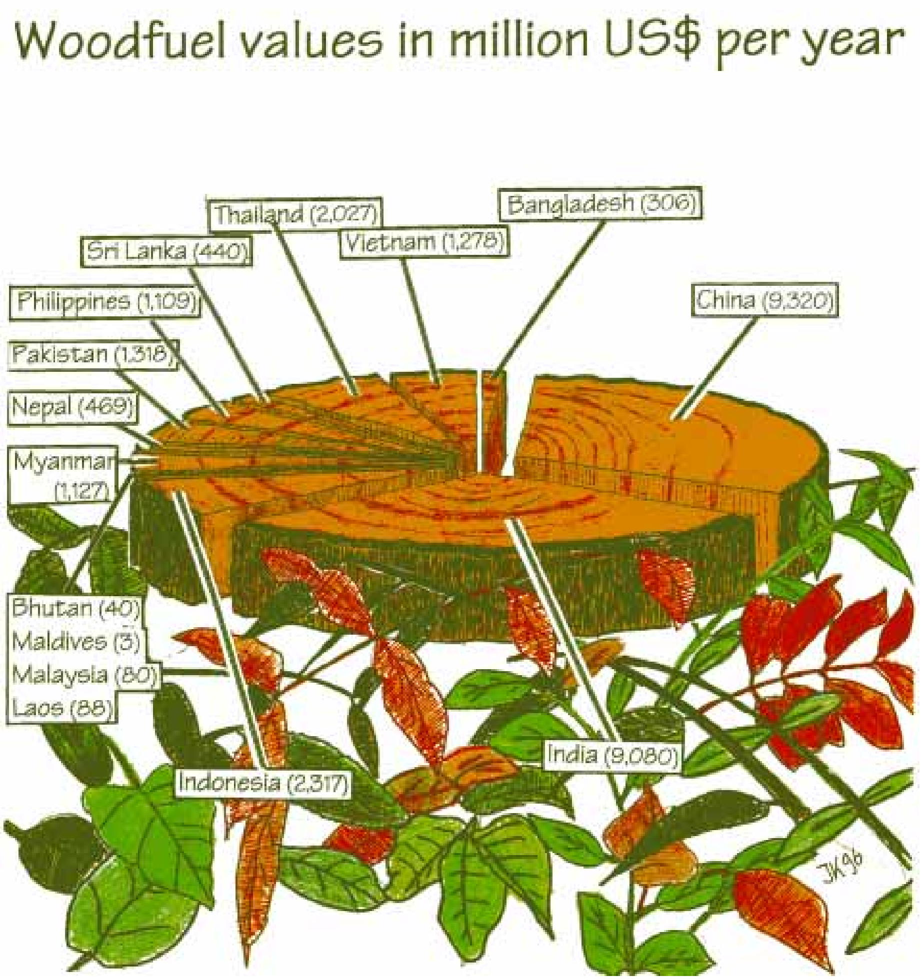
WOOD ENERGY NEWS

June 1996

Vol. 11 No. 2

Issued by the **Regional Wood Energy Development Programme in Asia (GCP/RAS/154/NET)**



Wood Energy Data

Contents

Colophon

Project Information

The Regional Wood Energy Development Programme in Asia (RWEDP) aims to assist 15 developing countries in establishing and strengthening their capabilities to assess wood energy situations, plan wood energy development strategies and implement wood energy supply and utilization programmes. The programme promotes the integration of wood energy in the planning and implementation of national energy and forestry programmes.

Wood Energy News

The programme's newsletter, *Wood Energy News*, which is published on a regular basis, addresses a wide variety of wood energy issues, such as woodfuel resources, woodfuel flows, wood energy planning and policies and wood energy technologies. Its purpose is to share information on wood energy with its subscribers. Suggestions, reactions or contributions are more than welcome, and don't forget to share your own experiences.

Those wishing to obtain *Wood Energy News* can write to the RWEDP secretariat at:

Regional Wood Energy Development Programme in Asia (GCP/RAS/154/NET)
FAO Regional Office for Asia and the Pacific
Maliwan Mansion, Phra Atit Road
Bangkok 10200, Thailand

Fax: +66-2-280 0760
Phone: +66-2-280 2760
E-mail: rwedp@fao.org

Project Members

Dr W Hulscher — Chief Technical Advisor
Auke Koopmans — Wood Energy Conservation
Conrado Heruela — Wood Energy Planning
Tara Bhattarai — Wood Energy Resources
Lydia Braakman — APO/Training
Jaap Koppejan — APO/Wood Energy Conservation
Marieke Toes — APO/Information Systems

Editorial

Basic wood energy data are important for various different policy areas, like economy, employment, agriculture, rural development and environment, in addition to forest and energy policies. For instance, when valued in terms of money, the woodfuel sector in the RWEDP member countries amounts to some 29 billion US$ per annum. This amount is substantial within the regional economy e.g. when compared to overall export earnings. About 10% of the rural population, or 200 million people, find their main cash income in the woodfuel business, and local employment in the wood energy sector is at least 20 times larger than that in the oil sector (per unit of energy). This information is or should be highly relevant for policies on employment and rural development. Furthermore, wood and biomass supply more than half of the region's energy, which is yet to be fully incorporated into national energy policies. In absolute terms the consumption of wood energy is still increasing in all 15 RWEDP member countries, and overall 2/3 of it originates from agricultural land, which is an important consideration for policies on agriculture. Last but not least, it is stated that more than 80% of a tree harvested for timber does not end up as timber, which seems to be an enormous waste in terms of forest management and the environment, but is it really?

The present issue of Wood Energy News presents some new data and summarises basic information which, so far, only a few people have been aware of. As yet, the data are far from complete. RWEDP, jointly with member countries, is in the process of strengthening wood energy data bases. The required methods, skills and facilities in member countries are advancing.

Developing policies with regard to wood energy needs more than a few key figures, and wood energy planning also requires disaggregated and site-specific data. Though data and planning do not solve wood energy problems, they can provide a basis for effective policies. Which data do we need most? It is sometimes argued that planning for wood energy cannot be properly undertaken because, unlike planning for fossil fuels, it suffers from unreliable data or lack of data. However, recent studies show that data on fossil fuel use can have inconsistencies as large as 30%. So, where do we actually stand?

We should not dream of ever having at our disposal a complete set of wood energy data. Our objective should rather be to provide decision makers with sufficient information on the main issues and trends, which could be generated on a recurrent basis by a country's own institutions. The challenge is then how to facilitate, select, and optimise data acquisition and organisation, given the limited resources available. The present issue of Wood Energy News provides some answers and at the same time poses many questions.

Front page: Woodfuel values in million US$ per year (drawing by J. Koppejan)

Programme Focal Points

Bangladesh: Chief Conservator of Forests, Forest Dept, Min. of Environment and Forest; Industry and Energy Dev., Planning Commission, Min. of Planning.
Bhutan: Dir, Dept of Power, Min. of Trade; Joint Secretary, Forest Services Division, Min. of Agriculture.
Cambodia: Chief Community Forestry Division, Reforestation Office, Dept. of Forests and Wildlife
China: DG, Dept of International Cooperation, Min. of Forestry; Dp. Dir INFORTRACE.
India: Inspector General of Forests, Min. of Environment and Forests; Secr., Min. of Non-Conventional Energy Sources.
Indonesia: DG of Electricity and Energy Devt; Dir of Regreening and Social Forestry, Min. of Forestry.
Laos: DG, Dept of Forestry, Min. of Agriculture and Forestry.
Malaysia: DG, Forest Research Institute; DG, Economic Planning Unit, PM's Dept.
Maldives: Dep. Director, Agricultural Services, Min. of Fisheries and Agriculture
Myanmar: DG, Forest Dept; DG, Energy Planning Dept, Min. of Energy
Nepal: DG, Forest Dept; Executive Secretary, Water and Energy Commission Secretariat
Pakistan: Inspector General of Forests, Min. of Env., Local Govt and Rural Devt.; Chairman, Pakistan Council of Appropriate Tech.; Chief, Energy Wing, Planning and Devt. Divison
Philippines Secretary, Dept of Energy; Secretary, Dept of Environment and Natural Res.
Sri Lanka: Conservator of Forests, Forest Dept; Sec., Min. of Irrigation, Power & Energy.
Thailand: DG, Royal Forest Dept; DG, Dept of Energy Development and Promotion.
Vietnam: Director, Forest Sciences Institute; Dep. Dir., Institute of Energy, Min. of Energy

Wood Energy Data - An Overview

A major constraint in the integration of wood into national energy planning exercises is an inadequate wood energy information base. Such a constraint also results in an insufficient understanding of wood energy systems, all of which lead to weaknesses in (or even lack of) wood energy development policies and strategies. In the end, this undermines wood energy development in a country even if commitments are made at top policy levels.

Many RWEDP member countries have now acknowledged this constraint and have accepted the need to improve their information bases for wood energy development. Mainly as a result of the seminars, consultations and training activities organised by RWEDP, the remaining countries have also begun to recognise that this can be a difficult but a necessary task to do.

Collecting primary data on wood energy is difficult because wood energy-related activities are mainly in the informal sector. In most cases the production, supply, distribution and consumption of wood fuels do not pass through the monetised economy. Even if they do, they remain largely unrecorded. Unlike fossil fuels and electricity, there are no accounts of sales or bills from which data can be derived. If information has to be collected, surveys or case studies requiring special data collection methods need to be designed and data collection has to be undertaken by specially trained staff. Such data collection initiatives can be expensive and time-consuming and will, in many cases, require pre-training activities for people who will be involved in them.

Collecting data from secondary sources is a less expensive and faster alternative for building up a wood energy information system. In most countries, data on wood resources potential and supply have been extrapolated from forestry data. Data on wood fuel consumption are derived from several types of surveys, many of which have been conducted by the national statistical offices. In many cases, as a result of the energy crisis of the 70's and of energy becoming a major national policy concern, some of these surveys are energy consumption surveys.

However, caution should be taken when using secondary data, particularly when attempting to use them for wood energy assessment and analysis. There are problems of consistency in the data collection techniques and conversion factors used in arriving at the final published data. Many data systems are not up-to-date and have not incorporated aspects of wood energy systems which have recently been studied such as: non-tree sources of woody biomass (such as shrubs), wood fuel supply from non-forest areas, the trading and transportation of wood fuels, other end-users such as industries and enterprises, and the market demand for wood fuels in urban areas. There is also a lack of data dealing with the social dimension of wood energy - i.e. information on the people who are involved in the production, gathering, trading, transportation and consumption of wood fuels.

Further, the available secondary information is composed of highly-aggregated national data or locally-based studies containing mostly qualitative facts. Many of the highly aggregated national data are in a form which are not useful for planning national programmes and strategies, given the site-specific nature of wood energy systems. The local studies on the other hand do not present enough quantitative data for a thorough process of project identification and formulation.

However, secondary data can be used as building blocks towards establishing an adequate and timely national wood energy information system. It can provide an initial information base to underscore the importance of addressing wood energy development as a major policy and development concern in the energy and forestry sectors, and also in the forestry, agriculture and rural development sectors.

RWEDP has compiled in this issue of WEN, the most recent data on wood energy available to provide our readers with a picture of wood energy systems in Asia. This issue hopefully, will help to prompt key decision-makers to recognise wood energy as a major policy and programme concern, and adopt and develop appropriate policies and strategies for wood energy development including, the updating or the establishment of an adequate information system for wood energy development.

Household Energy and the Fuel Ladder - Case India

When households 'step down on the fuel ladder' it is a sign of shortages of the preferred fuel and/or decreased purchasing power. In India three main trends seem to occur: 1) modern energy is increasingly used for productive and household activities; 2) in some areas rural people, instead of moving up the preferred fuel ladder, are moving down towards inferior fuels like straw, leaves and twigs; 3) the relative importance of the three major biofuels has changed over the years in rural areas. These trends are illustrated in table 1.

Table 1: Energy consumption in rural households in India.

Fuel Type	% Share 1978-79	% Share 1992-93
Coal/soft coke	1.92	0.38
Kerosene	2.55	4.44
Dung cake	22.51	17.00
Firewood logs	18.95	32.49
Firewood twigs	35.62	29.11
Crop waste	17.41	13.35
Others	1.03	3.23
Total	100.00	100.00

Sources: I. Natarajan, WEN Vol. 10.4; and N.C. Saxena (to be published).

Energy Balances in RWEDP Member Countries

JS

The energy situation of a country for a certain year is often presented in terms of an energy balance, which represents the total energy flow of several energy sources and products from primary production, through transformation processes, to the final consumption. This includes indigenous production, imports & exports, transformation and distribution losses and sectoral consumption.

Recently RWEDP developed an outline for a wood and biomass energy balance which can be used to present data on wood & biomass energy production, transformation and consumption for a region, country or sub-national area (see Wood Energy News, Vol. 10, No. 4). It follows the United Nations standard energy balance as far as possible and can be conveniently used to facilitate the integration of the wood/biomass energy balance with existing (national) energy balances.

To get an overview of wood & biomass data in national energy balances at present, RWEDP reviewed the available energy balances for its member countries published by national energy agencies and international organisations (United Nations, AEEMTRC: ASEAN-EC Energy Management Training and Research Centre). For those countries for which no energy balances were available the data of the World Resources Institute (WRI) were used. For Maldives no data were available. Data on the share of wood and other biomass from the energy balances are presented in figure 1 and in table 2.

Some general observations on wood and biomass in energy balances are given below:

- Energy balances were only available for Bangladesh, China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. Of these, only six came from publications of the country's national energy department, the rest came from publications of international government and non-government organisations;

- For all countries the consumption of biomass fuels is increasing, whereas the share of biomass energy in the total energy consumption is declining for most, and stable for some countries (see also figure 5 for data on Nepal, and table 2 for all countries);

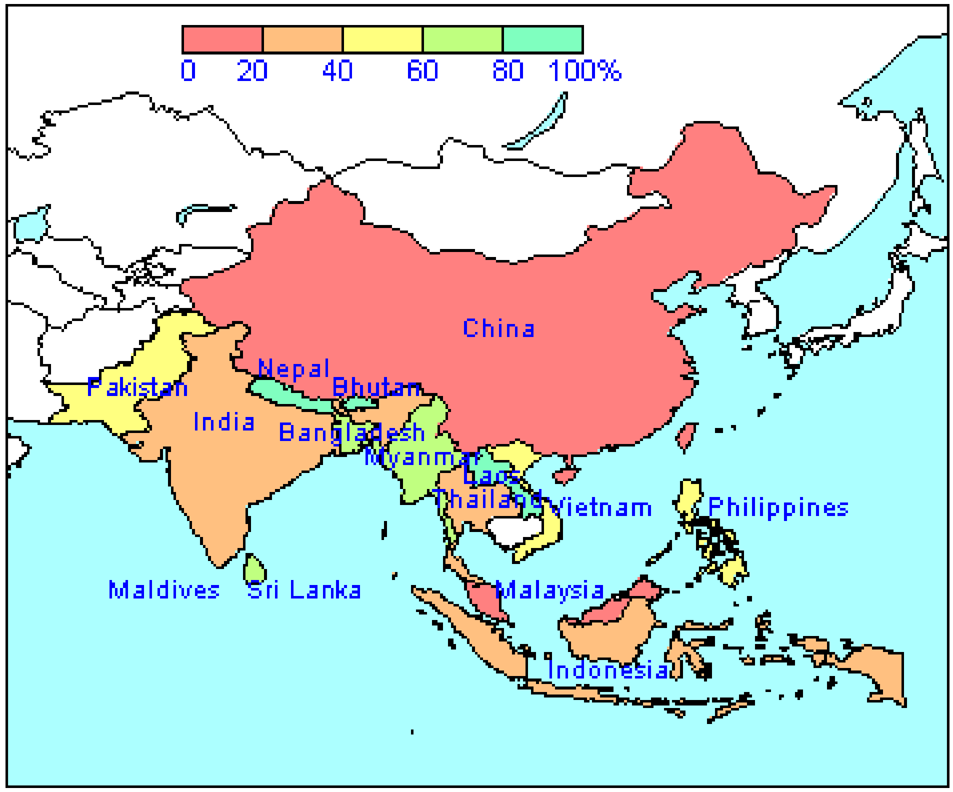


Figure 1: Share of biomass in total energy consumption (%).

- Most energy balances group several biomass fuels into one or two categories. Fuelwood is included as a separate column in the energy balances of Bangladesh, Nepal, Thailand, Vietnam (without data) and AEEMTRC. The UN mentions primary (including fuelwood, bagasse, animal, vegetal and other waste, alcohol and biogas) and derived biomass energy (e.g. charcoal). AEEMTRC distinguishes wood and other biomass. Definitions are not given (e.g. it is not stated whether 'wood' includes charcoal or whether 'other biomass' includes animal waste). WRI uses a conventional versus traditional (fuelwood, charcoal, animal and vegetal wastes) classification for energy consumption;

- None of the energy balances distinguishes between rural and urban households/areas, and large and small-scale industries. Such a distinction would be relevant for wood & biomass energy since rural households and small-scale industries are generally the main wood and biomass energy consumers;

- Probably for all energy balances the data for the conversion and production of biomass energy are derived from the consumption data using a standard conversion efficiency, because none of the energy balances accounts for distribution losses or statistical differences for biomass fuels;

- The commercial sector is often grouped with the residential sector. For those energy balances where the commercial sector is distinguished as a separate sector the biomass energy consumption is very low, which may be more due to lack of data and the difficulty of distinguishing it from the residential sector than to the low consumption of biomass fuels per se;

- Data from different sources are hardly consistent, for both conventional and biomass energy (see table 4).

This overview does not pretend to be complete. There may be other sources of energy data and balances that RWEDP is not aware of, so we would like to encourage national energy agencies and others to provide these data.

Table 2: Share of biomass & wood energy consumption.

Country	Year	Share of Biomass (%)	Share of Wood (%)	Share of Biomass in Domestic Sector (%)
Bangladesh[2]	1992	73	13	89
Bhutan[3]	1991	82	-	-
China[4]	1992	10	-	25
India[4]	1992	33	-	78
Indonesia[5]	1992	39	31	73[1]
Laos[3]	1991	88	-	-
Malaysia[5]	1992	7	2	15[1]
Myanmar[3]	1991	74	-	-
Nepal[2]	1992-3	92	68	97
Pakistan[2]	1993-4	47	27	83
Philippines[5]	1992	44	26	66[1]
Sri Lanka[2]	1990	77	-	93
Thailand[2]	1994	26	9	65[1]
Vietnam[3]	1991	50	-	-

- No data available, [1] Domestic and commercial sector, [2] National energy balance
[3] World Resource Institute, [4] United Nations, [5] AEEMTRC

Biomass Energy Consumption is Increasing

JS

Table 3 gives the total biomass energy consumption in all RWEDP countries (except Maldives, for which no data were available) in 1981, 1986 and 1991. This shows that for all countries the consumption has increased considerably over these years. Of course this is mainly caused by population growth. However, for most countries the consumption per capita also increased slightly or was stable, which indicates that any increase in conventional energy consumption came on top of traditional biomass consumption (for new applications such as developing industries) rather than replacing it as is often assumed. For half of the countries the average annual growth of biomass consumption was even higher in the period 1986-1991 than 1981-1986, so a decrease is not foreseeable. Despite the rapid industrialization of some RWEDP countries, wood and biomass energy consumption are still increasing and not likely to phase out in the near future. Therefore strong policies are needed to ensure a sustainable energy supply. Since land and biomass resources are limited and there are competing end uses for land due to population growth (e.g. agriculture, settlements) measures have to be taken to improve the production and consumption of biomass fuels.

Table 3: Biomass energy consumption (PJ) in member countries.

Country	1981	1986	1991
Bangladesh	243	262	277
Bhutan	7	9	12
China	1,541	1,820	2,018
India	2,165	2,441	2,824
Indonesia	1,181	1,320	1,465
Lao PDR	29	33	39
Malaysia	69	78	90
Myanmar	156	175	193
Nepal	113	197	206
Pakistan	192	233	296
Philippines	308	327	382
Sri Lanka	70	78	89
Thailand	484	546	526
Vietnam	197	222	251
Total:	6,755	7,742	8,666

Source: World Resource Institute, 1995.

Energy Data From Different Sources

JS

Lack of data on wood and biomass energy production and consumption, or its unreliability, is often cited as a reason for the lack of planning for these energy forms, and therefore these data are not included in national energy balances and statistics. Data on conventional fuels provided by its producers are thought to reflect the true situation and to be reliable whereas biomass energy data are thought to be no more than rough estimates.

Below, two examples are given that show that data on conventional energy can also be ambiguous. The first example (table 4) compares the data on consumption of conventional and traditional energy in Thailand in 1991 as provided by different organisations i.e. the Department of Energy Development and Promotion of Thailand (DEDP), the United Nations (UN), and the World Resources Institute (WRI). The data of DEDP and UN are reasonably consistent (which is not always the case for other countries), but the figures of WRI differ by up to 35% for conventional energy and up to 70% for traditional energy. The UN reports have received their data from national agencies, and WRI cites the UN as its source, so where do the differences originate from? Is it a matter of differences in definitions, heating values applied, or different national agencies and departments in the UN that publish different data for the same country?

The second example compares two energy balances of a RWEDP member country for 1991, both published by its sole national energy agency in different publications. Table 5 shows the total fuel consumption according to the two sources and the differences between them, which are as high as 79%. It should be noted that the conventional fuels show the largest differences. No systematic differences can be found. Both balances were presented as the energy balance of 1991, and no indications for projections or revisions were reported, so where do the differences originate from?

These two examples show that also data on conventional energy production and consumption should be interpreted with great care. It can be assumed that these examples are more than accidents and similar cases can be found for other countries and data sources.

Table 4: Comparison of energy consumption data in Thailand from different data sources, 1991.

Energy Type / Data Source	Conv. Fuels (PJ)	Trad. Fuels (PJ)	Share of Trad. Fuels (%)
DEDP	1,006	310	23.6
UN	957	303	24.0
WRI	1,281	526	29.1

Table 5: Comparison of energy balances of Nepal 1991/92 energy consumption (TJ).

(Unit: Tera Joules)	Balance 1	Balance 2	Difference (%)
Fuelwood	180,558	199,799	-10
Residues	38,072	32,737	16
Dung	21,781	23,893	-9
Coal	2,311	2,317	0
LPG	281	281	0
Motor Spirit	1,261	896	41
ATF	1,071	818	31
Kerosene	5,753	4,489	28
H.S.D. Oil	7,579	6,631	14
L.D. Oil	126	100	26
Fuel Oil	97	459	-79
Electricity	2,347	2,411	-3
Other	180	406	-56

Sources of Woodfuels

AK

The ‘gap-theory’, often quoted in the past and used to justify action in the field of enhancing forest resources as well as wood energy conservation programmes, was based on the belief that many, if not all, woodfuels originated from forests. The ‘gap’ between demand and supply was then used to calculate how long it would take before all the forests would disappear due to woodfuel use. However, 10-15 years of in-depth studies have shown that non-forest areas supply considerable amounts of woodfuels. In fact, evidence (albeit sketchy) shows that in many countries a major part, often over 50%, of woodfuels is derived from non-forest areas. The latter include village lands, agricultural land, agricultural crop plantations (rubber, coconut, etc.), homesteads, trees along roads, etc. Table 6 gives a brief overview of the sources of woodfuels in some RWEDP member countries.

Table 6: Indicative sources of fuelwood used in various RWEDP member countries for household (HH) and industrial (Ind.) use in % of total amount used.

Country	Year and Sector	Million ton	Forest land[1]	Other land[2]	Public land[3]	Unknown
Bangladesh[4]	'81 HH and Ind.	5.5	13	87	---	---
Indonesia[5]	'89 Urban HH	0.5-1.0	6	65	---	29
Nepal[6]	'85 HH and Ind.	11.3	66	34	---	---
Pakistan[7]	'91 HH	29.4	12.6	84.1	---	3.3
Philippines[8]	'89 HH	18.3	13.7	86.3	---	---
Sri Lanka[9]	'93 HH and Ind.	9.2	11	75	---	14
Thailand[10]	'92 Rural HH	5.74	---	56	37	7

1 Forest land includes forest plantations
2 Other land is mainly own land, neighbours land, common land, etc.
3 Public land may include forest land
4 Bangladesh Energy Planning project. Final Report. ADB/UNDP, 1987
5 Urban Household Energy Strategy Study. ESMAP, 1990
6 Master Plan for Forestry Sector Nepal, Main Report Dec. 1988 ADB - Finnida
7 Sources of fuelwood are based on number of responses. Pakistan Household Energy Strategy Study. ESMAP, 1991
8 Philippine Household Energy Strategy Study. ESMAP, World Bank 1991
9 Sri Lanka Forestry Sector Master Plan. Min. of Agriculture, Lands and Forestry, 1995
10 Thai Forestry Sector Master Plan. Subsectoral Plan for Production and Utilization (Vol. 6), Min. of Agriculture and Cooperatives, Royal Forest Department 1993

Woodfuels and Employment

AK

Although a large part of the woodfuels supply is gathered by the users themselves, the woodfuel trade is also important, particularly for urban areas as well as for industrial consumption.

The figures given in table 7 for the woodfuels are probably based on large(r) scale operation only, as evidence from rapid rural appraisals suggests that small scale producers in rural areas collect 20-80 kg. per day. Transporting and retailing this amount may take another day depending on area, means of transport and distance to the market. Using these average figures for small scale rural producers, the employment figure for woodfuels is probably 10 times higher than that shown in the table.

Table 7: Estimated employment per fuel type.

Fuel type	Tons of Fuel per Tera Joule (TJ)	Estimated Employment per TJ Energy Consumed in Person Days[1]
Kerosene[2]	29 Kilo Litre	10
LPG[2]	22 Tons	10-20
Coal[3]	43 Tons	20-40
Electricity[4]	228 MWh	80-110
Fuelwood[5]	62 Tons	110-170
Charcoal[5]	33 Tons	200-350

Source: Estimates by the World Bank mission members for the Philippine Household Energy Study.
1 Where applicable employment covers growing, extraction, production, transmission, maintenance, distribution and sales, including reading meters. It excludes employment generated outside the country for fuels that are imported in semi-finished or finished state
2 This assumes that crude oil (for refining), kerosene and LPG are imported.
3 Varying according to capital intensity of the mine, seam thickness, energy value of the coal as well as the distance from demand centres.
4 Varies according to production method ranging from hydro to traditional oil/coal fired units and the efficiency of electricity generation, transmission and distribution.
5 Depending on productivity of the site, efficiency of producers and distance from the market.

Woodfuel Use and the Value of Woodfuels

AK & JK

Although the domestic sector accounts for the lion's share of woodfuel use in most countries, many other end-users such as industries are also dependent on woodfuels. Much of this use is in the informal sector for which very little information is available and for that reason the industrial consumption figures are in many cases under-reported. Experience has shown that in most developing countries the industrial sector accounts for 10-30% of all woodfuel use. Table 8, however, indicates that industrial fuelwood use accounts for only 3% of all woodfuel use. The same under-reporting may also occur, to a certain extent, for the domestic sector, as woodfuel consumption is often based on estimates of average per capita consumption figures. Using data contained in official statements of national energy balances, as well as additional sources of information, table 8 has been drawn up, showing fuelwood and charcoal use in the domestic and industrial sectors of RWEDP member countries.

Table 8 gives an indication of the amounts used in the domestic and industrial sectors expressed in '000 tons of oil equivalent or KTOE (1,000 ton oil equivalent or 1 KTOE equals about 2,766 tons of wood or about 4,600 cubic meters of wood at 600 kg. per cubic meter).

The value of woodfuels consumed has been estimated by using average calorific values of woodfuels as well as fuelwood and charcoal prices from FAO forestry statistics. This calculation shows that the estimated value of the recorded woodfuel use in the 15 RWEDP member countries reaches a staggering 29 billion US dollars per year. This value is expected to be even larger due to under-reporting of woodfuel use in many countries. Furthermore, the result does not account for the social value of fuelwood supply activities.

In order to put the value of woodfuels in perspective, various comparisons can be made. One example is a comparison between the estimated woodfuel value and the value of energy imports. In the case of Thailand, where woodfuels account for less than 30% of all energy use, the value of woodfuels is estimated to be about 2 billion US dollars which is more than 50% of the 1994 energy import bill of 95.5 billion baht (about 3.8 billion US$). If woodfuels were to be substituted by kerosene in Thailand, the import bill would rise considerably. Using average data for stove efficiencies, heating values and oil prices, it can

Table 8: Energy consumption in RWEDP member countries calculated in Peta Joules (PJ) from information contained in Energy Balances etc.

Country	Fuelwood			Charcoal			Year
	Domestic	Industrial	Total	Domestic	Industrial	Total	
Bangladesh[1]	95.76	18.93	114.69	0	0	0	1989/90
Bhutan[2]	12.25	0.99	13.80	0	0.37	0.37	1988/89
China[3]	3,495.00	0	3,495.00	0	0	0	1990
India[4]	3,165.00	240.00	3,405.00	0	0	0	1991
Indonesia[5]	868.76	0	868.76	0	0	0	1992
Laos[6]	32.83	0	32.83	0	0	0	1990
Malaysia[7]	11.79	0	11.79	5.69	0	5.69	1992
Maldives[8]	1.05	0	1.05	0	0	0	1987
Myanmar[9]	342.87	0	342.87	24.65	0	24.65	1990
Nepal[10]	169.30	6.43	175.73	0	0	0	1994/95
Pakistan[11]	493.85	0	494.10	0	0	0	1993/94
Philippines[12]	231.74	0	231.74	56.98	0	56.98	1992
Sri Lanka[13]	136.12	0	163.34	0	0	0.54	1992
Thailand[14]	161.93	0	161.93	185.01	0	185.01	1994
Vietnam[15]	395.54	0	427.12	15.44	0.08	16.10	1990
RWEDP member countries	9,613.78	266.35	9,939.75	287.76	0.45	289.33	
% of Total	93.98	2.60	97.17	2.81	0.00	2.83	

[1] Rural Energy and Environment Planning for Sustainable Rural Development in Bangladesh. Ahsan Habib, 1994

[2] Wood Energy Sectoral Analysis. FAO-RWEDP, Field Document 32, [3] ESCAP - Executive Seminar and Study Tour, 1991

[4] Biomass, Energy and Environment. N.H. Ravindranath and D.O. Hall 1995 (Table 2.2 Low Est.), [5] ASEAN Energy Review . Vol. 3, AEEMTRC, 1994

[6] Sectoral Energy Demand in Laos, REDP, 1989, [7] ASEAN Energy Review . Vol. 3, AEEMTRC, 1994

[8] Sectoral Energy Demand in the Maldives, REDP, 1989, [9] Myanmar Energy Sector Investment and Policy Review Study. WB 1991 (Annex 1.2b)

[10] Energy Synopsis Report. Water and Energy Commission, April, 1996, [11] Asian Energy News, November 1995,

[12] ASEAN Energy Review Vol. 3, AEEMTRC, 1994

[13] Sri Lanka Energy Balance. Ministry of Power and Energy, September 1995

[14] Thailand Energy Situation, 1994. Department of Energy Development and Promotion, 1995

[15] Vietnam: Rural and Household Energy Issues and Options. WB-ESMAP, 1994

be shown that the energy import bill of Thailand would rise by about 850 million US dollars. Even though this amount is high, it is considerably lower than the woodfuel value. The difference is caused by the better end-use efficiency of kerosene stoves.

Another comparison can be made by comparing it with the export earnings per country in the same period. An overview is shown in table 9 and figure 2. Updated figures are not yet available, but they are likely to confirm the same point. For those countries where woodfuels are an important source of energy, it is clear that substituting woodfuels by kerosene would be difficult, if not impossible, as a large part of the export earnings would be required to pay for the import of kerosene (apart from many other reasons!).

Table 9: Woodfuel values in million US$ using average woodfuel prices.

Country	Fuelwood	Charcoal	Dom. FW	Dom. Char	Ind. FW	Ind. Char	Total
Bangladesh	306	-	255	-	50	-	306
Bhutan	37	3	33	-	3	3	40
China	9,320	-	9,320	-	-	-	9,320
India	9,080	-	8,440	-	640	-	9,080
Indonesia	2,317	-	2,317	-	-	-	2,317
Laos	88	-	88	-	-	-	88
Malaysia	31	49	31	49	-	-	80
Maldives	3	-	3	-	-	-	3
Myanmar	914	213	914	213	-	-	1,127
Nepal	469	-	451	-	17	-	469
Pakistan	1,318	-	1,317	-	-	-	1,318
Philippines	618	491	618	491	-	-	1,109
Sri Lanka	436	5	363	-	-	-	440
Thailand	432	1,595	432	1,595	-	-	2,027
Vietnam	1,139	139	1,055	133	-	1	1,278
RWEDP member countries	26,506	2,494	25,637	2,481	710	4	29,000

Fuel prices in	**US$/Ton**	**US$/GJ**	**End-use efficiencies of stoves**		**Fuel heating value GJ/Ton**	
Fuelwood	40	2.67	Fuelwood	20%	Fuelwood	15 GJ/Ton
Charcoal	250	8.62	Charcoal	30%	Charcoal	29 GJ/Ton

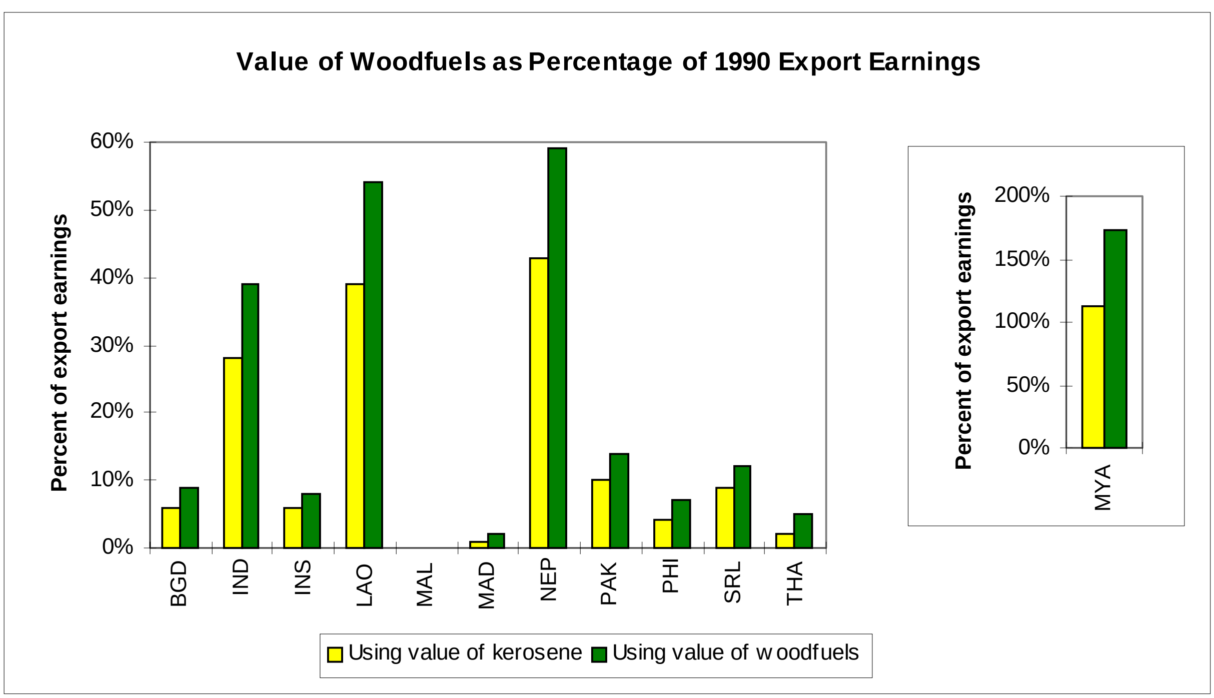


Figure 2: Value of woodfuels as percentage of 1990 export earnings.

Share of Woodfuel in Total Roundwood Production

The data provided in table 10 and figure 3 on the total roundwood and woodfuel production in 1992 are both derived from the FAO Yearbook: Forest Products 1981-92. This yearbook shows an extremely high proportion of woodfuel in total roundwood production in the fifteen member countries of RWEDP in Asia. Their combined roundwood production in 1992 was about 1,040 million m^3 , out of which about 819 million m^3 (or 79%) was accounted for by woodfuel. Although China and Thailand also imported roundwood, approximately 6.5 and 2.0 million m^3 respectively, followed by India and the Philippines, both less than 1.0 million m^3, others did not import any at all in 1992. This high share of woodfuel in total roundwood production is a clear manifestation of their heavy reliance on fuelwood and charcoal for energy. The share of fuelwood and charcoal (woodfuel) in total roundwood production is low (17%) only in Malaysia, which is on a par with the most developed countries in Europe. But in no other country is its share less than 69% (China), and as high as 97% in Bangladesh and Myanmar. For comparison, the share of fuelwood and charcoal in total roundwood production in North and Central America, South America, Europe and Asia accounts for 21%, 67%, 16% and 76%, respectively.

The RAP Publication 1995/22: Selected Indicators of Food and Agriculture Development in Asia-Pacific Region, 1984-94, published by FAO, Bangkok does

Table 10: Forest area, plantation, wooded land, roundwood and woodfuel production in member countries.

RWEDP Member Countries	Forest Area[1]		Plantation[3]		Wooded Land[3]		Total Roundwood Production in 1992 (million cum)[3]	Total Woodfuel Production in 1992 (million cum)[2]	Share of Woodfuel in Total Round Wood Production (%)
	Million ha	%	Million ha	%	Million ha	%			
Bangladesh	0.769	6.0	0.335	2.60	1.121	8.60	31.907	31.014	97
Bhutan	2.809	60.0	0.005	0.10	n.a.	0	1.610	1.332	83
China	115.050	12.0	33.310	3.60	27.730	2.97	296.560	203.800	69
India	51.729	17.0	18.900	6.40	16.771	5.60	282.359	257.789	91
Indonesia	109.550	60.5	8.750	5.00	0	0	185.630	146.300	79
Laos	13.170	57.0	0.006	0.02	0	0	4.400	4.100	93
Malaysia	17.580	54.0	0.116	0.35	0	0	54.010	9.200	17
Maldives	0.001	3.3	n.a.	n.a.	0	0	n.a.	n.a.	n.a.
Myanmar	28.860	44.0	0.335	0.51	0	0	22.730	18.600	82
Nepal	5.023	37.0	0.080	0.60	0.327	2.39	19.591	18.971	97
Pakistan	1.855	2.4	0.240	0.31	3.195	4.14	26.567	24.379	92
Philippines	7.830	26.0	0.290	0.97	0	0	38.650	35.000	90
Sri Lanka	1.746	27.0	0.198	3.06	0.354	5.64	9.229	8.566	93
Thailand	12.730	25.0	0.756	1.48	0	0	37.590	34.800	93
Vietnam	8.310	25.5	2.100	6.45	0	0	29.620	25.200	85
TOTAL	377.012	21.4	65.421	3.71	49.498		1040.453	819.051	79

[1] Source: FAO Forestry Paper 112, Forest Resources Assessment 1990: Tropical Countries, FAO 1993

[2] Source: FAO Yearbook: Forest Products 1981-1992, FAO 1994, [3] Source: World Resources 1994-1995

not show a decline in the average annual growth rate of fuelwood and charcoal production in any of the RWEDP member countries. As a matter of fact, it is still growing everywhere, average between 1.9% and 1.4% in rapidly industrializing countries like Indonesia and Thailand, and in others at a growth rate of not less than 2%, annually. On the other hand, industrial roundwood production in Bangladesh, Bhutan, Philippines, Sri Lanka and Thailand has declined at an average annual rate of -4.5%, -8.1%, -6.2%, -0.5% and -5.5%, respectively, between 1983 and 1993. In the remaining member countries, it has increased significantly in Laos and Pakistan by 8.8% and 11.9%, respectively. In Indonesia and Malaysia it has increased moderately, 3.9% and 4.1% respectively, and in the remaining countries the growth has been only marginal, from 0.7% to less than 3%.

Although most countries in the region have been progressing rapidly in terms of their economic growth in recent years, use of fuelwood and charcoal for energy has not declined any where in absolute terms over the years. The domestic sector is the single-most user of wood energy for cooking, space heating and agro-processing, primarily in rural areas. Infrastructure, availability and affordability of substitute fuels, local socio-cultural practices, income and living standards of users, government policy related to energy, etc., all seem to play an important role in the selection of fuel by households for meeting their basic energy needs.

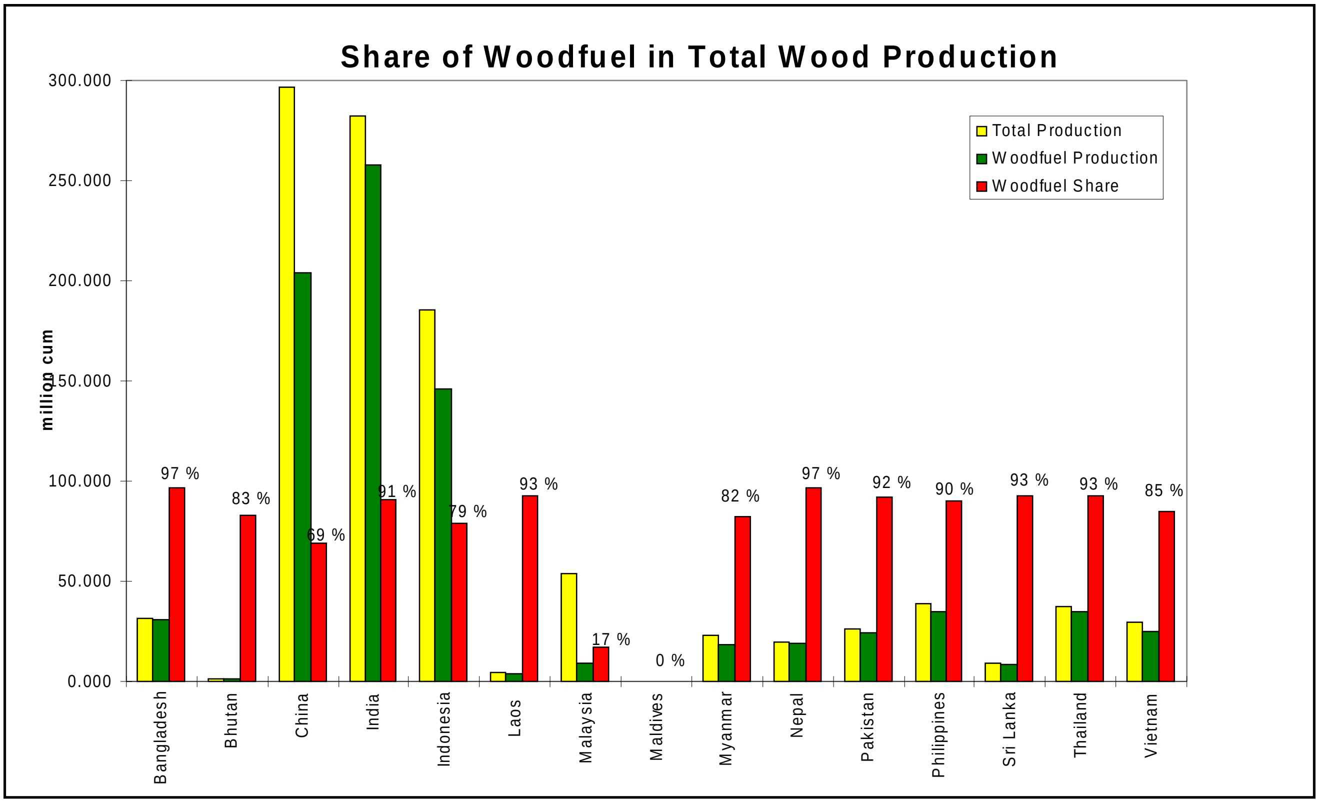


Figure 3: Share of woodfuel in total wood production, 1992.

Forest- and Wood Processing Residues

AK

Sawn wood is normally produced from logs. However, the process from trees in the forest to logs, and subsequently to sawn wood is associated with waste. This waste can be in various forms such as logging waste (branches, stumps, etc.) as well as other processing waste. The following provides a brief overview of the amounts of waste generated from transforming trees in the forest to kiln dried sawn wood ready to be used. It should be noted that average figures are shown here and that variations in the amount of wastes generated are common, depending on methods used, etc.

When cutting trees in the forests, recovery rates vary considerable depending on local conditions. A 50/50 ratio is often found in the literature, e.g. for every cubic meter of log removed, a cubic meter of waste remains in the forest (including the less commercial species). Where logging is carried out for export purposes, values of up to 2 cubic meter of residues for every cubic meter of log extracted may be valid (Adams, 1995). Other sources (Forest Master Plan for Indonesia - GOI 1990) give a figure of a ratio of 60/40, e.g. 6 cubic meters of logs versus 4 cubic meters of waste remaining in the forests. The 40% consists of: 12% stemwood (above first branch), 13.4% branch wood, 9.4% natural defects, 1.8% stemwood below first branch, 1.3% felling damage, 1.6% stump wood and 0.5% other losses. Figures of 30% logging wastes have been reported from Malaysia (FRIM, 1992) but others (Jalaluddin et. al. 1984) indicate a recovery rate of 66% with 34% being residues, consisting of stumps, branches, leaves, defect logs, offcuts and sawdust. This figure may be higher if unwanted species intentionally or accidentally felled are considered as well. Most of the wood residues are left in the forest to rot, particularly in sparsely populated areas where the demand for woodfuels is low.

Once the log has been produced, it is transported out of the forest for further processing, e.g. in a saw mill where it is converted sawn wood. Recovery rates vary again with local practices as well as species (FAO, 1990c). After receiving the logs, about 12% goes to waste in the form of bark. Slabs, edgings and trimmings amount to about 34% while sawdust constitutes another 12% of the log input. After kiln drying the wood, further processing may take place resulting in another 8% waste (of log input) in the form of sawdust and trim end (2%) and planer shavings (6%).

In short, as is shown in figure 4, out of the trees in the forest, an estimated 80% goes to waste while only about 20% of the original tree in the forest is available in the form of kiln dried sawn wood.

References:

Adams, M., 1985, Technical Report: Forest Products, Harvesting and Utilization Component. Paper presented to a Project Formulation Workshop on Sustainable Conservation, Management and Utilization of Tropical Rainforests in Asia, GCP/RAS/148/AUL, Bangkok, 6-8 February 1995.

FAO, 1990c, Energy conservation in the mechanical forest industries. FAO Forestry paper No. 93, FAO-Rome.

FRIM, 1992, Utilization of Industrial Wood Residues. Paper presented at the workshop on 'Logging and Industrial Wood Residues Utilization' in Jakarta, Indonesia, 24 August 1992.

GOI, 1990, Situation and Outlook of the Forestry Sector in Indonesia. Ministry of Forestry, Government of Indonesia in cooperation with FAO, Rome.

Jalaluddin, 1984, Wood residue and its utilization in Peninsular Malaysia. Proceedings of the seminar on 'Management and Utilization of Industrial Wastes', Harun. Abdul Rahman Md. Derus and W.C. Wong. Universiti Pertanian Malaysia, 13-14 September 1984.

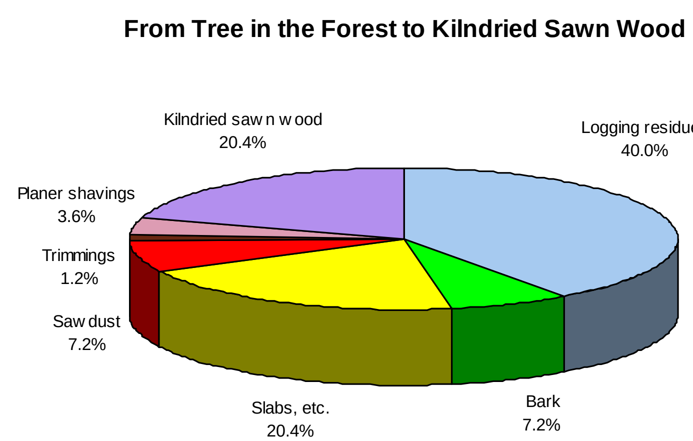


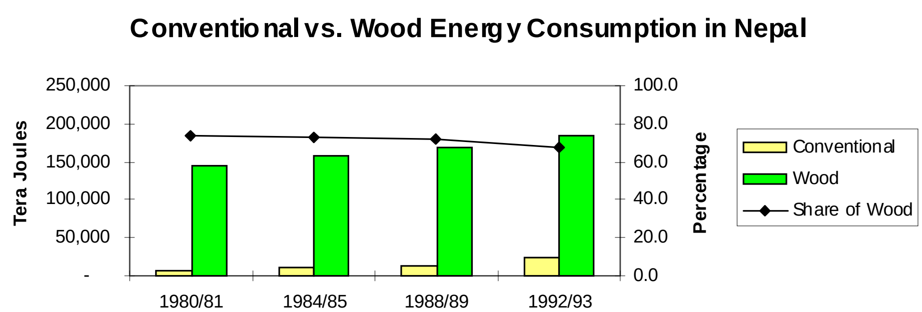
Figure 4: From tree in the forest to kiln dried sawn wood.

Wood and Biomass Energy in Nepal

JS

Figure 5 shows the consumption of wood and total biomass (i.e. wood, agriculture residues and dung) energy consumption compared to conventional energy consumption in Nepal. The graphs show that fuelwood is still by far the most important energy source and the consumption is still increasing, although its share in the total energy consumption is declining. The same applies to the other biomass fuels. RWEDP reviewed available data for all its member countries (except for Maldives because no data were available) and found that the trend of increasing wood and biomass energy consumption but a declining or stable share in the total energy consumption applies to all countries (see also Wood Energy News, Vol. 10, No. 4 for data of Thailand). This trend is not likely to change in the near future, so policies for wood and biomass energy are required.

Source: *Energy Sector Synopsis Report 1992/93 (2049/50)*, Water and Energy Commission Secretariat, Ministry of Water Resources, 1994.



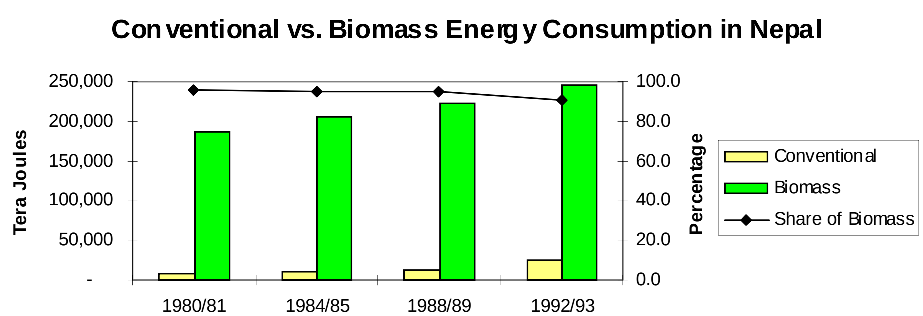


Figure 5: The consumption of wood and biomass energy in Nepal.

Commercial Wood Energy

CH

Wood fuels are still being used in many towns and cities in Asia in spite of the improvement in the supply of commercial fuels. In these places, wood fuels are bought from the market and have thus become like an agricultural commodity. The percentage of purchased wood fuels is small compared to the volume 'freely' collected and harvested for own-consumption. Nevertheless, the commercial wood energy systems can be significant enough to affect energy, forestry, agriculture and macro-economic policies and programmes. Such policies and programmes can in turn influence commercial wood energy systems, which are sensitive to policy instruments, because purchased wood fuels can be readily affected by pricing and other market interventions.

The tables 11 and 12 contain data on commercial wood energy systems obtained from national energy surveys and case studies. Though these data provide a great deal of information on wood energy, particularly, on consumption patterns of purchased wood fuels, other aspects of commercial wood energy systems need to be studied to get a complete picture of commercial energy systems. Care should be taken in using the data for extrapolating information for other areas. The characteristics of the production, flow and use of wood fuels, whether commercial or non-commercial, are very site-specific.

Table 11: Sources of firewood for urban and rural households - Pakistan 1992.

Rural	Low Income	Medium Income	High Income	Total
Buy only	22.5%	29.8%	40.2%	28.8%
Collect only	69.1%	58.5%	50.8%	60.9%
Buy and collect	8.3%	5.7%	9.1%	10.3%
Urban	**Low Income**	**Medium Income**	**High Income**	**Total**
Buy only	78.4%	85.0%	91.6%	84.3%
Collect only	18.8%	9.4%	5.8%	11.5%
Buy and collect	2.1%	5.8%	2.3%	4.2%

Source: HESS data base

Table 12: Total annual residential biomass fuels by source ('000 tons) - The Philippines 1992.

Fuel Types	NCR[1]	Other Urban	Rural	Total
Charcoal				
Home-produced	2	30	317	349
Purchased	119	686	410	1,216
All sources	121	716	716	1,565
Fuelwood				
Collected	65	1,463	12,788	14,316
Purchased	66	1,663	2,271	4,001
All sources	132	3,127	15,058	18,317
Crop residues				
Collected	15	317	1,999	2,330
Purchased	4	97	139	240
All sources	19	414	2,138	2,570

[1] National Capital Region

Source: UNDP/ESMAP Philippines Study Vol. 1

Woodfuel Consumption of Urban Households - Pakistan

CH

In urban areas of Pakistan, the size of the city is strongly correlated with the proportion of fuelwood users and their levels of consumption. Only 28.5% of households residing in larger cities (population 1 million and above) which house about half of the urban population, use firewood, and their average consumption is almost 30% lower than the consumption of households living in smaller cities. Large cities generally enjoy a better supply of modern fuels, and have larger populations with higher incomes. The level of average expenditure in large cities is about 43% higher than in the smaller ones. In urban areas fuelwood is generally purchased: less than 15% collect their needs and over 70% of these belong to medium-low and low income households with an average expenditure of Rs 2,000 per month.

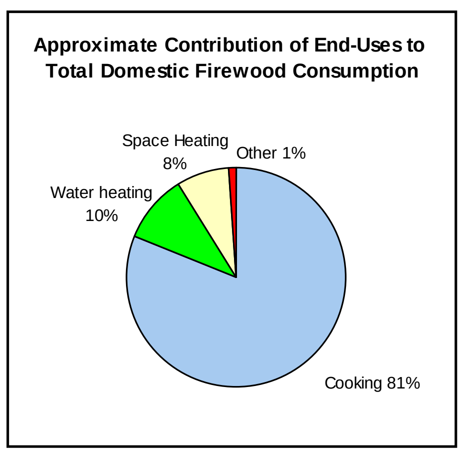


Figure 6: Approximate contribution of end-uses to total domestic firewood consumption - Pakistan 1992 (source: estimated from HESS Data base).

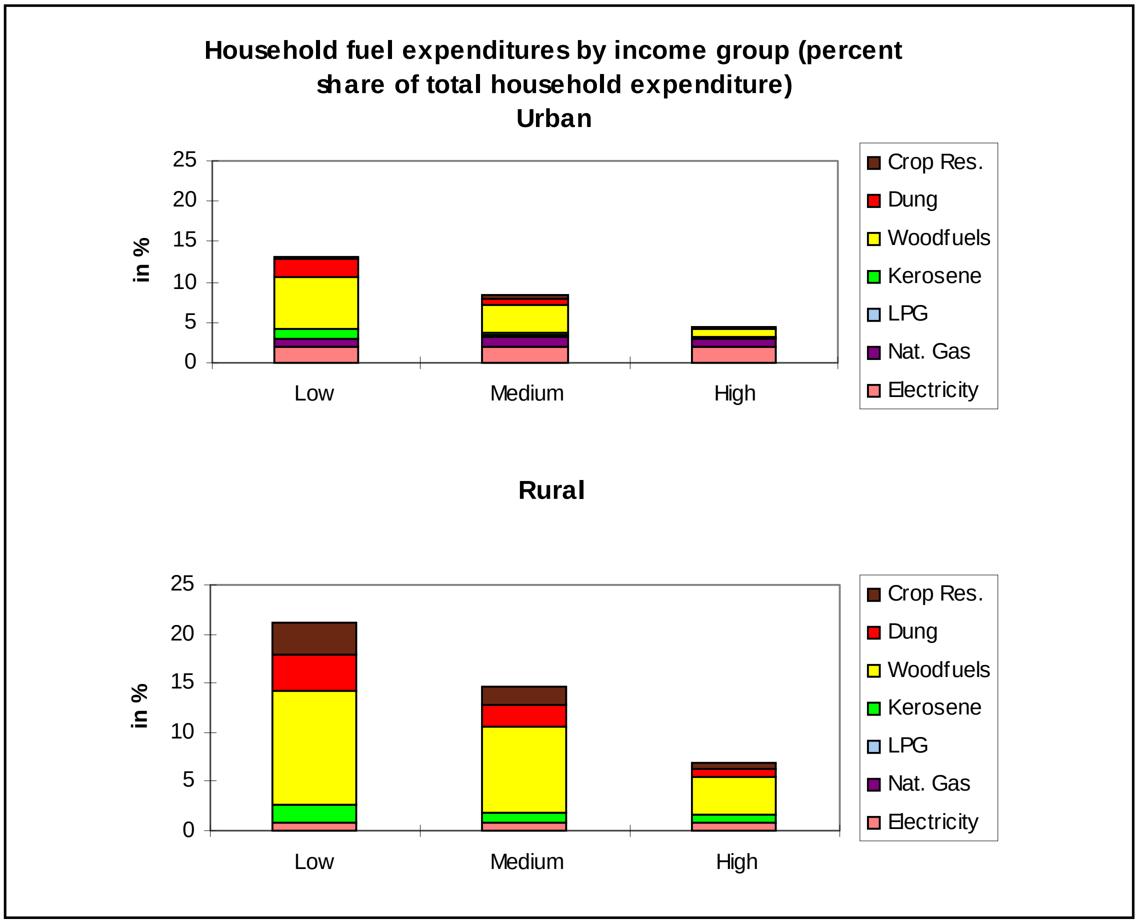
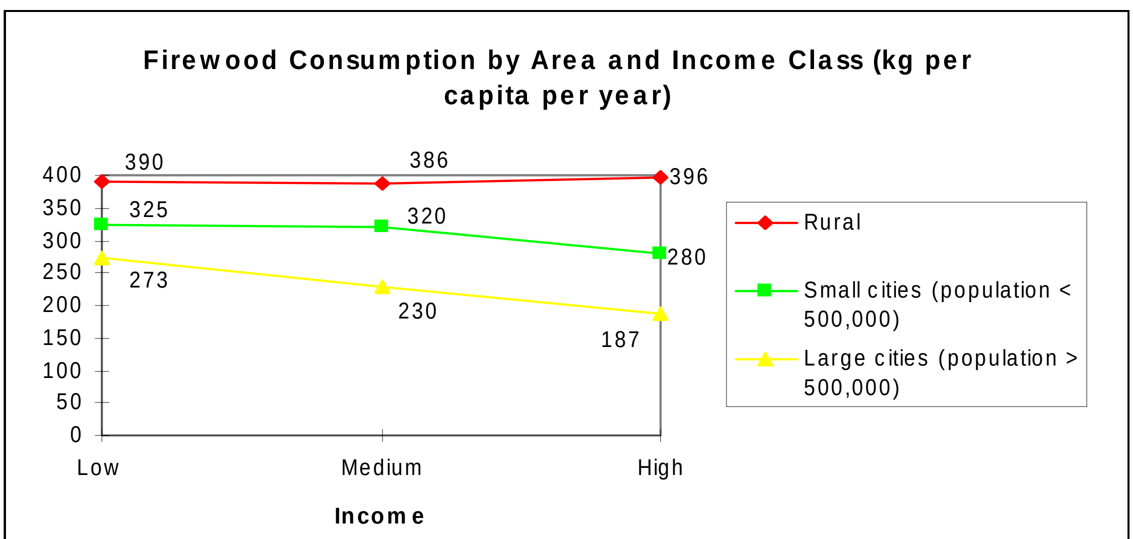


Figure 7: Household fuel expenditures by income group and area - Pakistan 1992 (source: HESS Data base).



Low income : expenditure < Rs. 18,000/household/year
Medium income : expenditure of Rs. 18,000 - 48,000/household/year
High income : expenditure > Rs. 48,000 household/year

Figure 8: Woodfuel consumption by area and income class - Pakistan 1992 (source: HESS Data base).

Conventional fuels have penetrated significantly into urban households, especially in the National Capital Region (NCR) where only the poorest households use charcoal for cooking to any significant degree. The transition from fuelwood to LPG is underway in other urban areas where kerosene and charcoal provide the first substitute for crop residues and fuelwood. For the poorest 10% of urban households outside the NCR, fully 86% of cooking energy is delivered by biomass fuels while this figure is less than 50% for the wealthiest households in the same areas.

Table 13: Firewood end-uses - The Philippines 1992.

Types of Energy End-uses	Consumption (kg/hhold/day)	Share of Total Consumption (%)
Cooking, space & water	8.6	20.6
Cooking & space	6.9	3.5
Cooking & water heating	5.9	19.8
Cooking only	6.0	54.5
Water heating only	3.1	0.2
Space heating only	6.9	0.6
Other	4.3	0.8
Total	6.4	100.0

Source: ESMAP Study

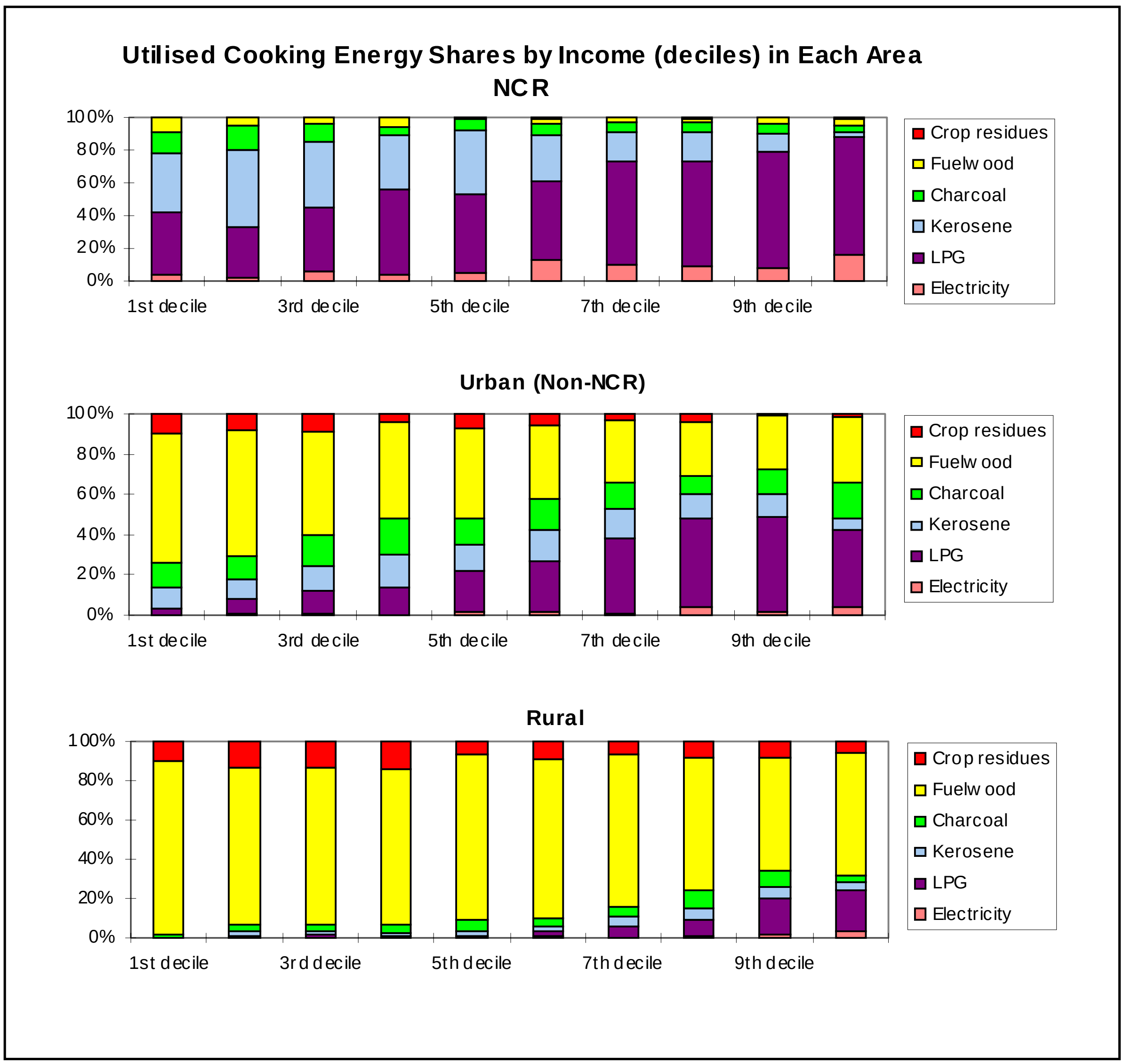


Figure 9: Utilised cooking energy shares by income (deciles) in each area - The Philippines 1992 (source: HECS, 1989).

Table 14: Demographic data - The Philippines 1989.

Location	Estimated Total Households	Household Income (Pesos/month)	Household Size
NCR	1,538,660	5,451	5.42
Other Urban	2,797,974	5,796	5.48
Rural	6,846,776	3,200	5.39
Philippines	11,183,410	4,159	5.42

Note: Total households and population estimates are from 1990 Census (preliminary) discounted by 2%

Consumption Patterns of Wood Fuels - Industries

CH

Rural industries and small enterprises consume some 10-30% of all wood energy (cf. section on 'Woodfuel Use and Value of Woodfuels', page 7). Industrial consumption is largely commercialised (cf. section on 'Commercial Wood Energy', page 13), though it should be noted that a substantial part of domestic consumption is also based on commercial transactions, particularly in urban households. With regard to the consumption in rural industries and small enterprises, table 15 relates various industrial products to wood/biomass fuel use.

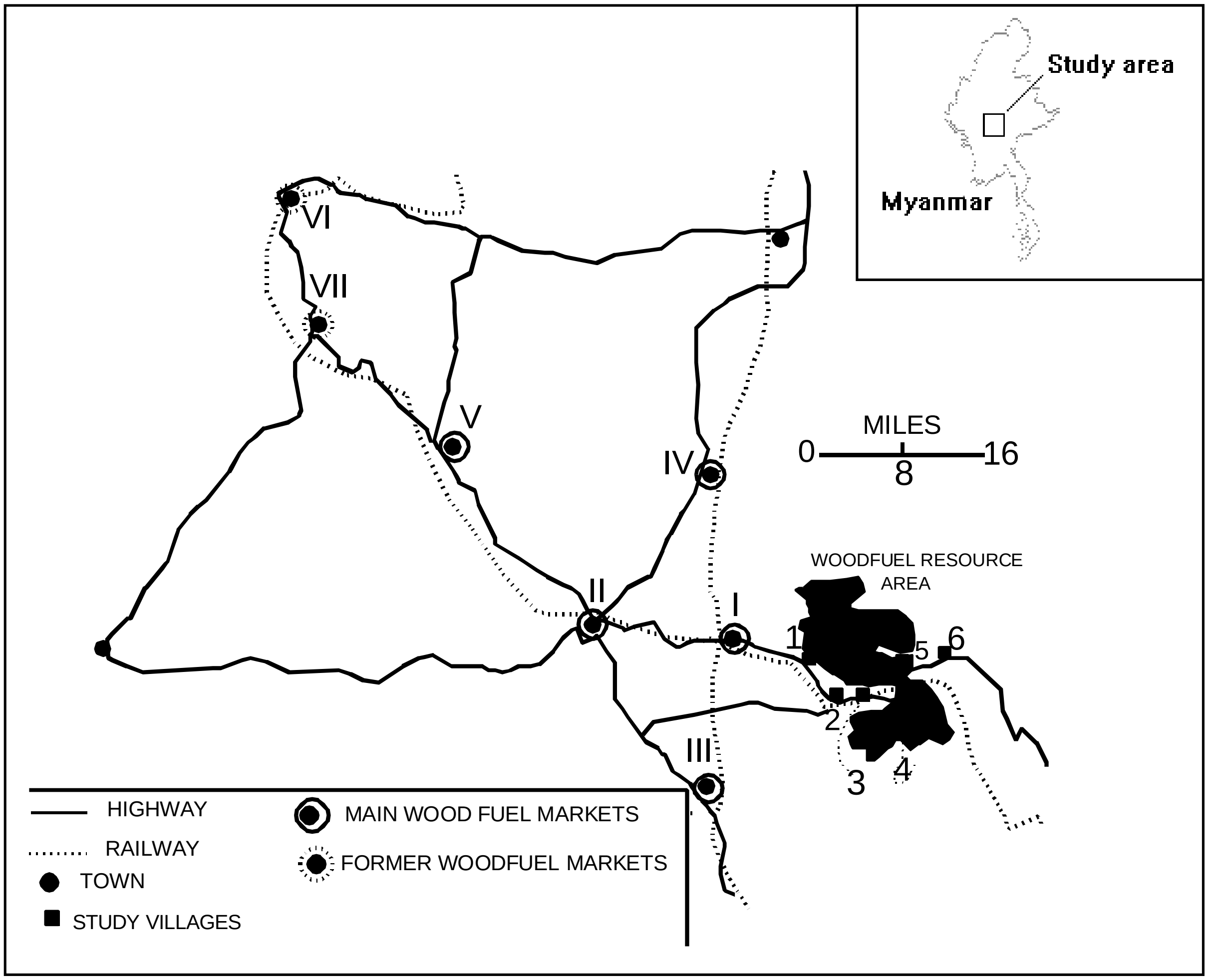
Table 15: Specific Wood/Biomass Fuels Consumption in Some Rural Industries.

Industry Type Activities	SEC Value Fuel Consumed/Unit Product	Source
a) Cottage activities		
- Roasted gari (cassava)	3.0 - 4.0 kg wood/kg gari	FAO 1987
- Rice parboiling	0.3 - 0.4 kg husk/kg rice	(BGD) FAO/RWEDP 89d
- Bread	0.6 - 2.2 kg wood/kg flour	(NEP) FAO/RWEDP 92
- Palm oil	7.0 - 9.0 kg wood/kg prod.	FAO 1987
- Smoked fish	0.2 - 16.0 kg wood/kg prod.	FAO 1987
	1.4 kg coconut fronds/kg prod.	(IND) DNES/IIT 90
- Cane gur	1.9 kg bagasse/kg prod.	(BGD) FAO/RWEDP 89d
- Date palm gur	3.0 kg palm residues/kg prod	(BGD) FAO/RWEDP 89d
- Beer	0.4 - 1.0 kg wood/liter	FAO 1987
- Potteries	0.4 - 1.0 kg wood/kg. prod.	FAO 1987
- Silk cocoon processing	14 - 34 kg wood/kg silk yarn	(BGD 89, IND 89)
b) Village enterprises		
- Bricks	0.3 - 1.5 kg wood/brick	FAO 1987
	0.1 - 0.4 kg wood/kg brick	(NEP) FAO/RWEDP 92b
- Ceramics	1.0 - 2.0 kg wood/kg pot.	FAO 1987
	0.6 - 0.8 kg wood/kg pot.	(NEP) FAO/RWEDP 92b
- Tiles	0.2 - 0.5 kg wood/tile	FAO 1987
- Lime	2.0 - 0.5 kg wood/kg lime	FAO 1987
- Breweries	0.2 kg wood/liter	FAO 1987
- Soap	0.4 - 0.6 kg wood/kg soap	(BGD 89, IND 89)
c) Rural industries		
- Bricks	0.3 - 1.5 kg wood/brick	FAO 1987
	0.08 - 0.1 kg coal/kg brick	(NEP) FAO/RWEDP 92b
- Tiles	0.2 - 0.5 kg wood/tile	FAO 1987
- Lime	0.6 kg wood/kg	FAO 1987
- Rubber smoking	0.8 - 2.0 kg wood/kg prod.	FAO1987
	0.3 - 0.6 kg wood/kg RSS	(MAL) FAO/RWEDP 90
- Copra	0.5 - 1.5 kg wood + coco resid/kg	FAO 1987
- Tobacco	5.0 - 12 kg wood/kg cured leaf	FAO 1987
	3.1 - 7.5 kg wood/kg cured leaf	(PHI) FAO/RWEDP 89a
- Tea	1.5 - 2.0 kg wood/kg cured leaf	FAO 1987
- Coffee	0.75 - 2.0 kg wood/kg roasted bean	FAO 1987

Source: RWEDP FD 37c 1993.

Wood Fuel Flows in Myanmar

Supplying the wood fuels market has created a 'wood fuel business' in many towns and cities. This wood fuel business has developed its own network which involves such activities as tree production, wood fuel harvesting/ collection, 'wood fuel processing' (i.e. involves 'physical processing' such as cutting, splitting, sizing and bundling of fuelwood, and 'thermochemical processing' such as charcoal production), and the transportation and marketing of wood fuels. The series of activities involving processing, transportation and marketing of wood fuels is termed 'wood fuel flows'.



Source: RWEDP/FD 39, 1993

Wood Resource Areas
1. Hlaingdet
2. Thahtaygon
3. Kywetatson
4. Yinmabin
5. Yebokson
6. Pyinyaung

Population Centres	Population 1991		Households 1991	
	Urban	Rural	Urban	Rural
I Thazi	22,015	154,263	4,262	28,380
II Meiktila	115,206	218,739	20,908	38,969
III Pyawbwe	28,482	217,924	5,199	38,612
IV Wundwin	25,431	187,668	5,181	35,031
V Mahlaing	17,570	161,134	3,371	31,275
VI Myingyan	92,001	218,534	18,511	42,427
VII Taungtha	16,864	231,897	3,265	45,206
Kyaukpadaung	34,286	246,651	6,340	48,574
Total	351,855	1,636,810	67,037	308,474

Figure 10: Study area showing main supply and market centres - dry zone area in Myanmar, 1992.

The employment generated by wood fuel businesses can be considerable and the income earned by the people involved in them can be economically significant too. Firewood and charcoal, like any other 'cash crop', are sold by rural producers to traders, who then transport the 'goods' from rural areas to urban markets and/or to large users. In the urban markets, there are dealers who stock wood fuels for wholesale and/or retail them to end-users.

The bulk of these users are households, particularly urban poor households who buy the wood fuels mostly in small quantities. Other significant users - thus, buyers - are enterprises and industries, including many household-based livelihood activities such as food preparation and vending. These users constitute the wood fuels market.

Wood fuel flows can be very complex. But their socio-economic significance as home-grown systems for the supply of an indigenous energy source that also generates income and employment and benefits mostly the poorer population, warrants a better understanding. Hopefully such will pave the way for a more realistic response to the problems and potentials that wood fuel flows present. Characterization of wood fuel flows involves the description of the following elements:

- *General Features And Patterns Of Wood Energy Flows* includes information on the types and number of traders, trading profiles who sells to whom, socio-economic profile of traders, and operational and financial data of wood fuel trading; a schematic diagram of the wood fuel flow can show the different 'actors' in the wood fuel flow system and the 'transformation' of the harvested/collected wood into 'commercialised' fuels sold in the market.

- *Processing and Conversion Systems* includes information on types and number of processing and conversion systems, production rate and efficiency of charcoal producers and other processing/conversion systems (i.e., gasification, fermentation, etc.), and socio-economic profile of actors involved in the processing and conversion of wood fuels.

- *Links in the Wood Fuels Distribution Chain* describes the supply sources and routes, distribution channels, and major catchment zones; maps showing the distribution chain can be useful in showing how the 'goods flow from producers to consumers'.

- *Wood Fuels Price Structure* provides data on sale volumes, prices and mark-ups, and net margins. Wood Fuel Transport - gives information on the types and characteristics of wood transport, transport costs, and hauling distances.

In Myanmar, wood fuels are widely used for domestic purposes such as cooking and food processing as well as for small industries. These include evaporated milk factories, sugar factories, jaggery boiling, caustic soda boiling, brick making, lime burning, potteries, blacksmithies and weaving factories. The results of the studies conducted im-

Table 16: Villages engaged in woodfuel collection and trade, Dry Zone Area, Myanmar 1992.

Wood Resource Areas	No. of Households	Population Size	No. of People Regularly Engaged in		
			Trade	Collection	Total
Hlaingdet	1,408	7,044	13	100	113
Thahtaygon	77	511	2	40	42
Kywetatson	197	1,063	3	110	113
Yinmabin	768	4,097	10	176	186
Yebokson	229	1,195	6	130	136
Pyinyaung	313	1,376	17	91	108
Total	3,363	17,460	51	647	698

Source: RWEDP\FD 39, 1993.

Table 17: Average income and expenditure of woodfuel traders and gatherers, Dry Zone Area, Myanmar 1992.

Occupation	Income in Kyats/year			Expenditures	Surplus
	Woodfuels	Others	Total	Kyats/year	
Hlaingdet					
Trader BF	42,400	85,700	128,100	64,176	63,924
Gatherer BF	21,960	1,773	23,733	24,060	(327)
Thataygon					
Middleman BF	11,370	6,000	17,370	16,044	1,326
Gatherer BF	15,840	3,800	19,640	17,740	1,900
Yinmabin					
Middleman BF	21,600	48,000	69,600	64,500	5,100
Gatherer BF	36,400	9,100	45,500	41,820	3,680
Trader FW	48,000	47,640	95,640	77,640	18,000
Gatherer FW	36,000	8,800	44,800	44,580	220
Yebokson					
Trader FW	14,720	26,833	41,553	39,513	2,040
Gatherer FW	35,360	-	35,360	33,100	2,260
Kywetatson					
Charcoal Prod.	5,500	20,200	25,700	26,020	(520)

Source: RWEDP\FD 39, 1993.

Note: BF denotes bamboo fuels while FW denotes fuelwood.

prove our understanding to wood fuel flows in the Dry Zone area of Myanmar which supply the demand for woodfuels by the above-mentioned users are mentioned below.

Along the border areas of the Mandalay Division and the Shan State, in the eastern fringes of the central zone of Myanmar, the woodfuel trade has been going on for a long time and is well established. In order to meet fuel demand in Mandalay Division, located in the dry zone of Central Myanmar, fuelwood is transported from the outer fringe areas to the sparsely forested dry zone. Hundreds of rural people, the majority being women and children, make their living from fuelwood and bamboo fuel collecting and processing.

The woodfuel supply areas, located in the hills of Yinmabin and Pyinyaung areas, along the eastern fringes of the dry zone, are still fairly well stocked. The areas support the woodfuel needs of Thazi and Meiktila as well as the surrounding areas. Figure 10 shows the main supply areas and the market centres.

Table 18: Equipment (i.e. capital) costs involved in wood fuel gathering, Dry Zone Area, Myanmar 1992.

	Yebokson/Yinmabin			Thahtagon/Hlaingdet		
Equipment Required	Amount	Price	Total	Amount	Price	Total
Bullock	2	10,000	20,000	2	10,000	20,000
Bullock cart	1	5,000	5,000	1	4,000	4,000
Two-men hand saw	1	500	500	-	-	-
Chain (12 ft)	1	1,500	1,500	-	-	-
Axe	2	70	140	-	-	-
Machete	1	70	70	2	70	140
File	1	150	150	-	-	-
Total	9	-	27,360	5	-	24,140

Source: RWEDP/FD 39, 1993.

Table 19: Woodfuel prices (Kyats) at different fuel supply centres, Dry Zone. Area, Myanmar 1992.

Woodfuel Type and Sales Unit		Pyinyaung	Yebokson	Yinmabin	Kywetatson
Fuelwood	Stacked ton (50 cubic)	104 - 185	104 - 185	104 - 185	-
	Bundle	2.0 - 2.5	1.6 - 2.0	1.9 - 2.0	-
Bamboo	Bundle	-	0.45 - 0.50	0.45 - 0.50	-
Mill off-cuts	Stacked ton	-	-	500	-
Charcoal	Bag (90lbs)	-	-	75	75
Sawdust	Truck (3 stacked tons)	-	-	500	-

Source: RWEDP\FD 39, 1993

Table 20: Main woodfuel supply and distribution channels, Dry Zone Area, Myanmar 1992.

Supply Centre	Pyinyaung		Yebokson		Yinmabin		Kywetatson		Hlaingdet		Thahtaygon	
Market Centre	Type	Dist.	Type	Dist.	Type	Dist.	Type	Dist.	Type	Dist.	Type	Dist.
Kywetatson	W	10	W	10	W	6	-	-	-		-	
Thazi	W	30	WB	25	WBMC	21	C	15	B	7	B	14
Meiktila	-		WB	39	WBMCS	35	C	29	B	21	B	28
Pyawbwe	-		WB	28	WBMC	24	C	18	B	22	B	17
Wundin	-		WB	59	WBC	55	-		B	41	B	48
Mahlaing	-		WB	63	WB	59	-		B	45	B	52
Taungtha	-		WB	82	WB	78	-		-			
Myingan	W	102	WB	97	B	93	-		-			
Kyaukpadaung	-		B	99	B	95	-		-			
Yenanyaung	-		-		B	133	-		-			

Source: RWEDP/FD 39, 1993

Note: Type denotes the type of woodfuel supplied (W = Fuelwood, B = Bamboo fuel, M = Mill offcuts, C = Charcoal and S = Sawdust, distances are given in miles)

Within the four main supply areas, there are six main villages and five nearby villages which can be considered as wood fuel supply centres. It is from these villages that labour for wood fuel gathering and trading is drawn. Most of the people in the 11 villages engaged in wood fuel collection and trade are farmers. However, for generations, they have been supplementing their income, particularly during the off-farm season, by extracting forest products.

As shown in figure 10, the woodfuel resource areas lie along the highway and the railway line that connect the Central Dry Zone and the Shan State. The six main collection and supply centres are all located along these transport ways between Pyinyaung and Meiktila. Both the highway and the railway are used to transport wood fuels to Meiktila which lies at a distance of about 50 miles from the supply area.

The main actors in the wood fuel distribution system are the traders who have their business based in the villages of the wood resource areas. The traders are the holders of the permits issued by

Table 21: Woodfuel prices at the main market centres, Dry Zone Area, Myanmar 1992.

Market Centres	Fuelwood		Mill off-cuts		Bamboo Fuel	Charcoal	Sawdust
	Kyats/ton	Kyats/bundle	Kyats/ton	Kyats/bundle	Kyats/bundle	Kyats/bag	Kyats/ton
Kywetatson	262	-	-	-	-	75	-
Thazi	625	1 - 5	1,400	6	0.80	90	-
Pyawbwe	625	2 - 5	-	-	0.80	90	-
Meiktila	812	2 - 5	-	-	0.90	110	800
Wundwin	950	2 - 5	-	-	1.00	115	-
Mahlaing	1,100	2 - 5	-	-	1.00	115	-
Thaungtha	1,300	2 - 5	-	-	1.10	120	-
Kyaukpadaung	1,500	2 - 5	-	-	1.25	120	-
Yenangyaung	-	-	-	-	-	-	1,500
Myingyan	1,500	2 - 4	-	-	1.15	120	-

Source: RWEDP/FD 39, 1993 Ton = stacked ton of 50 cubic feet

the government. Traders organise the supply by hiring woodfuel gatherers and at the same time keeping regular contacts with end-users/buyers as well as with the authorities concerned with their trade.

Source: 'Wood Fuel Flows in the Dry Zone of Myanmar - A Case Study' - by RWEDP in collaboration with the Pilot Integrated Watershed Development for the Kinda Dam Project (MYA/81/003), Ministry of Forestry - Myanmar (RWEDP Field Document no. 9, June 1993).

Table 22: Transport and labour charges (Kyats) for moving woodfuels to market centres, Dry Zone Area, Myanmar 1992.

Market Centres	Distance in Miles	Transport Costs	Labour Costs	Remarks
Kywetatson	10	1,000	120-200	per truck load
Thazi	21	2,000	120-200	per truck load
Pyawbwe	24	2,000	120-200	per truck load
Meiktila	35	3,200	120-200	per truck load
Wundwin	55	4,000	120-200	per truck load
Mahlaing	59	4,000	120-200	per truck load
Thaungtha	78	6,000	120-200	per truck load
Kyaukpadaung	95	8,000	120-200	per truck load
Yenangyaung	133	8,500	200	per truck load
Myingyan	102	2,600	500-600	per rail van

Source: RWEDP/FD 39, 1993

Woodfuel Potential Versus Accessibility

AK

The determination of the sustainable amount of woodfuel supplies for a country or a particular area is often based on the amount of forested area, total standing stock and its annual rate of increment. Although such an estimate will give an indication of the potential supply (assuming there is no overcutting or loss due to factors such as disease and fire), the actual supply may be smaller. This situation could arise for a variety of reasons. One, and maybe the most important, is the poor accessibility of the resource. Forests are a potential source of supply, but if they are located in areas without roads or across steep cliffs or big rivers and/or located far away from population centres, the resource can either not be moved or becomes too expensive if it has to be transported over long distances.

Applying an accessibility factor to the potential supply is then an option to determine the actual potential sustainable supply. However, determining this factor is wrought with difficulties as there are many parameters which should be taken into account. The case of Bhutan provides an interesting example. Within the framework of the country's Forest Master Plan studies, an attempt was made to determine the accessibility of the forest resources. Using results from the interpretation of satellite imagery, important parameters were determined for each intersection of grid-lines drawn 2.5 km apart. These include land use, type of forest, forest density, climatic conditions (south/north facing, altitude and slope), etc. The annual allowable cut (AAC) was established by using average growth rates of the standing stock (determined earlier). These data were then correlated with each grid intersection (dot). As each dot represented an area of 625 ha. a statistical analysis was carried out by taking into account the condition of adjacent dots. Assuming that no removals would take place from forest and wildlife reserves, critical watershed areas, etc. and assuming also that only areas located within a distance of 25 km of roads would be used for wood supplies, the potential supply for each location was determined.

Due to the fact that no information was available on demand centres (cities, urbanised areas and industrialised areas, etc.) average population densities for districts and subdistricts coupled with predetermined per capita woodfuel consumption data were used to determine the demand-supply balance.

Determining the area-specific wood energy supply-demand balance using geographic information systems in this way appears to be a possible way to guide planners. However, it should be kept in mind that many arbitrary assumptions were made along the way and the validity of the end result can be questioned. Even though in this case no extra expenditures were involved, it has to be noted that the method used is quite expensive in the absence of forestry sector master plan activities.

Guidelines for a Wood Energy Database

JK

RWEDP is in the process of developing a working document with practical guidelines for preparing national or subnational databases on wood and biomass energy. Feedback on earlier versions of this working document during recent workshops has led to a revised version.

These guidelines can assist countries that are in the process of defining and implementing a wood and biomass energy database, by presenting an illustrative format. Further, they can help to standardise the format of wood energy data in the region so that inter-country comparisons can be made and data can be aggregated at the regional level.

The document explains the role of data in planning and proposes a methodology for implementing a wood energy database. It contains illustrative examples and a framework with relevant parameters. Since woodfuels are more strongly related to gender issues than are conventional and marketed fuels, these issues are highlighted.

A wood energy database contains quantitative and descriptive data that can be grouped into five categories as shown in figure 11. Whereas to describe the present supply and demand patterns, mainly direct physical data on demand and supply is needed, forecasting trends and designing policy interventions also require additional knowledge about relevant social, economic, legislative and environmental parameters, and their relation to woodfuel. Quantifiable data can eventually be entered in a computer program for evaluation of energy scenarios. Although qualitative factors cannot be entered into a computerized energy planning model, they also play a role when planning wood energy. Examples are patterns of woodfuel trade, indigenous knowledge of planting woodlots and social functions of woodfuel collection and use.

Since one does not exactly know which data to collect when little knowledge is available about the driving mechanisms, data collection and analysis will be parallel and iterative processes. By analysing initially collected data, data errors and gaps can be identified. Analogous to this, in the process of collecting data new issues may emerge that lead to a better understanding of underlying principles. A sensitivity analysis of collected data in relation to the scenario outcome pinpoints which data are more important than others. Important data should be based on local conditions, while less important data may be taken from neighboring districts or regions and a lesser degree of accuracy is acceptable.

The working document is available at RWEDP on request, comments are most welcome.

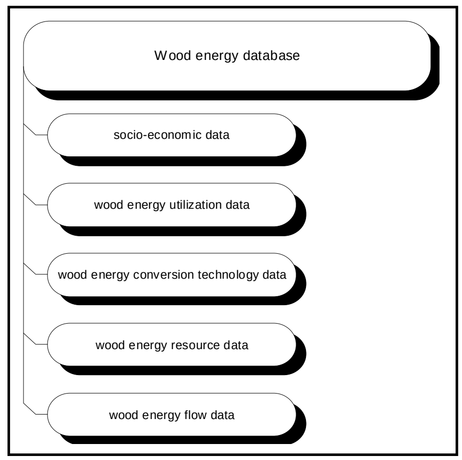


Figure 11: a wood energy data base can be grouped into five categories.

Wood Energy Terminology

JK

New and renewable are generally contrasted with fossil and nuclear energy sources. **Renewable** are biomass, animate, solar, water and wind energy, as well as geothermal energy. A distinction can be made between **woody biomass** (stems, branches, shrubs, hedges, twigs), **non-woody biomass** (stalks, leaves, grass, etc.), and **crop residues** (bagasse, husks, stalks, shells, cobs, etc.). **Fossil energy** is contained in coal, oil and natural gas.

The term **roundwood** describes all forms of wood in its natural state such as stem, branches, twigs and roots as felled or otherwise harvested from forests or any other clearances. All fuels containing wood fibres that are used for direct combustion, such as branches, twigs, stems, roots but also sawdust, are described by the term **fuelwood**. **Woodfuels** also include all wood derived fuels such as charcoal and producer gas.

Traditional energy is often contrasted with **non-traditional energy**, and also with **new energy**. However, what is considered to be traditional, depends on what one is used to. In industrialized societies which are used to fossil fuels, renewable energies like biomass and animate energy are often called traditional. At the same time, engineers working on 'new' energies like wind or solar energy, often consider fossil fuels as traditional. Apparently, what people call traditional are the forms they are actually not used to.

Commercial energy is contrasted with **non-commercial energy**. Commercial energy is energy traded in the market for a monetary price, and usually refers to oil, gas and other fossil fuels. However, it may also include traditional energy such as fuelwood, which is traded in urban and semi-urban areas in many developing countries.

An **energy balance** is a set of relationships accounting for all energy which is produced, transformed and consumed in a certain time period and geographic area. All figures in an energy balance are expressed in energy units. Commonly used units are GJ (10^9 J), TJ (10^{12} J), PJ (10^{15} J) and tons of oil equivalent (1 toe = 41.8 GJ).

The concept of **energy flows** relates to the conversion routes of energy in which the primary energy source (e.g. crude oil, natural gas, hydro power or fuelwood) is transformed and transported several times to end up as useful energy or the energy service that is required by the end-user (e.g. heat, light or power). In energy flows we distinguish **primary**, **secondary**, **final**, and **useful energy**. Final energy is sometimes also called **delivered** or **supplied energy**. Additional or fewer energy conversion stages are possible, e.g. when fuelwood is directly burned in a cookstove, primary and secondary energy are identical.

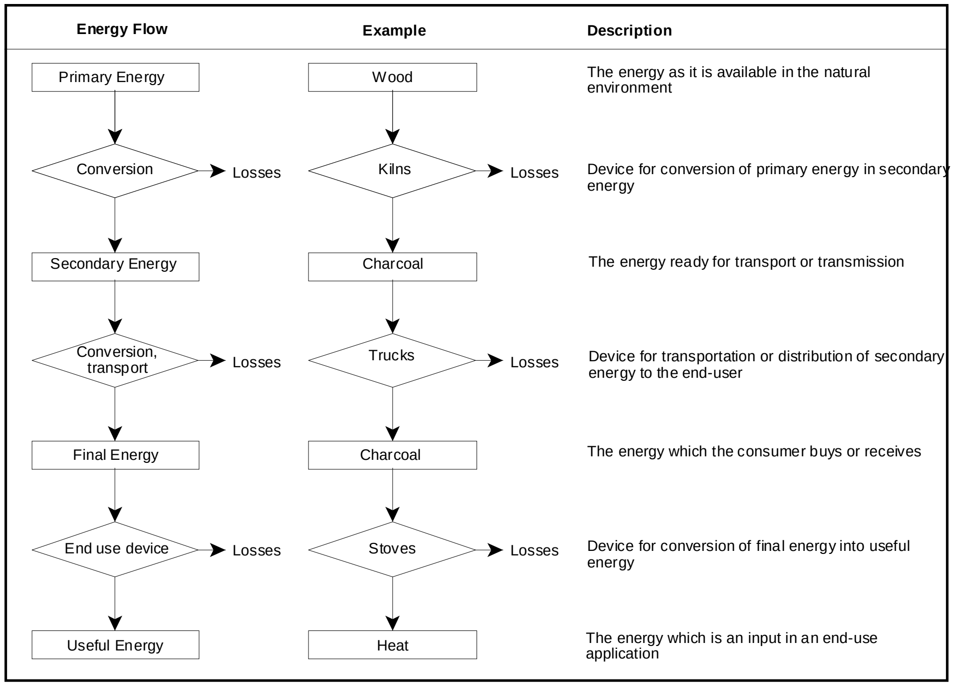


Figure 12: Energy flows describe the conversion routes from primary energy to useful energy.

An example is the energy flow related to charcoal. Here, the primary energy is wood. The wood is converted into charcoal in a charcoal kiln. Charcoal (the secondary form of energy) is transported to the consumer. What the consumer buys is charcoal at the market place, and this is called final energy. In his/her cookstove (the **end-use device**), the consumer converts the charcoal into heat for cooking. The heat is the useful energy.

At each conversion step some energy is lost and additional costs are involved, therefore the common aim is to eliminate any unnecessary steps in the flow of energy. The breakdown of energy flows is also relevant for surveys and statistics. We may not simply add primary energy such as fuelwood with secondary energy such as charcoal!

While energy flows relate to one type of fuel and end use, an **energy supply system** consists of a network of different energy flows, linking several primary energy sources and end uses through different conversion technologies.

W.E. Today: A Contribution to the Forestry Sector Outlook Study

WH

Because in South and South-East Asia some 30% of all woodfuels originate from forests, a strong linkage exists between wood energy and the forestry sector outlook in the region. This was acknowledged in the 16th Session of the Asia-Pacific Forestry Commission (APFC), Yangon, January 1996. Here APFC agreed on a proposal for a 'Forestry Sector Outlook Study for the Asia-Pacific Region' which will include scenarios for wood energy demand and supply in the context of overall energy transitions in the region. Up until now a general lack of data has hampered efforts to overcome current problems with regard to wood energy, and has constrained the wood energy sector from developing its full potential.

RWEDP co-operates with the Forestry Policy and Planning Division and the Forest Products Division of FAO to strengthen regional and national wood energy data overviews, which will contribute to the Outlook Study mentioned above. The named partners within FAO have recently commissioned a study from the Energy Planning Central Consultant Team (EPCCT), which is a group of experts based at the Asian Institute of Technology (AIT) in Thailand. The first phase of the study aims at regional overviews and the identification of main data gaps. The second phase, which is to start later in 1996, will aim at quantitative national overviews.

Agro-residues As A Source of Energy

AK

Every year large quantities of agro-residues are generated, which are an important source of energy for domestic and industrial purposes. In fact they account for between 10% and 50% of all rural energy. The use of residues as a fuel puts pressure on the resource base. In order to judge the impact of increased use, an overview of the potential supply and demand should be prepared. A distinction should be made with regard to location. Agro-residues are generated either in the field where the crops are grown (straw and stalks) or at processing centers (husks of grain, shells, etc.). The field-based residues are difficult to collect and therefore often left to be burnt where they are. The process-based residues are used more extensively as a source of energy.

Agro-residues are used for many purposes, cf. the 'six F's': *Fuel, Fodder, Fertilizer, Fibre, Feedstock and Further uses*. The last F comprises, for instance, soil conditioning (coconut coir dust to retain moisture in the soil), use as a growing medium (straw for mushroom, coconut husks for orchids), packing materials, etc. Residues may even have multi-purpose use: rice husk can be burnt as Fuel and the ash used by the steel industry as a source of carbon and as insulator (Feedstock/Further); rice straw can be used as animal bedding (Fibre or Further) and subsequently as part of compost (Fertilizer); crop waste can be used as a Feedstock for biogas generation (Fuel) and the sludge as Fertilizer, etc.

It is unwise to assume that residues are wastes and therefore by definition more or less 'free'. Even where residues are at present freely available, everything which has a use will sooner or later acquire a monetary value. For instance:

- About 15 years ago rice mill owners in Indonesia gave away rice husks free of charge to truck drivers and brick makers, and would even provide free labour to load it. Once a market had developed, the rice mills were no longer willing to give the husks away for free and brick makers had to pay for the husks and for labour to load the husks.

- The increased use of rice husk as a boiler fuel in the Nepali carpet industry resulted in a tenfold increase in the price from 2 to 20 NRs (about 0.04 - 0.40 US$) per bag of 20 kg over a period of only 14 months.

The wastes may also be used for various purposes in the local community without direct monetary value. Such situations are not always apparent to an outsider. In common share-cropping systems the crop as well as the residues are divided between the landowner and the tiller. Also, landless people have access to residues on common lands, and sometimes may collect residues from other peoples' lands. Trying to use these residues without compensation is likely to create problems. Even in cases where money changes hands, payments may be made not to the person to whom the original benefit accrued, but to some other person, which may lead to social disruptions in the community. Further factors to be considered in addition to competing use are: seasonality i.e. large quantities are available immediately after the harvest, but not at other times; ownership and access; fraction which can be recovered economically or with damage to the environment.

In order to estimate the amount of residues generated, use is often made of 'Residue to Crop-production Ratio' (RCR) or 'Residue to Area-planted Ratio' (RAR). Both ratios can be applied for both field and process-based residues, but RCR is most commonly used in official statistics because it is often more reliable than RAR (multiple crops per year, intercropping, etc.). However, RCR values can vary to a great extent (possibly even from year to year) depending on several factors, like variations in

Table 23: Some residues to crop production ratios for rice straw.

Crop and Reference	RPR	Moisture Content in %	C %	N %	LHV MJ/Kg	Ash %
Webb 1979	2.60 - 3.96	10 - 12				12.70 - 21.40
Vimal 1979	1.88					
AIT-EEC 1983	0.42	27			15.10	16.98
BEPP 1985	2.86					
Barnard e.a. 1985	1.40 - 2.90					
Strehler 1987	1.40	12 - 22	41.44	0.67	10.90	17.40
Bhattacharya 1990	0.45	12.71	24.79		16.02	21.05
Massaquoi 1990	1.10 - 3.00					
Ishaque 1991	1.40					
Ryan e.a. 1991	1.10 - 2.90					18 - 19
Kristoferson e.a. 1991	1.10 - 2.90					
Bhattacharya e.a. 1993	1.76	12.71	39.84		16.02	

weather conditions, crop variety grown, water availability, soil fertility, farming practices, etc. Although for most crops general RCR data are available, in many cases the moisture content of the residues is not given. This makes calculating the amount of residues based on crop production tricky. In order to demonstrate the risks of using RCR, an example of rice straw is given.

Rice straw: RCRs in the range of 0.416 to 3.96 have been cited in various references. The lowest amongst the values, 0.416 reported by AIT-EEC (1983), and 0.452 by Bhattacharya et. al. (1990), are based on the practice of harvesting rice in parts of Thailand and other South-East Asian countries where only the top portion of the rice stem along with 3-5 leaves is cut, leaving the remainder in the field. In cases where the rice is cut at about 2" above ground, the RCR becomes 1.757 (m.c. 12.71%) as reported by Bhattacharya et. al., 1993. Vimal (1979) indicates a RCR of 1.875 based on Indian experience, while in Bangladesh a value of 2.858 has been reported (BEPP, 1985) which however may be valid only for a local variety (floating rice).

The data presented in table 23 show large variations. Due care should be taken in using RAR and RPR values to calculate the amount of residues generated in a certain area or period. Field checking should determine the most appropriate value for a given situation.

References:

AIT-EEC, 1983, *Evaluation and Selection of Ligno-Cellulose Wastes Which Can Be Converted Into Substitute Fuels*. Project report submitted to EEC, Belgium.

Barnard, G. and Kristoferson, L. 1985. *Agricultural residues as fuel in the third world*. Earthscan - The Beijer Institute, Energy Information Programme, Earthscan.

BEPP, 1985, *Bangladesh Energy Planning Project: Draft Final Report*. Rural Energy and Biomass Supply, Vol. IV.

Bhattacharya, S.C. and Shrestha, R.M. 1990. *Biocoal Technology and Economics*. RERIC, Bangkok, Thailand.

Ishaque, M. and Chahal, D.S. 1991. *Crop Residues. In: Food, Feed and Fuel from Biomass*. Edited by D.S. Chahal, pp. 15.

Kristoferson, L.A. and Bokalders, V., 1991. *Renewable Energy Technologies: Their Application in Developing Countries*. IT Publications, London.

Massaquoi, J.G.M. 1990. *Agricultural residues as Energy Source. In Energy for Rural Development*. Edited by Bhagvan, M.R. and Karekezi, S.

Ryan, P. and Openshaw, K. 1991. *Assessment of Biomass Energy Resources: A Discussion on its Needs and Methodology*. World Bank.

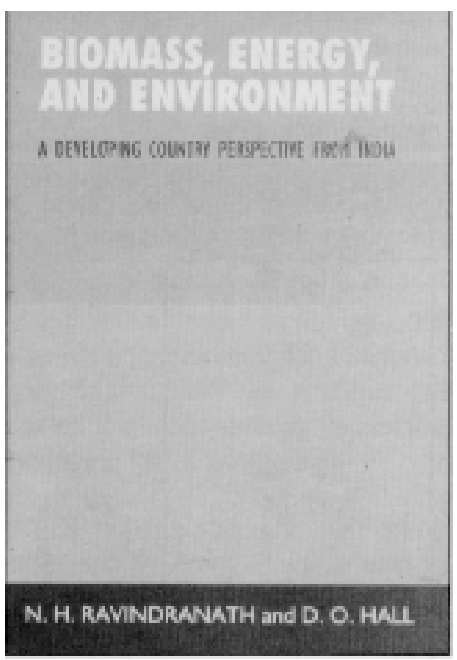
Strehler, A. and Stutzle, W., 1987. "Biomass Residues". In *Biomass Regenerable Energy* Edited by Hall, D.O. and Overend, R.P.

Publications

Biomass, Energy, and Environment: a Developing Country Perspective from India

There have been significant improvements in renewable energy technologies in recent times along with declines in cost. A number of global success stories and the growing concern for the environment (land degradation, deforestation, climate change) and sustainable development, have led to worldwide interest in renewable energies and bioenergy in particular. Biomass can be converted into modern energy forms such as liquid and gaseous fuels, electricity, and process heat to provide energy services needed by rural and urban populations and also by industry. These features of modernised biomass are becoming widely recognised.

In the literature there is a lack of detailed and country-specific studies on the potential, prospects, and problems of bioenergy. It should be recognised, however, that any analysis of bioenergy must start at the local or country level. This approach reflects the variations in socio-economic and biomass resource situations, especially because policy decisions are made at the country or regional level within a country. India offers a good opportunity to start such an analysis owing to its relatively good database, the diversity of existing biomass resources and opportunities, and a number of innovative programmes which have been implemented with varying degrees of success.



In the past 10 years or so, considerable practical experience has accumulated in India, as well as in other developing and industrialised countries, on biomass energy production and conversion. India is a pioneer among developing countries, with significant indigenous efforts in promoting renewable energy technologies, with the setting up of a Department of Non-Conventional Energy Sources in 1982, later upgraded to a Ministry in 1992. In fact, some of the bioenergy programmes, e.g. biogas production, were launched even prior to the first oil crisis in 1973, although they achieved focus and significant funding only with the formation of the Department.

In this book the authors have attempted to put together the relevant experiences on bioenergy in India. They analyse the current situation, compare bioenergy and other options for promoting development, explore the potential for bioenergy, endeavour to understand the socio-economic and environmental impacts, and suggest policy decisions and guidelines required to promote bioenergy options.

Biomass, Energy, and Environment: a Developing Country Perspective from India, N.H. Ravindranath and D.O. Hall, Oxford University Press, Oxford, England, 1995, ISBN 0 19 856436 8.

Marketing in Forestry and Agroforestry by Rural People

This publication of the FAO Forestry Department, 1996, stresses the importance of marketing. It presents the term marketing as a mechanism which 'connects what the consumer wants with what the producer can produce and supply at a profit'. According to the authors not all forestry and agroforestry extensionists may be sufficiently aware of the importance of marketing or of the steps involved to help producers design production systems for greater profit. Thus they argue that both 'markets' and 'marketing' should be clearly defined in practical terms applicable to agroforestry and community forestry where marketing of multiple products is seen as a big challenge to producers.

It is further stated that the challenge of developing products, setting prices, selecting middlemen, organizing delivery systems and constantly monitoring competition and changes in the market is a

complex activity, which both reflects and affects the local social customs, values and division of labour. Many small-scale farmers are considered unable to take full advantage of existing or potential income-generating opportunities in agroforestry and community forestry because they lack access to general and specific information related to markets and marketing.

Therefore, the authors explain the role and application of marketing in agroforestry and community forestry and how it can affect the production system. It can serve as an invaluable tool for defining markets and marketing activities related to the above named programs, assist relevant government and non-government agencies to develop marketing organizations for producers of forestry and agroforestry goods, and assist farmers and forest dwellers to increase their incomes. This document is intended to be useful to extension workers, community organizations, NGOs and other field practitioners who wish to understand and improve local marketing systems and practices.

This publication can be obtained from the Forest Products Division of FAO, Rome.

News and Notes

National Training Workshop on Woodfuel Trade, Pakistan

RWEDP collaborated with the Pakistan Forest Institute (PFI) to organise a 'National Training Workshop on Woodfuel Trade'. The Workshop was held from 12-16 May 1996 in Peshawar. This course was a national follow-up action after the 'Regional Course on Trade in Wood Fuel Related Products', also held in PFI Pakistan in October 1995 for a selected number of RWEDP member countries having established trade and trading mechanisms for wood fuel related products.

The workshop was attended by 29 participants and resource persons. Among the government institutions related to forests and forestry development in Pakistan, the PFI, three Provincial Forest Departments (the Punjab, Sindh and North West Frontier Province), and the Agriculture University of Faisalabad participated in the workshop as participants and/or resource persons. Besides the participants from the government sector, private consultants and representatives of the local woodfuel traders also attended the workshop, some full time and most others part time.

Fourteen papers were prepared exclusively for the purpose of this workshop by highly experienced field workers, consultants and staff members of the PFI and Agricultural University of Faisalabad. These papers tried to cover all important aspects of the prevailing woodfuel flow systems in different parts of Pakistan, including the issues of woodfuel transport/movement (distribution) and markets and marketing (trade). A frank and critical comment made by one of the representatives of the local traders in the presentation/discussion session summarised the obstacles faced by traders in/during acquisition/ procurement and transportation of woodfuels from non-forest production sources. These included uncoordinated local taxes imposed on the movement of woodfuel between places, bureaucratic hurdles associated with procurement and movement, and the non-existence of institutional credit and extension services for woodfuel related businesses.

The field visit sessions of the workshop gave an opportunity to participants to familiarise themselves with the energy (particularly wood energy) related problems of the local tobacco curing industries, the brick kilns, and the wholesalers and retailers of woodfuel in and around Peshawar City.

Last, but not least, the workshop provided an unique opportunity to the PFI to bring together a number of relevant individuals from different agencies of the government, representatives of the local woodfuel traders, consultants, etc. in a common platform to discuss the crucial issues of woodfuel trade. The valuable recommendations provided by the workshop could be incorporated into the policy and strategy documents of the related sectors and thus could greatly assist the government to bring about the required changes which would help to promote woodfuel flows in the country.

Wood Based Energy Systems for Rural Industries and Village Applications, Pakistan

The Pakistan Council for Appropriate Technology (PCAT), with support from the FAO-Regional Wood Energy Development Programme organised, a national seminar on Wood Based Energy Systems for Rural Industries and Village Applications in Peshawar, Pakistan from 3-5 March 1996. The meeting was attended by 17 delegates from various government industrial support organisations, academic institutions and an NGO.

The national seminar was held as a follow-up of the regional seminar held earlier in Thailand in which recognition was given to the fact that woodfuels, besides being widely used in the domestic sector such as for cooking, heating, etc., are also essential for numerous small scale enterprises and village industries and other village based applications. Despite their obvious economic and socio-economic importance, many of the rural industrial and village activities are still facing various constraints, mainly in the form of shortages of: improved process technologies, raw materials, investment capital, management and labour skills etc. Pertinent to energy and forestry are the problems of fuelwood and agri-residue scarcity and shortages which are often compounded by poor energy conversion devices.

During the three day meeting, which consisted of two and a half days of presentations and discussions followed by a half day field trip to some selected sites in Peshawar city, the critical issues were discussed and conclusions and recommendations were drawn up. The meeting resolved that each organisation represented during the seminar would make efforts to bring the conclusions and recommendations to the attention of other relevant policy makers. Besides, efforts would be made by the organisations represented to provide support to other organisations to implement the recommendations made.

Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems, Vietnam

RWEDP collaborated with the Forest Science Institute of Vietnam (FSIV) to organize a 'National Training Course on Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems', from 17-20 April 1996, in Hanoi, Vietnam. This course was a follow-up to the subregional 'Training workshop on Integrating Woodfuel Production in Agroforestry Extension programmes in Southeast Asia' which was organized by RWEDP in Indonesia, in April 1995.

The training course was hosted by the FSIV on behalf of the Ministry of Agriculture and Rural Development of the Government of Vietnam. There were 29 full-time participants (including 6 women) and 6 part-time participants as well as 2 NGO representatives, one from the VACVIVA (an association of tree farmers) and the other from the Women's association of Da Ton Village. Among the participants from the government organizations were the representatives of the forestry, energy and agriculture sectors. Besides the FSIV, two other agencies, Vietnam Agriculture Science Institute (VASI) and the Energy Institute (EI) of Vietnam were also actively involved in the organisation of this national training course which was a great success and clearly achieved its intended objectives. It has contributed positively to raising awareness of the role of wood energy in the socio-economy of Vietnam, and communicated a clear message that there is an urgent need for integration of wood energy production into the extension programmes of the forestry, agriculture and rural development sectors in the country.

In all, six papers were prepared exclusively for presentation in the training course, and covered the different aspects of the woodfuel systems. One day was assigned to observe the woodfuel use patterns in local woodfuel based industries in and around Hanoi. At the concluding sessions, participants tried to identify three specific sets of follow-up activities applicable to the three distinct characteristic areas of the Red River Delta, the Northern highlands, and the Central-South Region, to overcome their present problems of woodfuel supply.

A report on the national training course is being prepared at the moment. An announcement will be made in this newsletter when it is available to our readers.

Rectification:

It has been brought to our attention by our friend and former colleague Dr. Aroon Chomcharn that the picture shown at the last page of Wood Energy News Vol. 11 No. 1 is not the transport of leaf litter from casuarina trees. The material carried is in fact grass, etc. growing around casuarina trees planted for coastal protection. Removing the grass cover and in some case uprooting it underlines even more the seriousness of the fuel situation in this particular area.

Acronyms used in articles:

AK	Auke Koopmans
CH	Conrad Heruela
JK	Jaap Koppejan
JS	Joost Siteur
TB	Tara Battarai
WH	Wim Hulscher

Events

Events, Description (Info)	Date, Venue
Architecture, Energy & Environment: Tools for Climatic Design The objective of this course is to deepen and extend the participants' understanding of climatic design, including the theoretical background, built examples and methods for future improvements. The focus is on modern, small-scale and low-cost construction, considering both passive climatisation and energy-saving techniques and strategies (Lund).	16 Sep - 18 Oct 1996 Lund, Sweden
International Training Workshop on Tropical Agroforestry and Multipurpose Tree Species (MPTS) in the Reforestation of Degraded Lands The objectives of the training workshop are to review the basic principles and concepts of agroforestry and MPTS and to discuss agroforestry technologies and use of MPTS with emphasis on their roles in degraded land use development (INFORTRACE).	30 Sep - 12 Oct 1996 Guangzhou, China
Forest Community Development Course The course covers five modules designed to build up the capability of the participants to formulate and manage a forest community development program or project. It focuses heavily on the community development process as the major intervention and the role of woodfuel resources management in community development (Los Banos).	3 Sep - 14 Oct 1996 Los Banos, The Philippines
First European Conference on Energy Crops This conference will give a concise picture of how energy crops are used, and which parties are using them, and will cover agricultural, technical, environmental, energy, economic and institutional aspects (BTG).	30 Sep - 1 Oct 1996 Enschede, The Netherlands
Workshop on Joint Forestry Management for Sustainable Development The workshop will review the concept of Joint Forestry Management and the role of the community in the protection of forest resources. It will also review the relationships of forest practices to ecological progress, socio-economic considerations in forest management, planning and monitoring procedures and the relationships of forest practices to policy and science (IES).	4 - 6 Oct 1996 Shimla, India
Energy Management and Cleaner production in Small and Medium Scale Industries (SMI) The objectives of this workshop are to enhance the management capabilities of SMI in developing countries with respect to: an analysis of the role of energy in production processes in relation to economic viability and environmental effects; the availability and acquisition of energy; the modes of energy supply; an analysis of the choice of fuels; conversion equipment and machinery, etc. (UT).	7 Oct - 9 Nov 1996 Maastricht, The Netherlands
Rehabilitation of Degraded Lands The course covers concepts, approaches, techniques and recent advances in: soil and water conservation; planning; implementing and evaluating projects for the rehabilitation of degraded lands. It also includes rehabilitation for woodfuel production and utilisation (Los Banos).	15 Oct - 2 Dec 1996 Los Banos, The Philippines

BTG: BTG Biomass Technology Group B.V., P.O. Box 217, NL-7500 AE Enschede, The Netherlands, ☎ +31-53-4893249, 🖷 +31-53-4893116, 💻 ecrop.btg@ct.utwente.nl

IES: Dr. Deshu Bandhu, President, Indian Environmental Society, U-112, (3rd Floor) Vidhata House, Vikas Marg, Shakarpur, Delhi - 110092, ☎ +91-11-222-3311/245-0749, 🖷 +91-11-33-7301

INFORTRACE: Cai Mantang, Course Coordinator, INFORTRACE< c/o Research Institute of Tropical Forestry, Longdong, Guangzhou, P.R. China 510520, ☎ +86-20-7797299, 🖷 +86-20-7725622, 💻 gzmtcai@pub.gz.gdpta.net.cn

Los Banos: The Director, Institute of Forest Conservation, College of Forestry, U.P. Los Banos, P.O. Box 434, 4031 College, Laguna Philippines, ☎ +63-94-2268/3340/2736, 🖷 +63-94-3340/3206, 💻 trv@mudspring.uplb.edu.ph

Lund: Dr. Hans Rosenlund, Lund Centre for Habitat Studies (LCHS), Lund University, Box 118, S-22100 LUND, Sweden, ☎ +46-46-222-4881/9761, 🖷 +46-46-222-4545, 💻 Hans.Rosenlund@ark3.lth.se

UT: Mrs. Ir. G.L. Stassen-te Velde, Technology and Development Group, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands, ☎ +31-53-4893539/4894377, 🖷 +31-53-4893087, 💻 G.L.Stassen-teVelde@TDG.UTWENTE.NL

Wood Energy and Employment

Local employment in the wood energy sector is at least 20 times larger than in the oil sector (per unit of energy).