investigate the current rates of wood consumption, the main sources of supply, the types of stove used and the tree species preferred. The survey coverage was limited to Apia and therefore did not provide are presentative picture of the whole country.

TABLE 1

Summary of energy consumption by sectoral user groups 1983-87 *(In terajoules)*

User group	Electricity[1]				
	1983	1984	1985	1986	1987[4]
i. Transport	–	–	–	–	–
– road					
– aviation					
– marine					
ii. Heavy construction	–	–	–	–	–
iii. Industry	30.7	32.3	23.9	22.5	14.5
iv. Commerce	96.1	106.1	82.6	82.5	54.6
v. Domestic	66.9	63.9	50.5	55.0	38.1
vi. Others	36.2	40.4	34.3	34.2	32.8
Total consumption	229.9	242.7	191.3	194.2	130.0
Percentage of total	7.0	7.2	5.3	5.5	4.1

User group	Petroleum[2]				
	1983	1984	1985	1986	1987[4]
i. Transport	302.0	324.7	369.3	391.0	287.4
– road	150.9	162.1	183.3	189.4	117.6
– aviation	109.9	112.3	127.8	151.4	147.3
– marine	41.4	50.3	58.0	50.5	22.5
ii. Heavy construction	204.8	217.2	443.0	292.1	104.7
iii. Industry	362.7	362.5	366.2	334.0	127.3
iv. Commerce	60.9	70.8	81.2	84.1	40.5
v. Domestic	63.8	77.5	83.2	94.9	32.1
vi. Others	24.2	31.6	34.4	34.1	12.9
Total consumption	1018.4	1085.3	1377.3	1280.2	604.9
Percentage of total	31.2	32.2	38.3	36.0	28.4

TABLE 1

Summary of energy consumption by sectoral user groups 1983-87 *(In terajoules)* (cont.'ed)

User group	Biomass[3]				
	1983	1984	1985	1986	1987[4]
i. Transport	–	–	–	–	–
– road					
– aviation					
– marine					
ii. Heavy construction	–	–	–	–	–
iii. Industry	659.0	672.0	645.0	688.0	494.0
iv. Commerce	–	–	–	–	–
v. Domestic	1361.0	1372.0	1381.0	1392.0	1935.0
vi. Others					
Total consumption	2020.0	2044.0	2026.0	2080.0	1429.0
Percentage of total	61.8	60.6	56.4	58.5	65.5

User group	Total energy				
	1983	1984	1985	1986	1987[4]
i. Transport	302.0	324.7	369.3	391.0	287.4
– road	150.9	162.1	183.5	189.4	117.6
– aviation	109.9	112.3	127.8	151.4	147.3
– marine	41.2	50.3	58.0	50.5	22.5
ii. Heavy construction	204.8	217.2	443.0	292.1	104.7
iii. Industry	1052.4	1067.8	1035.1	1094.5	635.8
iv. Commerce	157.0	176.9	163.8	166.6	95.1
v. Domestic	1491.7	1513.4	1514.7	1541.9	2005.2
vi. Others	60.4	72.0	68.7	68.3	35.7
Total consumption	3268.3	3372.0	3594.6	3554.4	2163.9
Percentage of total	100.0	100.0	100.0	100.0	100.0

Source: Electric Power Corporation/Treasury/Staff estimates
1/ Includes total energy input to generate electricity
2/ Distribution obtained from data received from oil industry sources
3/ Includes fuelwood together with coconut husk and shell fuel
4/ Provisional

A follow-up survey for fuelwood sold in Apia market was conducted in 1983. Since that time, the data obtained have not been updated.

In 1984, the Government approved the setting up of an Energy Division in the Prime Minister's Department following the preparation of a Five-Year Development Plan by an ADB consultant. Unfortunately, this Division has never been established due to lack of appropriate personnel.

In 1987, the Petroleum Unit of the Treasury Department expanded its function to cover all other energy sources including fuelwood and charcoal, but as yet no work has been carried out on this area. However, it is reported that a survey of energy consumption in the country covering all energy sources

is under way.

The country's Sixth Development Plan (1988-1990) provides details of the total energy consumption by source of supply and by sectoral user groups for the period 1983 to 1987 (see Table 1). The data relating to biomass has to be treated with some caution as almost 85% is consumed at village level for which no accurate estimates are available.

4. FOREST PRODUCTS OTHER THAN WOOD

No surveys or estimates of the production of forest products other than wood (non-wood forest products) have been made. Even proper identification and recording of some of these products is lacking. There is some traditional knowledge of the use of some non-wood forest products such as bark and leaves of certain trees which are used for medicines, ointments and costumes.

The people of Western Samoa have traditionally relied heavily on forests for many purposes such as wood for fuel and construction, food, water but the value of the forest is not generally fully appreciated. This is reflected in the lack of attention paid to the protection of this limited resource.

5. TRADE

The Customs Department has its own statistical unit responsible for the collection of trade statistics, including those on forest products.

These trade statistics are published annually in the "Returns of the Trade, Commerce and Shipping of Western Samoa" by the Customs Department and are made available to all government and non-government organisations either by distribution or on request. However, this publication is published with a considerable time-lag. The latest report available is for 1986.

Table 2 shows exports of forest products for 1986.

6. FOREST PRODUCT PRICES

The Government Price Control Board has overall control over the prices of all commodities including sawntimber intended for sale in local markets. The Board periodically issues price series for various commodities. However forest products are not comprehensively covered. The prices of locally-produced forest products such as furniture and sawnwood are determined by producers.

The price of logs or royalty rate is the same for all locally-processed logs (WS$ 7.77/cu.m.).

TABLE 2

Exports of forest products: 1986

Export articles	Destination	Exported quantity (board ft.)	Exported value (WST $)	Total value (WST $)
Timber	Tokelau Is.	141 532	82 089	
	American Samoa	230 264	181 296	
	Cook Is.	6 040	5 248	
	New Zealand	89 032	64 285	
	Tonga	126 932	116 074	
	Australia	18 260	143 730	
	TOTAL	612 060		592 722
Furniture	American Samoa	–	8 059	
	Tonga	–	700	
	TOTAL			8 759
Handicrafts (including wood & non-wood products)	New Zealand	–	5 835	
	American Samoa	–	4 926	
	U.S.A.	–	5 767	
	Cook Is.	–	1 116	
	Australia	–	240	
	Japan	–	200	
	Tahiti	–	3 907	
	TOTAL			21 991

7. COMPUTERS

Computers are extensively used in Government departments and the Treasury Department issues guidelines for the purchasing of computer equipment to ensure compatibility and standardisation throughout Government (see Table 3).

TABLE 3

Computerisation standards for the Government of Western Samoa

Hardware	Comments
IBM PC-XT or PC-AT with:	True, maintainable "compatibles" allowed.
i. 640K RAM	Preferably on the system board.
ii. 20Mb Hard Card/Disk	Minimum advised.
iii. Half-high 5.25" diskette drive	Beware the PC-AT High Capacity drive.
iv. Mono or Colour Monitor	
v. Mono or Colour adaptor	Colour provides graphic capability. Mono graphics requires "Hercules".
vi. Standard and enhanced keyboard.	
vii. Serial and parallel printer interfaces	
viii. 5250 Emulation Board	Optional.
ix. Voltage regulator/line conditioner	Matsunaga SVC-1000W advised.
x. Diskettes	Double-sided, double-density.
xi. All manuals and cables	Essential.

TABLE 3
Computerisation standards for the Government of Western Samoa (cont'ed)

Hardware	Comments
Printer	All EPSON Dot-Matrix printers are very reliable and compatible.
i. Parallel interface and cable	
ii. Manuals	
iii. Four spare ribbons	Initially.
iv. Tractor feed and/or cut-sheet feeder	For continuous-forms paper or single sheets
v. Three varieties of typefaces/font modules	If applicable.
Enhancements to the above minimum configuration may be acquired i.e. additional diskette drive (3.5"/5.25"), larger hard disk/card, EGA and monitor.	
Software (Programmes & packages)	In addition to any unique requirements, the software below will provide ways of exchanging information between departments. The latest version should be obtained, but certainly not less than the stated:
i. PC-DOS — v.3.20	Essential operating system
ii. LOTUS 123 — v.2.01	Used for spreadsheet applications
iii. HAL — v.1.00	Optional Lotus assistant
iv. LOTUS MANUSCRIPT — v.1.00	Used for Word Processing applications
v. WORDSTAR 2000+ — v.2.00	Alternative to Lotus Manuscript
vi. dBase III+	Used for developing any type of system you require
vii. Enhanced 5250 emulation software	Optional: only if you are using the 5250 Emulation hardware to talk to the IBM System 36 computer
viii. All manuals	Essential for all the above software
When deciding on computerisation, it may also help to bear in mind:	
i. If you are looking for a computer to help your workload, remember that a computer can do NOTHING without the RIGHT software!	
ii. The right software for you may already be available as a "package", or it may have to be developed specially	
iii. Training to use the package or specially developed software takes TIME!	
iv. All hardware breaks down!! Make sure your hardware can be maintained here in Western Samoa	
Normally you should choose the software that suits your needs forest, then buy the hardware on which it will run. However, here on the island, several factors have to be born in mind	
i. Government Computerisation Standards	
ii. Hardware and software maintenance	
iii. Future departmental information interchange	
Thus IBM or a true, 100% IBM-compatible machine must be purchased with suitable, compatible software	
Don't be fooled by some advertisements that state "IBM compatible"....most are not FULLY compatible. And most cannot be repaired here on island	

In the Forestry Division, the most widely used software are Lotus 123, Word Perfect and Harvard Graphics.

Training in the use of computers in the Forestry Division is generally done on an on-the-job basis.

8. SUMMARY CONCLUSIONS AND RECOMMENDATIONS

There is no coordination in the collection of national statistics on the forestry sector. The Forestry Division, which is responsible for forestry statistics, tends to overlook this function. Most of the statistics that are collected tend to refer to plantation growth, timber extraction and other statistics of immediate relevance to management of forest resources.

Statistics from the forest industry and trade statistics are collected only when necessary.

There is a lack of trained manpower and resources for the collection of national forest statistics. Systems and methods for collecting statistics are not clear and the statistics collected are inadequate as a result.

Very little attention is paid to the utilization and production of forest products other than wood although some of these products are used extensively, such as medicines, fuelwood, costumes and perfumes.

Adequate statistical information is essential for the development of appropriate policies and strategies for the management of forest resources. However, in Western Samoa many of these statistics are not available. This may be why many forestry and forestry-related projects fail to achieve their objectives.

A request for a TFAP exercise for Western Samoa is now in the pipeline and it is hoped that this will eventually address some of the problems facing the forestry sector. These include the utilization of the remaining indigenous forests, the technical capabilities of timber industries and market prospects of plantation industries. Current programmes do not adequately address these aspects.

Appendix 1
Modern sector products

PRODUCT: INDUSTRIAL ROUNDWOOD

DEFINITION: "Merchantable logs" or "sawlogs" (NC) means a straight log not less than nine feet long and not less than three feet six inches mid-girth under bark provided that:

i. any log with the following or less than the following deviations from the straight shall be considered straight, that is to say:
   a. for logs nine and not exceeding eleven feet in length the maximum deviation shall be two and a half inches.

b. for logs exceeding eleven feet in length one inch shall be added to the maximum deviation cited for every three feet, or part of three feet, of additional length. The above allowances refer to logs that deviate from the straight in one direction only. If a log deviates from the straight in two opposite directions, the logs shall be classed as straight if the sum of the maximum deviation from the straight in each direction is not greater than the allowances stated above.

ii. a log shall not be classed as merchantable
   a. if its volume is reduced by more than one third by branch knots exceeding three inches in diameter, shakes, shatters and decay.
   b. if its heart is spongy, brittle or hollow, unless it has an average thickness of not less than five inches of sound timber when measured in a radial direction. For the purpose of this paragraph, defects caused by fungi or insects that have occurred after the tree has been felled by the License shall be ignored.

iii. if a tree is not so cross-cut as to ensure that as much merchantable timber as possible is obtained from it, its merchantable content shall be assessed as if it had been so cross-cut.

MEASUREMENT UNITS: Units of volume in cubic feet (cu.ft.). Originally the cubic content of each log was assessed from its length and mid-girth under bark and taken from the "Table of Cylindrical Volume". Now this method has been changed and cubic content is assessed from its length and average diameter from the big and small end diameter, and taken from the "Indigenous Log Volume Table".

METHOD OF SURVEY & COVERAGE: The measurement of logs is done in conjunction with the licensee everyday when logging is in operation.

A working plan prepared by the Forestry Division is added as the Second Schedule to the Deed of License issued by the Ministry of Forestry and Ministry of Lands and Environment. This plan covers all the prescriptions of management related to the land/forest approved for logging. Inspection after logging is also covered to ensure that logging has been done in compliance with the working plan and the Forest Regulations of 1969. However, one area which is not included in this data collection is the residual volume after logging. This should be done immediately after logging but, as most of the land and forest is under customary ownership, villagers usually move in to cultivate newly cleared land rather than developing silvicultural management techniques for further logging in the future.

FREQUENCY: Measurement of merchantable logs or sawlogs is done every day as long as logging is in operation. Measurement of logs and volume determination is also done by species but assessment and calculation for royalty payment is done inclusively (i.e. one royalty rate for all species) at the end of each month.

Review of the status of the indigenous forest resource is done by the Forest Division based on previous forest inventories and other available data, and on information such as aerial photographs and topographical maps.

OFFICE RESPONSIBLE: Forestry Division of the Department of Agriculture, Forests and Fisheries.

PUBLICATION: No publication as yet except for internal reports and departmental annual reports in which some of these data are published.

PRODUCT: SAWNWOOD

DEFINITION: Sawntimber (NC) varies from simple building timbers and boards and squares for furniture for local needs, to graded lumber of many lengths, sizes and qualities for export.

MEASUREMENT UNITS: Board feet (bdft.)

METHOD OF SURVEY & COVERAGE: Information can be obtained from sawmills from their regular returns which record daily output. Sometimes the volume and size of timbers produced can be based on orders placed by retailers and consumers.

FREQUENCY: Collection of data is done on a regular basis by sawmills concerned.

OFFICE RESPONSIBLE: Sawmills.

PUBLICATION: Company's monthly returns.