RWEDP Report No. 25

REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA
GCP/RAS/154/NET

REPORT

ON THE REGIONAL COURSE ON TRADE

IN WOOD FUEL RELATED PRODUCTS

PESHAWAR, PAKISTAN
1 to 4 October 1995

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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FOREWORD

Peshawar is situted at the situated at the North-West Frontier of the RWEDP Region. However, Peshawar, with its Pakistan Forest Institute (PFI), can also be perceived as being right in the center of RWEDP. There has been and still is a long-standing cooperation between PFI and RWEDP for many good reasons. The North-West Frontier Province of Pakistan provides an outstanding example of private sector participation in wood and wood-energy development, which is linked to agro-forestry practices, wood industries, trade an markets. Moreover, PFI is one of the pioneer institutes which have incorporated wood energy subjects into forestry research and training programmes. A note on the training curricula for woodfuel production, flow and utilization at PFI has been included in Wood Energy News, Vol. 11 No. 1.

This report gives an account of the regional course on trade in woodfuel and related products, which was conducted at Peshawar in 1995. Many delegates from RWEDP member countries travelled to “the frontier” and contributed to the course together with the competent resource persons of PFI and other organizations in Pakistan, Philippines, Myanmar and India, as well as RWEDP. Though the activity was labeled as a “course”, it also had many characteristics of an expert meeting, especially as the participants came up with a number of recommendations for follow-up activities in the region. Amongst these is a sequence of ten national workshops with support from RWEDP, for which the regional activity laid the foundations.

This report benefitted from contributions by several experts. First drafts were written by the team of PFI. These drafts were them re-organised and complemented by Mr. Tara N. Bhattarai, wood energy resources expert of RWEDP, in consultation with Mr. Conrado Heruela, wood energy planning expert of RWEDP, and with substantial assistance from Mr. I. Baker of Mahidol University, Bangkok.

Further related activities being initiated by RWEDP will be directed to capitalising on the many important papers of the workshop by reworking them into training materials for coming workshops and regular training activities in the region.

Dr. W.S. Hulscher
Chief Technical Adviser

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PART 1 : MAIN REPORT

1. INTRODUCTION

1.1. Report Organisation

This report consists of the Proceedings of the Regional Course on Trade in Woodfuel and Related Products held at the Pakistan Forest Institute (PFI), Peshawar from 1-4 October, 1995. The course was organised by the Regional Wood Energy Development Programme in Asia (RWEDP). The report was prepared in collaboration with the Pakistan Forest Institute.

Part 1 contains the Main Report and consists of this Introduction as well as material relating to the Introductory Session of the course, i.e. course background, objectives, content and structure, and an overview of the regional woodfuel situation, along with a brief report on the Open Forum which proceeded the presentation of the regional overview. This is followed by summaries of the three other sessions (as well as brief reports of the Open Forums which followed each session), namely “Patterns of Supply and Use of Traded Woodfuels” (Session 1), “Issues in the Trading and Marketing of Woodfuels” (Session 2), and “Commercialisation of Woodfuels: Policy and Strategy Issues” (Session 3), and reports on the Field Trip and the Workshop and Plenary Session. Part 1 concludes with a summary of the Course Evaluation.

Part 2 contains the texts of the technical papers presented to the course participants. These are arranged in the order in which they were presented.

Part 3 contains seven annexures consisting of the Course Programme, the Opening Addresses, the Closing Addresses, a Profile of the Participants, a List of Participants and Resource Persons, the Course Evaluation Form and, finally, the Framework for Organising Field Observations.

2. Introductory Session

2.1. Introduction

The purposes of this session were, firstly, to orient the course participants by providing them with details of the background of the course, the course objectives, and the course structure and activities, and, secondly, to present the participants with an overview of woodfuel trade in the Asian region so that they would have a broad regional framework within which to place the national presentations which would follow in the remaining sessions. The session was jointly chaired by Mr. Ismet Hakim, FAO representative, Islamabad and Dr. Wim Hulscher, Chief Technical Adviser, RWEDP. Details pertaining to the course were presented by Mr. Conrad Heruela, Wood Energy Planning Specialist, RWEDP and can be found in sections 2.2, 2.3 and 2.4 below. The regional overview was presented by Mr. Tara N. Bhattarai, Wood Energy Resources Specialist, RWEDP and a summary of this can be found in section 2.5. The full text is presented in Part 2 of this report.

2.2. Course Background

At present, developing countries in the Asia-Pacific region meet 30 to 80% of all their energy needs with woodfuels. Woodfuels for cooking dominate domestic energy use in the majority of the countries of the Asian region, including Pakistan. Woodfuels are also used by many industries and enterprises in many of these countries. Per capita consumption of woodfuels may appear to be decreasing, however the aggregate consumption of woodfuels is increasing because of the increasing number of users. Woodfuels will continue to be a major component of the energy supply system of most Asian countries in the future.

The **Regional Wood Energy Development Programme in Asia (RWEDP)** GCP/RAS/154/NET, aims to contribute to the sustainable production of woodfuels, their efficient marketing and trade and rational use for the benefit of households, industries and other enterprises in its member countries. As such, RWEDP, has three **immediate objectives** to be addressed and achieved within the present phase (1994-1999).

- To contribute to an improved database on wood energy at regional and national level and to improve the capacity of institutions to generate, manage and assess such data at regional, national and sub-national level.
- To contribute to the development and adoption of improved wood energy policies, plans and strategies in member countries.
- To improve the capabilities of government, private and community based organizations in implementing wood energy strategies and programmes.

RWEDP's strategies to attain these objectives include: improving country capabilities (including GOs, NGOs and POs) to generate and assess wood energy-related data; assisting them in the use of these data for developing wood energy policies, strategies and plans; and assisting initiatives to integrate wood energy into national development programmes. Ultimately, RWEDP aims to see wood energy continue the important role that it currently plays of significantly meeting the energy needs of the majority in the countries of this region but in an economical, sustainable and environmentally-compatible way. In other words, making wood energy a "modern" fuel option for the future. One prerequisite to this is a thorough understanding of the trading and marketing of woodfuels, i.e., woodfuels flows from producers to users. Past studies have revealed that woodfuels flows involve many actors and constitute a complicated network. The production systems, for example, could include several sectors employing various resource management techniques: (a) the public sector - national, state or provincial forestry services (b) the private sector - private land owners, tenant farmers and/or lessees, and (c) the informal sector - the traditional forest users groups and/or the rural communities. Similarly, a number of different distribution networks/chains have been found active in operating the trading and marketing systems for woodfuels.

In its current phase, RWEDP will continue to study the conditions that affect and/or determine the production and flow of woodfuels from producers to consumers, for this is an important aspect of wood energy which has not been adequately addressed. A thorough knowledge of this is essential for adequate planning, for this influences the design of development interventions that impinge upon policies, strategies and programmes for promoting the use of and developing access to wood energy resources with due consideration for their sustainability. Some major activities under the RWEDP include training, workshops and seminars, as well as the compilation of case studies and the implementation of pilot projects.

The Regional Course on Trade in Woodfuel and Related Products (the subject of this Report) was organized by RWEDP in pursuance of its mission outlined above.

2.3. Course Objectives

- To bring together participants from governmental, non-governmental and /or private organizations who have been and will continue to be involved in the production and distribution (flow) systems of wood energy resources in RWEDP member countries to share knowledge and experiences and to form mutually beneficial professional networks.

- To enhance their knowledge and understanding about the complexity, intricacy and linkages of various elements of these systems so that the specific role of every element is duly recognized and incorporated into the planning process of different sectoral agencies affecting the national energy balance.

- To develop country capacities to design and implement national workshops/training courses that recognize the role and contribution of the private tree owners, woodfuel processors and traders with the aim of integrating their needs and required assistance into sectoral development policy and plans so that a sustainable income is assured by involvement in the wood energy sector.

- To identify and plan follow-up training activities at the national level, within the scope of work of RWEDP.

2.4. Course Structure and Contents

Essentially, the course consisted of a total of 8 technical papers presented by a number of regional experts who were active in some capacity in the field of woodfuel trade. These presentations consisted of a regional overview of the current status of fuelwood supply/demand, resource management, and woodfuel flow systems in selected countries of Asia, two case studies from the Philippines, three from Pakistan (the final one focussing exclusively on policy and strategy issues related to woodfuel trading and marketing in that country) and one case study each from Myanamar and India. Each session was followed by an open forum in which the participants had an opportunity to ask questions or make comments based on their experiences in their own countries. These technical presentations occupied the bulk of the first two days of the course. The third day of the course was devoted to a field trip which consisted of an observation tour to wood markets in Mardan. The morning of the final day of the course was reserved for a workshop designed to formulate regional-level and national-level activities (and to make other recommendations) to help improve national capabilities to assist processors and traders of woodfuels to maximise their benefits from the woodfuel trade and to help them ensure that woodfuels become an efficient , economic and sustainable energy option. For the purpose of the workshop the participating countries of the region were divided into two groups -- a South East Asian group and a South Asian group. The recommendations of the groups were presented in an afternoon plenary session when they were discussed and officially adopted. These are presented in section 4.3

2.5. Summary of Technical Presentation

A paper entitled **"Trade in Woodfuel and Related Products in Asia: An Overview"** was presented by Tara N. Bhattarai, Wood Energy Resources Specialist, Regional Wood Energy Development Programme in Asia. Some of the major points made by Mr. Bhattarai in his paper are presented below along with a brief report of the open forum which followed Mr. Bhattarai's presentation.

Energy consumption in most of South East Asian countries has increased significantly between 1980 - 1991, due to rapid economic and population growth. Energy supplies of the region include both "commercial" (coal, kerosene, LPG, electricity etc.) and "traditional" sources (fuelwood, charcoal and other biomass fuels, including crop and animal residues).

Numerous countries of the Region are already feeling the pressure of widening imbalances between the energy supply and demand. Total consumption of energy in the Region in 1991 was 13,094 petajoules of which woodfuels accounted for 3,704 petajoules (28.3%).

Traditionally-obtained energy is mostly used by the domestic sector for cooking and heating. APDC/GTZ (1993) estimated that about 80% of the household energy needs in the rural areas is met by woodfuel. National averages for the amount of wood coming from forests range between 10-50%, and for non-forest resources the range is between 50-90%.

It is estimated that 236.5 million tonnes of fuelwood and charcoal were consumed in eight regional countries in 1992. Of this, the share of forest wood was about 34%.

An increase of 34% in woodfuel prices in real terms in 10 major cities of the region took place between 1970 - 1982.

In addition to being an important source of energy, woodfuels also provide employment and income to a large number of families through their collection, transportation and sale. The World Bank (1992) estimated that over 830,000 households were employed in woodfuel-related activities in the region. Trade in woodfuel constituted the main source of income for about 10% of all the rural households, contributing about 40% of their cash earnings.

Fuelwood trade and transport channels involve many actors including the fuelwood producers, the collectors from forest and non-forest resources, and the traders who use different means of transport to get it to the urban centers for sale to the wholesalers, retailers and finally to the consumers and households.

A number of important issues related to woodfuel energy need to be addressed if the efforts to disseminate decentralized energy options in the developing countries of the Asia-Pacific region are to succeed. These issues relate mainly to policies (e.g. policies show a poor appreciation of the significance of energy in rural development and provide limited financial and fiscal incentives for decentralised renewable energy systems) and institutions (e.g. the overwhelming influence of centralised energy supply agencies and the marginalization of decentralised agencies with low levels of resource and manpower allocation).

During the **Open Forum** questions were raised by the participants from Philippines, Pakistan and Bangladesh regarding the sources of information and data reproduced by the speaker in his paper. It was also pointed out that there were discrepancies between the quoted data and the actual statistics on woodfuels in terms of supply, demand and prices for different countries.

The speaker answered that the data which he reported in his paper are based on figures contained in various sources including World Bank reports, reports of the World Resources Institute, the Pakistan Household Energy Supply Study(HESS) and the data collected from other sources in the region.

3. COURSE SESSIONS

3.1. Session 1: Patterns of Supply and Use of Traded Fuels

Session Objectives

The session was designed to identify the pattern of uses of traded woodfuels, their sources and the systems for supplying them to various end users in some of the countries of the region, particularly the Philippines, Pakistan and Myanmar.

Summary of the Technical Papers

The session was chaired by Dr. K.M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar, Pakistan. Three papers were presented.

(1) The first presenter was Ms. Felicisima N. Ariola, Non-conventional Energy Program Development Section, Non-conventional Energy Division, Dept. Of Energy, the Philippines whose paper **"Study of Wood Fuel Flows in Six Urban Areas of the Philippines"** reported on a major year-long study which attempted to identify the sources of traded woodfuels, the patterns of distribution and consumption, and the market mechanisms for distributing the fuels from the rural areas to users in six urban areas of the Philippines. The study also aimed to identify various problems which affected the woodfuel trade. The author presented the results of only four of these areas, namely Cagayon de Oro, Cebu, Metro Manila and Tacloban as the results of two of the target areas were not currently available. A brief summary of some of the major points is presented below.

Cagayon de Oro has a population of 430,000 with an annual woodfuel consumption estimated to be 82,000 tons of fuelwood and 7,000 tons of charcoal. Most of the fuelwood went to households and commercial establishments (e.g. bakeries, restaurants, textile factories etc.). Incomes of charcoal-makers average US$ 435 per year which is about 50% of their cash income.

If the above-mentioned figure for the total consumption of fuelwood and charcoal is translated into LPG demand then this would be equivalent to a value of US$ 0.73 million or P 21.87 million in foreign exchange savings. Apart from these savings, fuelwood is a source of income for many households. The wood gatherers interviewed collect an average of 4.9 tons each year, which suggests that around 17,000 households earn some income from supplying wood to the city's market. The charcoal makers' incomes from charcoal (including that sold for activated carbon) average P11,300 each year or around US$ 435 which is about 50% of their cash incomes.

The total woodfuel consumption of **Cebu** city is about 180,000 tons/year of woodfuel and 15,000 tons of charcoal. The commercial sector consumes 49% of the charcoal and 37% of the fuelwood. Average total consumption of charcoal in Cebu city is less than 5 kg/household/month. Charcoal-making fetches around US$ 147 per year accounting for 30% of the cash income of charcoal makers. The total amount of these resources consumed each year is equal to 43,000 BOE or US$ 0.73 million.

The fuelwood gatherers collect an average of 5.9 tons of wood each year. This suggests that around 30,000 households are engaged in wood gathering in Cebu. Wood gathering is an important source of income with earnings averaging over P 3,500 per year or about US$ 135.00. This is equal to about 40% of total cash income for these households.

Charcoal is not widely used in the urban areas of Cebu -- the average household consumption is less than five kilograms per month. Charcoal making is a supplementary occupation for farmers who receive about P 5,000 per year or US$ 417, a sum which represents about 30% of their incomes.

Total demand for woodfuel in **Metro Manila** was estimated at less than 60,000 tons of fuelwood and less than 50,000 tons of charcoal in 1989. The total quantity of wood used (including that used to produce charcoal) is estimated at 350,000 tons per year. Most of the fuelwood supply in Manila goes to bakeries, restaurants, textile factories, etc. Overall woodfuel consumption in Metro Manila is equal to approximately 80,00 BOE, worth an estimated US$ 1.32 million at 1989 prices.

Total annual woodfuel consumption in **Tacloban** is about 61,000 tons of fuelwood and 5,000 tons of charcoal. About 49% of the total fuelwood was consumed for domestic purposes. Charcoal is utilized mostly by households (60%), bakeries and restaurants (17%), retailers (17%) and wholesalers (4%).

Woodfuel trade is considered to be an important source of income in Tacloban city. The study estimated that fuelwood gatherers collect an average of 4.4 tons each year, which suggests that about 14,000 households (46% of the total) are engaged in fuelwood collection to supply Tacloban's market.

In marketing, fuelwood and charcoal pass from the fuelwood gatherers and charcoal makers to the rural traders and urban traders who further transport the fuel to the cities and sell it to urban traders or directly to the consumers.

These woodfuels equal about 14,700 BOE with an approximate value of US$ 0.24 million at 1989 prices.

Private lands, forest areas and marginal lands are the main sources of fuelwood and charcoal supply. Fast growing tree species, forest and fruit trees are the principal sources of fuelwood and charcoal in all the above urban centers.

An analysis of the biomass situation in the Philippines suggests that that the overall picture for these fuels is a favourable one and there is no cause for concern about household shortages. There is evidence, however, of mismanagement and possible over-exploitation of mangrove and upland areas in some parts of the country.

During the **Open Forum** questions were raised by the participants from Bangladesh and Nepal about the distances involved in the marketing of fuelwood. Some clarification about commercial establishments and the views of the author about the future development of charcoal were also requested.

The Ms. Ariola answered that the distances involved in the marketing of fuelwood had been considered in the various marketing studies undertaken by the study teams and that details of these could be found in the research reports. By commercial establishments Ms. Ariola said she was referring to the retailers. She also replied that in her opinion charcoal would remain cheap and economical to produce well into the future.

(2) The second presenter was Mr. Zamir Ahmed, Deputy Chief, Energy Wing, Planning and Development Division, Ministry of Planning and Development, Government of Pakistan whose paper was entitled **"Wood Fuels Trade and Marketing in Pakistan."** Some of the main points mentioned by Mr. Ahmed are reproduced below.

The household sector in Pakistan consumed about 20 million tons of oil equivalent of fuelwood out of a total energy consumption of 38 million tons of oil equivalent. This amounts to 52% of the total. Within the household sector, 86% of fuel consumed was accounted for by woodfuel. Overall, the country consumed 32.4 million tonnes of woodfuel with the household sector consuming about 90% of this. About 79% of households use fuelwood with an average of 2,324 kg/year/household. In urban areas, the number of firewood users decreases as income increases. Households with 16 or more members consume 2.17 times more than those having fewer than five members. However, per capita consumption is 198 kg/year for large households and 568 kg/year for small households

Only 28.5% of the urban households use fuelwood. In rural areas most of the fuelwood (69%) is collected apparently free of charge. In fact, about 699 person-hours per year are spent on collection. If this labour is valued, it would cost a rural household almost Rs.2,800 and the economy, about Rs.19 billion, while the market value of the collected fuelwood did not exceed Rs.14 billion in 1991.

Firewood used in traditional fireplaces generally serves multiple uses simultaneously e.g. cooking, water heating and space heating.

The average market price of firewood was Rs.0.98/kg in 1991. In terms of delivered energy for cooking, the cost of 1 megajoules (MJ) of fuelwood is Rs.0.47 which is nearly comparable to kerosene at Rs.0.48/MJ and more expensive than dung cakes and crop residue (Rs.0.37/MJ and Rs.0.36/MJ, respectively). The average total household expenditure on fuelewood in 1991 was Rs.31,147 which is still much lower than the expenditure on electricity (Rs.38,599/year), or natural gas (Rs.54,330/year). Total fuelwood expenditure represents 10.6% of the total household expenses.

It is estimated that farmlands are the major source of fuelwood. According to the Forestry Sector Master Plan(FSMP), the standing stock of farmland trees was 76.6 million m^3. This is comparable to the Household Energy Supply Strategy's (HESS) standing stock estimates of 96.7 million m^3 as the FSMP estimates did not include twigs, roots, road side trees and citrus trees in their total projections.

About 40,412 trading establishments are currently operating throughout Pakistan. These operators employ roughly one out of every 1,185 person in the country. There is a woodfuel business for every 2,500 inhabitants and about 80,000 to 100,000 people are directly involved in this trade. The business generates about Rs.11.4 billion annually, equivalent to 10% of the value of all the exports of Pakistan for 1991-92.

High tonnages of firewood are transported over large distances in Pakistan. Transport costs are the largest component of the wood purchase price, accounting for 67% of *en route* and yard arrivals costs. Overall transit taxes take up the same share of costs involved in unloading and other yard arrival tasks. This is a high tax burden for a non-manufactured good. The tax structure appears to be poorly understood and subject to widespread abuse.

Some small portion of the pressure on forest resources certainly comes from the increased demand for firewood but the continuing pressure on forest resources is largely attributable to multiple sources.

For woodfuel resources to continue to be the predominant source of energy in the country there must be a transition from the widespread exploitation of existing trees to the exploitation of trees specifically planted as a source of fuel. The management of trees on agricultural lands must also be improved. Moreover, unbridled population growth without increases in income to provide for inter-fuel substitution will lead to the destruction of the fuelwod supply system in Pakistan.

The following recommendations were made:

- Regular surveys should be carried out to collect data on farm land tree planting, management, production and economics of tree planting as well as farmers' attitudes towards tree planting.

- Information and advice to farmers on tree growing and marketing should be improved.

- A country-wide review of taxes on wood transport as well as of the permits and payments systems should be carried out as the present systems are onerous and reduce incentives for tree growing and effective marketing.

During the **Open Forum** the participants from Pakistan and China raised questions concerning: (1) why there is no mention of fuelwood in the Energy Handbook (2) the follow-up to the HESS Study and (3) whether or not environmental impacts were considered when planning the study.

Mr. Ahmed answered that (1) the Energy Handbook deals with commercial fuels only (2) the results of the HESS Study were finalized in July, 1993 and the follow-up strategy and comprehensive report have just been received and so were not mentioned in his presentation (3) traded fuelwood comes mainly from farm lands where there is least environmental impact, so environmental impacts were not really addressed in any great depth in the study.

(3) The third and final paper of this session was **" Wood Fuel Flows in the Dry Zone of Myanmar"** by U Saw Tun Khaing, Watershed Management Project, Myanmar. There follows some of the main points mentioned by the author.

The forest area in Myanmar showed a steady decline from 57% in 1958 to 47% in 1980. This was mainly due to over-use of timber and fuelwood by a large and ever- increasing population. Studies carried out in Myanmar have shown that out of 14 states and divisions, two states and six divisions are classed as fuel deficit areas.

Case studies on woodfuel flows in the Mandalay Division, in the dry zone of Myanmar, reveal that woodfuels are extensively used by both domestic and industrial sectors in the form of firewood, charcoal, mill off-cuts, bamboo fuel and agricultural residues.

In two urban centers (Thazi and Meiktila) 153,703 tonnes of fuelwood and 604,800 bundles of bamboo fuel were estimated to have been consumed by 58 cottage industries, 293 food stalls and 21,570 households.

Fuelwood supplies are procured from 13 reserves covering an area of 61,500 acres. Eleven small and large villages in the area provide labour for the collection of fuelwood for onwards supply to the urban consumption centers. People engaged in the collection of fuelwood are primarily farmers. Fuelwood collection is a supplementary activity carried out in the off-farm season. In six villages alone, there were almost 700 persons engaged in fuelwood collection, and the data for a further five villages were not available.

In addition to the traditional fuelwood species, mesquite (*Prosopis juliflora*) is now increasingly being used as fuel in evaporated milk production, caustic soda boiling, palm sugar production and yarn dyeing. Evaporated milk producers prefer bamboo fuel over other commonly used woodfuels as it has some characteristics which make it more suitable for use, namely it does not impart a brown color to the milk which other biomass fuels do and thus does not result in a lowering of the price.

Saw mill waste in the form of off-cuts and sawdust and agricultural residues are other sources of fuel which are used to a lesser degree.

Charcoal is seldom used as a source of domestic energy in rural areas except in small scale industries and blacksmithies. In urban areas it is used in domestic cooking as well as in restaurants, tea shops and noodle shops etc.

Around 1983-84 the Forest Department carried out an inventory of 7 forest reserves which have been designated as fuel supply sources of the supply area. The results of the inventory indicate that woodfuel supply can be sustained for 16 years and bamboo for 6 years given the existing rate of prescribed cutting.

At present the consumers have very little option but to depend on biofuels, mainly woodfuel. For the increased production of fuelwood, Woodlot Development Projects have been started with the assistance of the United Nations to check environmental degradation and improve the living conditions of rural people by providing enough woodfuel for domestic use and additional job opportunities.

During the **Open Forum** questions were raised by the participants from Pakistan, Nepal and Bangladesh regarding (1) the density of various fuelwood species (2) the reasons why rich fuelwood resources remain, and (3) the proportion of fuelwood collected from forest and non-forest resources and use of cow dung as fuel.

The author answered that (1) only two wood species have a low density and the remainder are identified as suitable for fuelwood (2) the reason for the richness of fuelwood resources is the large forested area which amounts to about 47% of the total land area, and (3) the fuelwood supplies are all forest based and cow dung is very rarely used as fuel in Myanmar.

3.2. Session 2: Issues in the Trading and Marketing of Woodfuels

Session Objectives

The objective of the session was to discuss the factors that promote commercialization of woodfuels, how the trading and marketing systems for woodfuels evolve, and their socio-economic and environmental impacts.

Summary of the Technical Papers

This session was chaired by Ms. Yao Xiangjun, Deputy Director, Institute of Energy and Environmental Protection, China. Three papers were presented.

(1) The first paper in the session was **" Woodfuel Production for Urban Markets in Cebu: Issues and Challenges "** which was written by Ms. E.M Remedio and T.G. Bensel, Department of Economics, University of San Carlos, Cebu City, the Philippines. Ms. Remedio presented the paper which reported on the most significant findings of recently completed research into the way wood energy is produced, traded and consumed in Cebu Province and the economic and environmental impacts of these activities. Some of the findings are presented below.

Most of the woodfuel is produced on an area of 73,000 ha. which is about 15% of the land area of Cebu, Philippines. Major supplies of woodfuel are from four kinds of cultivated fast-growing tree and shrub species accounting for 58% of fuelwood and 71% of charcoal sold in the province. Fruit-bearing trees account for 23% of fuelwood and 14% of charcoal, while naturally-growing trees account for 16% of fuelwood and 12% of charcoal traded in the market.

In many parts of Cebu, small land-holders have established wood lots generally on marginal lands ranging in size from 100 m^2 to 2 *ha*. Commercial tree plantations are usually established on better quality lands and range in size from 5 to 20 ha., planted with *Leucaena leucocephala* and *Acacia auriculiformis,* mainly producing woodfuel and underground mine props on a 2-5 year rotation. Large plantations produce high-value wood products from species like Gmelina and Mahogany on an 8-15 years rotation.

The commercial woodfuel trade is organized in a fairly scientific manner. Small land-holders typically do their own harvesting. In plantations, harvesting is usually done either by tenants or professional wood cutters on a sharing-contract or daily-wage basis. The most common sharing arrangement is to receive two-thirds of the farm-gate value. If it is a contract arrangement, the land-owner is paid a fixed amount of money, often by rural traders with an advance cash payment.

Fuelwood cutters and charcoal makers earn 30-50% of the final selling price if they work on a sharing basis, 40-60% if they cut trees from their own lands and much less if hired on a daily-wage-basis. Land owners earn about 20% of the final selling price, transporters earn 7-35% (depending on the transport distance), rural traders earn 10-25% of the final selling price and urban traders another 10-20%.

Wood energy trade in Cebu is worth US$ 10 million/year. Around 35,000 rural households (15% of the population) derive some cash income from the sale of fuelwood and charcoal. Another 5,000 earn income as rural and urban traders, transporters and helpers.

Ms. Remedio noted that the general perception that overcutting of trees in Cebu for local woodfuel supplies and for sale in urban markets is a major cause of deforestation on the island needs to be treated with caution. Indeed although Cebu has been called a “fuelwood deficit zone” in one FAO report and the government of the Philippines has classed it as one of nine provinces nationwide that are characterized by ”very heavy stress” in terms of biomass fuel supplies, her research results suggest that the overall biomass supply-demand picture in Cebu is favourable, and will remain so if the current woodfuel- producing land use practices do not change for the worse.

During the **Open Forum** questions were asked by the participants from Pakistan and Nepal regarding (1) the number of people engaged in the fuelwood trade (2) the sampling method used by the researchers, and (3) the issue of licenses and permits for fuelwood collection.

Ms. Remedio answered (1) about 35,000 households are involved in the fuelwood trade (2) during the research no response was accepted from an interviewee without verification from other households, and (3) an improvement in the permit system could reduce the burden on fuelwood traders.

(2) The second paper in this session **“Marketing of Wood Fuels in Peshawar City, Pakistan”** was presented by K.M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar. Some of the most significant details are presented below.

Dr Siddiqui first gave some of the major characteristics of the national energy situation in Pakistan, which are:

- Low per capita energy consumption-- the figure for 1990-91was 11.45 million kg.
- Rapid growth in national energy consumption with an annual growth rate of 4.3%. In 1990-91 an estimated 29.2 million TOE were consumed.
- There is an increasing reliance on commercial fuels--these accounted for 74% of the total in 1990-91.

- Heavy reliance on imports--imports of oil and petroleum products amounted to 8.4 million tonnes in 1990-91.

- Declining role of wood fuels which accounted for 15% of national energy consumption in 1990-91.

Fuelwood is mainly used as a source of domestic energy in Peshawar city. However, a survey conducted in 1992, revealed that only 13.4% of households surveyed used fuelwood as a source of energy, while 80% depended on commercial fuels. Only a small percentage of households (6.3%) used cow dung.

The pattern of consumption of commercial and non-commercial fuels with the different income groups classified as high, medium and low was also different. The low income group met about 18% and medium income group met about 4% of their energy needs from non-commercial sources (fuelwood and charcoal), while high income households totally depended on commercial fuels like kerosene, LPG (bottled) and piped gas.

The energy consumption level was related to the household size and showed a decreasing trend with increasing number of persons per household. The annual per capita energy consumption in households in Peshawar city (excluding electricity) is estimated to be about 4.6 million KJ, with the per capita consumption of smaller households (1-3), almost double this figure. The per capita consumption for larger households sizes (10-13) was about ≥4.2 million KJ.

In terms of annual per capita energy consumed and fuel type, piped gas dominated (5.9 million KJ), followed by fuelwood (5.37 million KJ), kerosene (4.1 million KJ), LPG (1.8 million KJ), with dung at the bottom (0.99 million KJ). Average annual fuel expenditure per household (excluding electricity) was Rs.3,526. The highest expenditure was on fuelwood (Rs.4,636), followed by kerosene (Rs.4,065), piped gas (Rs.3,591), LPG (Rs.1,198) and dung (Rs.755). The share of wood was 15.7% of the total energy consumed while gas accounted for almost 50%, kerosene oil 30% and the rest was shared by LPG and dung.

In terms of tonnage, the amount of woodfuel consumed was about 41,000 tonnes followed by kerosene oil (31,000 tonnes), LPG (3,000 tonnes) and dung (7,000 tonnes). Of the total 224 commercial units located in 4 sampled wards of Peshawar city (out of a total of 45 wards, 22% used wood, 5% charcoal, 8% kerosene oil and the remainder (65%) consumed natural gas. Energy consumption in the commercial sector was estimated to amount to 9,227 TOE. The government sector also consumes a considerable amount of wood fuels, mainly for space heating in the winter. Charcoal is the main fuel with an estimated 2-3 thousand tonnes consumed each year. The trade in woodfuels is roughly worth Rs. 78 million (3.1 million US dollars) in Peshawar City market. The people of Peshawar spend about 61 million rupees on fuelwood and 17 million rupees on charcoal each year. Total demand for woodfuel and charcoal is estimated at 44,600 tonnes and 3,500 tonnes, respectively.

During the **Open Forum** there were no questions, however, the Indonesian delegate commented as follows:

"The procedures for harvesting, transporting and trading fuelwood and its products were quite different from place to place. I think the situation is similar in our country too. We cannot make a general statement about all places. I think the consumption and marketing are influenced by scarcity of fuelwood. Like Cebu city and Peshawar, the supply depends on prices and these depend on scarcity of fuelwood and lack of commercial energy. In places where commercial energy is available the people do not like fuelwood. It also depends on the income of households. If the income of the household is very small then they will collect fuelwood rather than buy it."

(3) The third paper in this session was read by Mr. T.N. Bhattarai, RWEDP, on behalf of its author Mr. Prakash M. Shingi, Indian Institute of management, Ahmedabab, India who was unable to attend. The paper is entitled **" Charcoal Production and Marketing in Gujarat"** and a brief summary of some of the main points follows.

Charcoal production and marketing have a long history in Gujarat. Introduced into India in 1836, *Prosopis juliflora* (locally known as *gando baval*) is the only species used for making charcoal.

Used as a fuelwood, *Prosopis* has some inherent disadvantages, including limited shelf life resulting in considerable storage losses, the fact that only thorny varieties are available, prices are low, and it comes in non-standardized sizes and shapes. In contrast, charcoal made from *Prosopis* sells at a higher price, is much easier to handle than fuelwood and easier to sell on a cash basis in the central market of Ahmedabab.

Charcoal production in Gujarat consists of small scale operations based on simple traditional technology. Production is sluggish during the monsoon season (October-December) and the bulk of the output is produced between January and June.

Different arrangements for producing and selling charcoal are possible depending on the skill and convenience of the *Prosopis* owners. The two most popular options, whether the owners are individuals or institutions, are selling the standing trees outright to charcoal producers who produce the charcoal and then sell it to traders, and contracting the producers to make the charcoal on behalf of the *Prosopis* owners who will then sell the final product directly to traders themselves.

Charcoal sold to the traders is subject to processing (unloading from bags, screening, cleaning, sorting, re-filling bags, top-dressing i.e. placing attractive and high quality pieces of charcoal at the top of the bag to attract customers) who then add their margin to the net cost. The margin depends upon the quantity lifted and the mode of payment. A 2% margin is charged for cash transactions and 18% when a credit period of four months is involved.

Charcoal is used for cooking, by laundry-men in irons for pressing, for extracting lead from old automobile batteries and roasting of coriander seed. Industrial use of charcoal is in the manufacture of calcium carbide, calcium carbonate and rayon industries. Their combined consumption is estimated at 63,000 tons per annum.

To generate employment and thus improve family welfare, the UNICEF-supported Development of Women and Children in Rural Areas (DWACRA) have organized more than 100 women's groups in Banaskantha district where charcoal-making is the second largest preferred activity.

The per acre cost of *Prosopis* charcoal production and transportation to the market as worked out by DWACRA was Rs.6,300 while the gross income from its sale was Rs.10,000 thus leaving the owners with a net income of Rs.3,700/acre. Access to 10 acres of standing *Prosopis* was considered potentially remunerative for a group of 10-15 women. In the first year of its existence, DWACRA, with 7 groups and a total of 94 women members, manufactured 3,515 quintals of charcoal and earned a net profit of Rs.569,102 by using an initial capital of Rs.176,400.

Yearly arrivals of charcoal from the different districts in Gujarat show an overall increasing trend, although there were set-backs in some of the years. Some districts also experienced set-backs in their ability to supply the charcoal to the Gujarat market.

While most of the charcoal arriving in the Ahmedabab market came from the Gujarat state, a small proportion of the charcoal produced in the state is despatched to destinations outside of the state.

During the **Open Forum** a participant from Pakistan commented on the methodology of data collection stating that the results could be biased if official records were used for a commodity which is taxed. He also proposed changes in the forestry education system to change the attitude of forest officers so that they would be supportive of the charcoal industry. Delegates from Srilanka, Nepal, Pakistan and Thailand made further comments regarding production, trade and consumption of charcoal, as well as different socio-economic and gender issues related to woodfuel.

3.3. Session 3: Commercialization of Woodfuels: Policy and Strategy Issues

Session Objectives

This session was designed to investigate policy and strategy options for improving the efficiency of woodfuels marketing and trading so that their potential as a modern and commercial energy option can be better exploited more effectively.

Summary of the Technical Papers

Session three was chaired by Mr. Gopal M. Shreshta, Ministry of Forest and Soil Conservation, Nepal. There was only one paper presented in this session which was presented by Mr. Syed Waquar Haider, Energy Consultant, World Bank Household Energy Strategy Study Project. Mr. Haider's paper, **"Policy and Strategy Issues in the Trading and Marketing of Woodfulels"** gave an overview of the energy sector in Pakistan and emphasised woodfuels and their consumption by the household sector. Some of the highlights are prsented below.

The current national energy consumption is estimated at approximately 20 million tons of oil equivalent in 1991. The household sector accounts for 54% of this and is thus the largest single energy consuming sector in the country. Because of rapid population growth it is the fastest growing sector in terms of demand for modern fuels. Indeed it has placed considerable stress on the modern fuel supply infrastructure, resulting in electricity load shedding, natural gas rationing, fuel shortages and increased demand for fuel imports and massive capital investment in the fuel sector. Despite the growth of modern fuel use, the majority of households still rely on biofuels such as firewood, dung and crop residues of various kinds. Each of these biofuels alone supplies more energy (in terms of their latent value) to the household sector than all the modern fuels combined. The rapid population growth has created fears that woodfuels could become scarce and thus create considerable hardship, especially for those low income households who rely on being able to gather these fuels at no cost to meet their energy requirements.

Biofuels account for 86% of the total household energy consumption. Natural gas is the most important modern fuel and accounts for 50.6% of the total modern fuel consumption in the household sector of urban areas. Electricity (30.6%), kerosene oil (15.7%) and LPG (3.2%) are the other types of modern fuels used in the household sector.

Sixty six percent of the country's energy requirements are supplied locally and the remaining 34% of energy is imported at a cost of US$ 1.5 billion, almost 40% of the export earnings of the country.

About 40,000 fuelwood businesses operate in the country of which 32% are located in urban areas, 52% in rural areas and the remaining 16%, along metalled roads. In 1992, about 98,800 persons were engaged in fuelwood businesses of whom, 71,800 were engaged permanently and 27,000 were engaged only part time-- about one out of every 1,185 inhabitants of Pakistan.

Nearly 90% of farmers of Punjab sell their wood to local traders on a standing-tree-basis. About 75% of the farmers surveyed indicated that they plant *shisham* and *kikar* trees. Sale price ranged from Rs.125 to Rs.1,000 per ton with an average price of Rs.450 per ton. In 1992, wood trade in Pakistan was about 15.8 million tons of which 12.4 million tons were sold to the final consumers and 3.4 million tons to traders.

Except in Balochistan, price mark-ups are fairly consistent at 30%. However, Sindh traders show the lowest profit margin at Rs.23,000 while Balochistan traders show a very high net profit of Rs.108,000. Transport costs are prominent in the price structure of firewood and account for 67% *en route* and yard arrival costs; average costs being Rs.0.53 per ton-kilometer.

Transit taxes have an important bearing on the landed price of wood and vary significantly among the provinces. For Punjab, these are about 50% of the transportation costs (les taxes). The initial wood price ranges between 57% and 74% of the landed cost. Transit costs in NWFP amount to Rs.150 per tons or 30-35% of the tree-producer price.

With careful planning, woodfuel can provide a sustainable energy future for Pakistan's households. However, if this is to be attained electricity and gas connections should be accelerated and reduction in the amount of woodfuel used for cooking should be realized by switching over to LPG. Such measures would reduce the burden on biomass.

Mr Haider's paper also included a brief appendix consisting of an extract from a paper entitled "Boom and Crash: Farm Forestry in North West India" by N.C. Saxena. This described the "explosion of tree growing" which took place in north-west India in the eighties as a result of rapidly rising prices for timber, poles and fuelwood, and the equally dramatic crash which followed, beginning in 1986, as a result of saturation of the market.

The presentation of Mr. Haider elicited many comments and reactions from almost all of the participants during the **Open Forum** and these covered almost all policy and other issues related to production and trade of fuelwood. Topics which were raised included (1) policy formulations for improving woodfuel production in China (2) the fuelwood price situation in Bangladesh (3) the question of saving natural forests and the environment through the establishment of fuelwood plantations in Pakistan (4) an integrated approach for rural development and energy management (5) the uneven distribution of per capita income in most of the countries of the region (6) policy and institutional arrangements for increased production of fuelwood (7) education of fuelwood producers to reduce their dependence on the traders (8) greater involvement of the private sector in fuelwood production, trade and marketing and less intervention from the government sector.

Participants also wondered whether Pakistan's farm tree boom could lead to a similar crash as that experienced in north-west India. Whilst noting that the conditions in the two countries are dissimilar in many respects, it was felt that Pakistan could not discount such a boom and bust scenario and would be advised to adopt integrated policies and programmes to ensure the sustainability of her tree farming sector.

4. REPORT ON FIELD VISIT TO THE FARM / AGRO-FORESTRY AREAS IN CHARSADDA AND MARDAN DISTRICTS ON 3 OCTOBER 1995

The third day of the training course i.e. on the third of October 1995 was devoted to a field trip to the farm/agro-forestry areas in Charsadda and Mardan Districts, adjoining Peshawar. The purpose was to show the participants the practice of growing timber and fuelwood species (hybrid poplar and shisham), both in block plantations as well as in linear rows, in combination with the other agricultural crops. The trip would also provide an opportunity to the participants to interact with and ask questions of timber and fuelwood growers, traders, processors and users.

4.1. Background

The majority of the farmers in Charsadda and Mardan Districts have small landholdings and this is a major reason why they practice intensive agriculture through the adoption of farm and agro-forestry techniques to make their living. Moreover, in the early seventies, and the years which followed, certain geo-political developments took place in Pakistan which gave a further momentum to the farm/agro-forestry systems already rooted in the area. These developments, namely the secession of the east wing of the country to become the independent state of Bangladesh, and the influx of Afghan refugees after the invasion of USSR troops into Afghanistan, resulted in an increased demand for timber and fuelwood and created more opportunities to increase earnings. This rendered the Charsadda-Mardan districts as the leading poplar producers in the country. Poplar timber is extensively used in construction and as raw-material for industry, mainly in the manufacture of matches, and the leftovers are used as fuel.

On the field visit the participants were accompanied by Mr. K.M. Suleman, Senior Pulp and Paper Officer and Mr. Fazle Subhan, Senior Research Officer of the Pakistan Forest Institute, Peshawar.

4.2. Visit to the Farm of Mr. Abdul Latif Khan

Mr. Abdul Latif Khan is a progressive farmer of the Charsadda District. The size of his farm is about 18 ha. On this farm he practices farm/agro-forestry, planting hybrid poplar in three linear rows along the boundaries of his crop fields. A piece of land, in the form of an orchard, is also set aside to grow fruits. Furthermore, he is also the biggest producer of valuable exotic flowers in the area for marketing in the urban centers.

The participants showed a keen interest in the growing, harvesting and marketing of poplar wood on his farm and asked a number of questions about propagation, rotation age, distribution, marketing and uses of poplar wood locally and elsewhere. The participants also learned that poplar trees of 4-5 years age are harvested and marketed for use in the match industry in Peshawar. On the question of the need for middleman in the timber and fuelwood trade, Mr. Khan emphasized the positive role of the middleman in streamlining the process of harvesting and efficient trade of timber and fuelwood in the area. As a supplementary business Mr. Khan himself is engaged in handling of poplar timber from the area and acts as a middleman in the trade and marketing of poplar timber outside. However, he told the participants that direct sale of the timber is not possible for the majority of the farmers in the area due to a number of reasons. Firstly, they don't have enough capital to invest in the business and secondly, in view of the high overhead costs, the production of poplar timber on their own farms is not sufficient for direct and economic marketing,

4.3. Visit to Timber Wholesalers

The participants also visited a wholesale depot for poplar in Mardan District. They asked a number of questions regarding the purchase, grading and marketing, transportation and pricing of poplar wood. Most of the participants showed a keen interest in the existing integrated marketing of poplar wood in the area. They also discussed the marketing margins of wholesalers.

4.4. Visit to Small Scale Primary Processing Units

The participants also visited small scale sawmills owned by the wholesalers. These small units produce sawn poplar timber for the manufacture of different wood products. The participants asked a number of questions to estimate the degree of value-adding by the small processing units. They also enquired about the possible users and markets of the wood products manufactured from poplar wood. The participants were highly impressed by the agro-forestry activities they encountered in the Charsadda and Mardan districts.

From the discussions with various people, it can be concluded that:

- the demand of poplar wood, as raw-material for industries, in the country has created good prospects for the sector and a strong driving force to expand it.
- poplar cultivation is not only a source of raw material for a number of industries and for fuelwood, mostly for domestic use in the area, but employs a large number of rural people in its planting, harvesting, transportation and sale.
- processed poplar residues like bark, small branches and leaves are also used as a source of energy in the area.
- some of the participants expressed a strong interest in introducing poplar into their own countries.
- the majority of the participants were of the opinion that much can be learned from poplar growing in Pakistan.
- the free marketing of poplar wood in the Charsadda and Mardan districts has a number of important lessons for those who still advocate restrictions on the wood trade.

SALES DEPOT FOR FARM-GROWN POPLAR WOOD

Participants discussing with a private depot owner who trades farm-grown poplar wood in Mardan, Peshawar.

Graded piles of poplar wood for different uses in Mardan, Peshawar. Larger piles are used for paper making or construction purposes and the smaller ones are used as cooking fuel in household and restaurant kitchens.

TRANSPORTATION OF PRIVATELY GROWN WOOD

Contractor in his depot unloading wood bought from private producers.

Fuelwood being transported by donkey cart for delivery to end-users.

WOOD FUEL USERS

Brick kilns require a substantial amount of firewood for initial burning.

Saw-mill waste (off-cuts and sawdust) are used as fuel for different purposes.

5. WORKSHOP AND PLENARY SESSION

5.1. Introduction

To conduct the workshop, the various countries represented at the course were grouped into two categories based on criteria which reflect the wood fuels trading and marketing situation in these countries. The criteria used were: adequacy of information, availability of policies and strategies, institutional infrastructure for programme planning and implementation, and number and levels of programme activities.

The two groups are as follows:

- Group 1: South East Asian Countries:
  China, Vietnam, Thailand, Indonesia,
  Philippines and Myanmar
- Group 2: South Asian Countries:
  Pakistan, Srilanka, Bangladesh. Nepal.

Each group identified regional-level and national-level activities, including a framework for national seminar/workshops on the trading of wood fuels, plus other recommendations, that were designed to (in the long-run) improve capabilities of government agencies and NGOs to assist wood fuel traders and processors to generate sustainable income from their involvement in the wood energy sector. Various specific pilot schemes were also proposed by the members of each group.The results of the group workshops were presented at a plenary session.

5.2. Presentation of Participants' Recommendations

South East Asia Group

Countries: China, Vietnam, Indonesia, Philippines, Thailand and Myanmar.

Country	Participants
China:	Ms. Y. Xiangjun Mr. W. Zhong.
Vietnam:	Dr. N.D. Chong Dr. M.V. Bui
Indonesia:	Ms. Indarti Mr.D.B. Astowo
Philippines:	Ms. E.M.Remedio Ms. F.V. Ariola

	(Group Leader)
Thailand:	Mr. P. Verapong
Myanmar:	Mr. S.T. Khaing Mr. K.W. Maung

Recommendations:

General Activities to be Undertaken

Activity	National	Regional
Developing Better Understanding of Wood Energy System	- Workshops/Consultation Meeting - Determine what to produce and for whom to produce - Information exchange - Networking - Strengthening of data base - Documentation	- Establish data base • micro (site specific) • macro (country/region specific) - Wood Energy Systems • resource assessment • consumption • distribution/marketing (This can be carried out by means of surveys, case studies and forecasting) - Support national level • workshops - In-country coordination efforts for solving problems related to production and marketing
Developing Institutional Set-ups	- Establish National Advisory Committee - Establish a Sub-regional Advisory Committee (without institutional structure) - Establish Working Groups (Gos, NGOs and Pos) - Conduct research on product improvement and arrange demonstration of results - Carry out extension activities on a large scale	- Establish Regional Advisory Committee with NGO involvement - Establish Sub-Regional Advisory Committee with NGO involvement (South Asia and South East Asia) - Formulate guidelines for improving research methods - Continue regional support activities
Policies and Strategies	- Organize Workshops/ Consultations to formulate policies and strategies	- Guide the formulation of overall energy development policies and strategies with relevant agencies and incorporate into them the principle of reduced government interference • Formulate long term programmes to address wood energy trade issues keeping in view the prevailing situation

South Asia Group

Countries: Bangladesh, Pakistan, Nepal and Srilanka

Country	Participants
Bangladesh	Mr. M. Ghulam Rasul Mr. Shamsul Huda
Pakistan	Mr. M. A. Qadeer Khan Mr. Zamir Ahmed Dr. Usman Mustafa Dr. M. Iqbal Mr. Habib Gul Mr. Hakin Shah Mr. K. M. Suleman Mr. Waqar Haider (Group Leader)
Nepal	Mr. G. Shrestha
Srilanka	Mr. W. P. Ranasinghe

Recommendations:

General Activities to be Undertaken

Activities	National	Regional
Developing better understanding	Undertake a comprehensive study on household energy/biomass resources in South Asian countries (like HESS), once every ten years	Develop a regional biomass data base for South Asian countries.
	Update existing studies/follow-up surveys (like HESS, etc.) to develop time-series data bases	Organize expert visits to relevant programmes in different South Asian countries
	Organize national courses/training programmes for target groups	Networking of regional institutions/ experts
	Publish newsletter in vernacular languages	Publication of a directory of regional institutions/ experts
	Publication of available reports (such as HESS, etc.)	Publication of experts' technical papers from the region
	Initiate ten specific pilot schemes, described later	Work on the standardization of measuring units and related matters
Developing Institutional Set-ups	Establish/designate one focal point	RWEDP should be institutionalized within RAPA
	Establish a Steering Committee/Commission to coordinate strategy/policy formulation and implementation	Designation of a regional focal point, and regional networking
	Develop local networking	Develop content/curricula for training programmes that could be offered at the regional level
	Strengthen woodfuel-related R&D capability of national institutions	
	Develop suitable curriculum for woodfuel trading and marketing	
Policies & Strategies:	Government pronouncement on no intervention in the marketing/trading structures for woodfuel	Establish pilot projects on:
	Policy announcement on the removal of unnecessary restrictions on firewood transportation/movements	a. Comparative analysis of policies on firewood production, marketing and trading in the region
	Rationalize energy prices for modern fuels	b. Intra-regional exchange of information on experiences in strategy formulation and implementation
	Government should act as a facilitator to improve marketing the dissemination of information	

Specific Pilot Schemes/Activities to be Undertaken

Pilot Scheme	Proposer	Objectives	Output
Workshop for woodfuel shop-keepers and traders	G.Rusul Bangladesh	To develop an understanding of marketing structures and remove impediments/difficulties	Availability of better information for planning and policy making
Study on taxes/levies/ restrictions on fuelwood movements	Z. Ahmed Pakistan	To understand the structure of taxes/levies for its rationalization	Assistance in the form of quantitative information in policy-making
Study on marketing of woodfuel from home-garden sources	W.P.Ranasinghi SriLanka	To increase availability of fuelwood from home gardens through better information	Report on the structure of fuelwood supply from home gardcens
Fuelwood marketing study	S.Huda Bangladesh	To develop baseline number for fuelwood markets	Data base development for planning exercises
Initiating tree farmers/fuelwood marketing associations	Dr. M.Iqbal Pakistan	To organize farmers/traders for their common economic benefit	Enhancing returns to farmers/traders
Organizing seminars on woodfuel technology	Dr. Habib Gul Pakistan	To create awareness among woodfuel appliance manufacturers/users regarding technology improvement	Better quality of stoves and equipment
Training of local-level staff and woodfuel farmers/ traders	G. Shresta Nepal	To create awareness among local-level staff on woodfuel marketing information	Better returns to the farmers, and greater cooperation with the local staff
Study tour for concerned officials to woodfuel markets	A.Q. Khan Pakistan	To appraise officials with field conditions, so that they are better prepared to provide advice	Better informed officials
Study of fuelwood marketing structure in NWFP	K. M. Suleman/Hakim Shah Pakistan	To better understand marketing structures, and improve profitability of farmers/traders	Comprehensive information on market structures, data base, etc.
Workshop for woodfuel traders	W. Haider Pakistan	To initiate a dialogue between planners and traders, and to bring consistency into the planning process	Greater information to traders/planners
Study of fuelwood marketing structure in Balochistan	Dr. Usman Mustafa Pakistan	To initiate a dialogue between planners and traders, and to bring consistency into the planning process	Greater information to traders/planners

6. COURSE EVALUATION

On the last day of the course, the participants were asked to complete the course evaluation forms which had been distributed on the first day. These evaluation forms were designed to elicit the opinions of the participants regarding different aspects or components of the course such as the pre-course information, the course structure, the course objectives, the presentations/ discussions, the logistics of the course, course organization, interaction among the participants. The completed forms were analysed by the RWEDP staff and a summary of the results is given here.

On the question of course information documentation, the majority of the participants stated that they had received this well in advance and that it contained sufficient information to enable them to make all the necessary arrangements to attend the course. Some stated that they would have preferred this documentation to have reached them sooner than it did as they needed more time to make all the necessary arrangements. As could be expected with this type of course, the majority of participants were of the opinion that the various sessions of the course and the discussions which followed these only partly achieved the objectives of the sessions. But they also felt that it definitely helped them to improve their capabilities to assist producers and traders of fuelwood to operate more effectively. The majority also reported substantial gains in knowledge regarding the various aspects of woodfuel production and trade that the evaluation form had identified. Most of the participants rated the field trip as very informative and as making a definite contribution towards achieving the objectives of the course. The responses of the participants to the various technical paper presentations in the different sessions were mixed, with some papers considered to have made more of a contribution to achieving the objectives of the course than others. However, on the whole the participants regarded the technical presentations as satisfactory and effective in contributing to the achievement of the course objectives.

PART 2: PAPERS PRESENTED

1. INTRODUCTORY SESSION

1.1. Trade in Woodfuel and Related Products in Asia: An Overview

by

TARA N. BHATTARAI
Wood Energy Resources Specialist
Regional Wood Energy Development Programme in Asia
Food and Agriculture Organization of United Nations
Bangkok, Thailand

General

Energy consumption in most countries within the Asia region has increased significantly between 1980 - 1992/93. Supply includes both "commercial" (i.e. coal, kerosene, LPG, electricity, etc.) and "traditional" (i.e. firewood, charcoal and other biomass fuel, including crop and animal residues) sources of energy. With the priority for rapid economic growth through the expansion of industrial and commercial activities, plus the ever increasing population and its energy demand, most countries in the region are already feeling the pressure of widening imbalances in energy demand/supply. As a result, the pace of development is slower than anticipated for most countries, and adversely affected for others due to energy shortages. Moreover, the condition of their natural resources is deteriorating due to inadequate or no management and the long-term sustainability of the natural resource base is being increasingly challenged due rapidly growing environmental degradation. Such a situation has led to the realization, in recent years, that countries need to maintain a balance between environment and development. In addition to the rampant poverty and limited financial and technical resources in most developing countries, increasing dependency on imported energy sources is further exacerbating the problem of maintaining environmental quality and the prospect of long-term sustainable economic development.

Growth in energy consumption is reflected directly in the increasing share of energy imports in terms of percentage share in their merchandise exports. This growth in consumption is primarily to meet the energy demand from the industrial/transport sectors and to some extent from the commercial sector . See tables 1 and 2.

Unfortunately, no reliable, location specific data on traditional energy production and consumption is available for energy planners in most of the developing countries. The data on traditional energy consumption still do not appear in the statistical bulletins which are regularly published by those international agencies responsible for supporting and guiding economic development throughout the world. Moreover, the data collected at the country level, to a great extent, do not provide a reliable estimate of production and consumption, largely due to limited funds and non-availability of skilled manpower for conducting these extensive surveys.

Country specific studies conducted so far reveal that traditional sources of energy are mostly used by the domestic sector, primarily for cooking and space heating. As most of the users are confined to rural areas and collect the wood themselves, no record of its consumption is maintained, either by the users or by local institutions, except for that portion collected under permit from the local forestry office with payment of royalty. Recent studies of the energy sector in different countries of Asia, carried out according to guidelines established by the concerned donor agencies, estimated a 10 to 30 percent higher share in the consumption of traditional sources when compared to the official data in most countries (Koopmans 1993).

Although the national energy balances of most RWEDP member countries show a declining share of traditional sources (in percentage terms), in rural households they still form the bulk of energy supply for domestic uses. If these national level data are not interpreted carefully, it may give a false impression of a declining trend in the use of traditional energy sources in most developing countries. Instead, its use in absolute terms might actually be increasing in many areas due to the growth in population. In most countries, except Pakistan, Philippines, Thailand, and possibly India too, recently conducted study findings suggest that the domestic sector is the largest consumer of energy and is derived primarily from traditional sources. APDC/GTZ (1993) estimated that about 80% of the household energy requirements in the rural areas of the Asia-Pacific region are exclusively for cooking. The other activities in rural areas which rely on traditional sources for energy include agro-based activities (i.e. tobacco-curing, rice-milling, etc.) and non-agro-based industries (i.e. brick making, potteries, bakeries, metal-works etc). Tables 1 and 2 present data on energy consumption and transformation in the fifteen RWEDP member countries in Asia.

Koopmans (1993) presents three common statements about woodfuel users which may be applicable to most countries in the region: (a) a majority of woodfuel users are low-income households; (b) most of the woodfuel using families live in rural areas, and (c) many of the users gather the woodfuel they need themselves at the production source. More generally he stated:

- With the increasing rural population (in spite of urbanization) and a low probability of the majority of the population drastically shifting to other fuels within the foreseeable future, woodfuel consumption (including biomass) will continue to increase in the future.

- In the urban areas where woodfuels are still being used, in spite of the availability of different types of commercial substitutes, or the so-called "modern fuels", woodfuels have become a traded good.

- Many rural families with higher incomes, most urban households, and a number of industries and commercial enterprises buy woodfuels.

- Due to the possibility of large variations in agro-climatic and socio-economic conditions within a small geographical area, macro-level data on traditional fuel sources cannot give an accurate picture of all the local situations and calls for dis-aggregated data for comprehensive energy sector planning.

- National averages for the amount of woodfuels coming directly from the forests range only between 25-50%, a large portion of it is produced in the form of twigs, leaves and dead wood and does not involve cutting of standing trees.

- Except in fragile ecosystems, woodfuel collection may not be the main cause of deforestation. Deforestation is a result of many complex factors in which the clearing of forest areas for agricultural expansion and for other uses, primarily to accommodate population growth, and uncontrolled grazing and fires are the major contributors.

- About 50-75% of woodfuels consumed by local people come from non-forest areas (i.e. fallow lands, scrub and grass lands, agricultural lands, trees on homesteads, home gardens, along roads, rivers and canal banks, etc.

- Sustainable production of wood for energy can be a viable undertaking--woodfuel demand/supply imbalances in many areas are considerably less serious than perceived if wood coming out of non-forest sources are properly accounted for.

Table 1 Energy Consumption and Transformation in Southeast Asian Countries

Country	Total Energy Consumption in 1991 (petajoules)	Commercial Energy Consumption (petajoules)			Traditional Energy Consumption			Av. Annual Energy Consumption Growth (%) 1979--91	Av. Annual Population Growth (%) 1979-91	Energy Imports as % of Merchandise Exports
		1984*	1991**	Growth in Consumption	1991 (petajoules)	Percentage of total consumption				
						1971	1991			
CHINA	29,363	20,047 (137)	27,345 (66)	7,298 (36)	2,018 (7)	7	7	5.1	1.42	4.0
INDONESIA	3,737	1,248 (207)	1,914 (337)	666 (53)	1,465 (43)	68	43	7.2	1.78	6.0
LAO PDR	44	3 (-63)	5 (-11)	2 (67)	39 (88)	82	88	2.5	3.00	46.0
MALAYSIA	915	390 (119)	825 (334)	435 (111)	90 (10)	22	10	9.6	2.35	4.0
MYANMAR	261	78 (44)***	68 (39)	-10 (-13)	193 (74)	72	74	-0.6	2.14	9.0
PHILIPPINES	1,139	489 (66)	757 (147)	268 (55)	382 (34)	45	34	3.1	2.07	22.0
THAILAND	1,807	613 (213)	1,281 (425)	668 (109)	526 (29)	54	29	10.1	1.27	10.0
VIET NAM	499	210 (-43)	248 (33)	138 (66)	251 (50)	30	50	1.7	2.03	NA
TOTAL****	37,765	23,078	32,448	9,465 (40)					1.61(av.)	

Note:
* Figures in parentheses indicate percent change over 1970
** Figures in parentheses indicate percent change since 1971
*** 1987 figure, percent change also since 1977 only
**** Total may not match due to rounding up of figures.

Source: Bhattarai (1995a)

Table 2 Energy Consumption and Transformation in South Asian Countries

Country	Total energy Consumption in 1991 (petajoules)	Commercial Energy Consumption (petajoules)			Traditional Energy Consumption			Av. Annual Consumption Growth (%) (1980-93) Commercial Energy	Av. Annual Population (%) 1990-95	Energy Imports as % of Merchandise Exports
		1989*	1991**	Growth in Consumption *** (1989-91)	1991 (petajoules)	Percentage of Total Consumption				
						1989	1991			
Bangladesh	539	227 (125)	262 (3,945)	35 (7.7)	277	54	51	7.9	2.41	26.0
Bhutan	15	NA (155)	3 (2474)	3 NA	12	-	82	NA	2.33	NA
India	10,835	7,528	8,011	483 (3.2)	2,824	25 (41%in'71)	26	6.7	1.91	36.0
Maldives	NA	NA	NA	NA	NA	NA	NA	NA	3.5[1]	NA
Nepal	221	13 (80)	15 (318)	221 (7.7)	206	92 (97% in '71)	93	8.1	2.45	NA
Pakistan	1,328	930 (119)	1,032 (629)	102 (5.5)	296	21	22	6.8	2.67	24.0
Sri Lanka	156	55 (17)	67 (72)	- 12 (-8.9)	89	52 (61%in '71)	57	1.9	1.27	13.0
Total**	13,094	8,753	9,390	832 (7.2)	3,704		30		2.4	

Note: * Figures in parentheses indicate percent change over 1979.
** Figures in parentheses indicate percent change since 1971.
*** Figures in parentheses indicate average annual growth percent.

Source: Bhattarai (1995b)

[1] Population growth rate for Maldives derived from RAPA/FAO (1994), and for other countries directly taken from WRI (1995) growth projection for 1990-95.

Origin and Source of Woodfuel

The common sources of woodfuel include both forest and non-forest lands. Woodfuels are derived from many different sources, even if their primary source may be from trees in forest or non-forest lands, waste wood from wood based industries, sawdust, drift wood, old furniture and scrap wood in urban centers, bamboo, charcoal, and other woody biomass of different kinds (stalks, fronds, bagasse, etc), all contribute to woodfuel supply. Households and industrial/ commercial activities are the two important woodfuel consuming sectors. The household sector has a general tendency to collect its own woodfuel requirement from near-by sources, whereas the industrial/commercial sector invariably purchases its requirements from the locally available sources.

In most RWEDP member countries forests alone are not the sole source of woodfuel supply, a substantial amount of woodfuel is also produced from non-forest areas outside the government owned/managed forest estates (i.e. homesteads/homegardens in privately owned or leased lands, local community grass and scrub lands etc). Biomass fuel used for different purposes vary in form, shape and size, it may be in the form of firewood or charcoal, mostly produced for the market, or as leaves, branches or twigs collected for self consumption). Unfortunately, very little is known about the non-forest woodfuel sources, not to mention their contribution and importance in the national economy and the energy balance. Further, the mechanism of woodfuel production in non-forest lands and the process through which it reaches the users (or the market) is not yet fully known, and may also vary significantly in different parts of virtually any country in the region depending upon many factors such as existing forest cover, population density, availability and stability of supply of alternative energy sources, level of cash income, etc. Table 3 provides an overview of the woodfuel supply sources for some RWEDP member countries.

Some highlights of the location specific findings of the energy sector studies of the past, with regard to woodfuel production sources, include:

- The Indonesia Urban Household Energy Strategy Study revealed that people in large urban areas in Indonesia used no fuelwood from forests; only 11% of the woodfuel used in small urban areas came from forests; around 50% of the fuelwood used in small to large urban areas was obtained from the users' own land; in Jakarta only 1% of the woodfuel came from the users' own land (WB, 1990).

- The Pakistan Household Energy Strategy Study (HESS) showed the share of own-land produced fuelwood in total consumption in Balochistan, Sindh and NWFP as 8%, 14%, and 40% respectively (WB, 1993).

- In Cebu Province of the Philippines, which is widely regarded as an environmentally degraded area with less than 1% forest cover, 90% of the rural and 60% of the urban households still depended on various forms of biomass for fuel, for some or all of their cooking needs. In Cebu City, almost 75% of the lowest-income households (0-1,999 Pesos/month) used fuelwood or charcoal as primary cooking fuel in 1992. Kerosene was clearly found to be a main fuel for the lower middle-income group and LPG for 80% of the highest income group (20,000 Pesos/month), and 7.3% of the surveyed households were using "multiple fuels" or two or more fuels on an equal and simultaneous (Bensel et al. 1993).

Cooper (1985; in Hulsebosch, 1993), presents a scenario of competition between producers and free collectors of woodfuel in most rural areas. The latter collect fuelwood freely from the common property resources or government forest lands and distort the market in a monetary sense. Its effect is considered profound and creates direct competition with the marketed fuelwood supply. Although considerable time is spent for its collection, woodfuel derived from self-collection is regarded as a "free of charge" resource, where time spent for collection has a very small opportunity cost. In most cases, only a small part of the total woodfuel consumption is marketed in a commercial way. The share of marketed and free supplied woodfuel varies from place to place and at some places the possibility of a monetized market may even collapse due to competition with the "free of charge" supply. Even in large towns not everybody purchased fuelwood, though 26% of the people surveyed in Java (Indonesia) used fuelwood, not all of them purchased it in the market. More people (44%) in small towns purchased their fuelwood compared to large towns (34%) where other commercial substitutes are mostly used and where 45% of fuelwood users collected the fuelwood and others bought their own supply from homegardens (World Bank, 1990 in Hulsebosch, 1993).

Woodfuel Flows

The flow of woodfuel includes its production, distribution and consumption. the limited number of studies conducted so far demonstrate that the mechanism of woodfuel flows could be a more complex system than generally perceived. Important and useful information is now available from these studies which helps to explain the complexity of the system, but much more still remains to be known, particularly to exhibit the inter-relationship between the woodfuel flows and the local political, social and economic systems. Understanding about it is further constrained by the nature of its trade, which is mostly handled by the informal sector. How woodfuels are moved from production sources to end users may depend upon the source of collection and/or the purpose of use. It may vary from a very simple process of direct involvement of only the users who collect the woodfuel for own use from the nearby forest or other sources and carry it home as head- or back-load, to a more elaborate system if produced for sale to urban users. In the latter case many types of intermediaries (such as, the tree owners/caretakers, woodfuel cutters / collectors / converters, assemblers, wholesalers, retailers, transporters etc) and different modes of transport may be involved in woodfuel flows. Where many intermediaries are involved, it will be difficult to trace the flow of woodfuels even though in most cases permits are required to move the woodfuel and/or to cut down the trees to convert them into woodfuels.

The process, which an individual tree farmer has to follow in the Gujrat State of India for obtaining an official permit for producing and marketing charcoal from the trees grown on leased wasteland granted by the concerned agency of the government involves a cumbersome process. It requires multiple visits to different government agencies if harvesting of standing trees is involved in the process of conversion and marketing of charcoal, for loading and transporting of charcoal to bring it to markets, for measurement, certification and granting of a transit pass to transport it to the market, etc. Such a restrictive measure discourages people from getting involved in entrepreneurship in woodfuel related areas. Administrative constraints of this nature favour the local commission agents or middlemen who take most of the benefits derived from trade in fuelwood and related products. It explains both the complexity of the issue and the practical difficulties of the tree growing farmers. Wherever there was delay in getting administrative clearances, people were forced to sell the material they produced to the local commission agents for a price much lower than the previously agreed price (RWEDP 1993a).

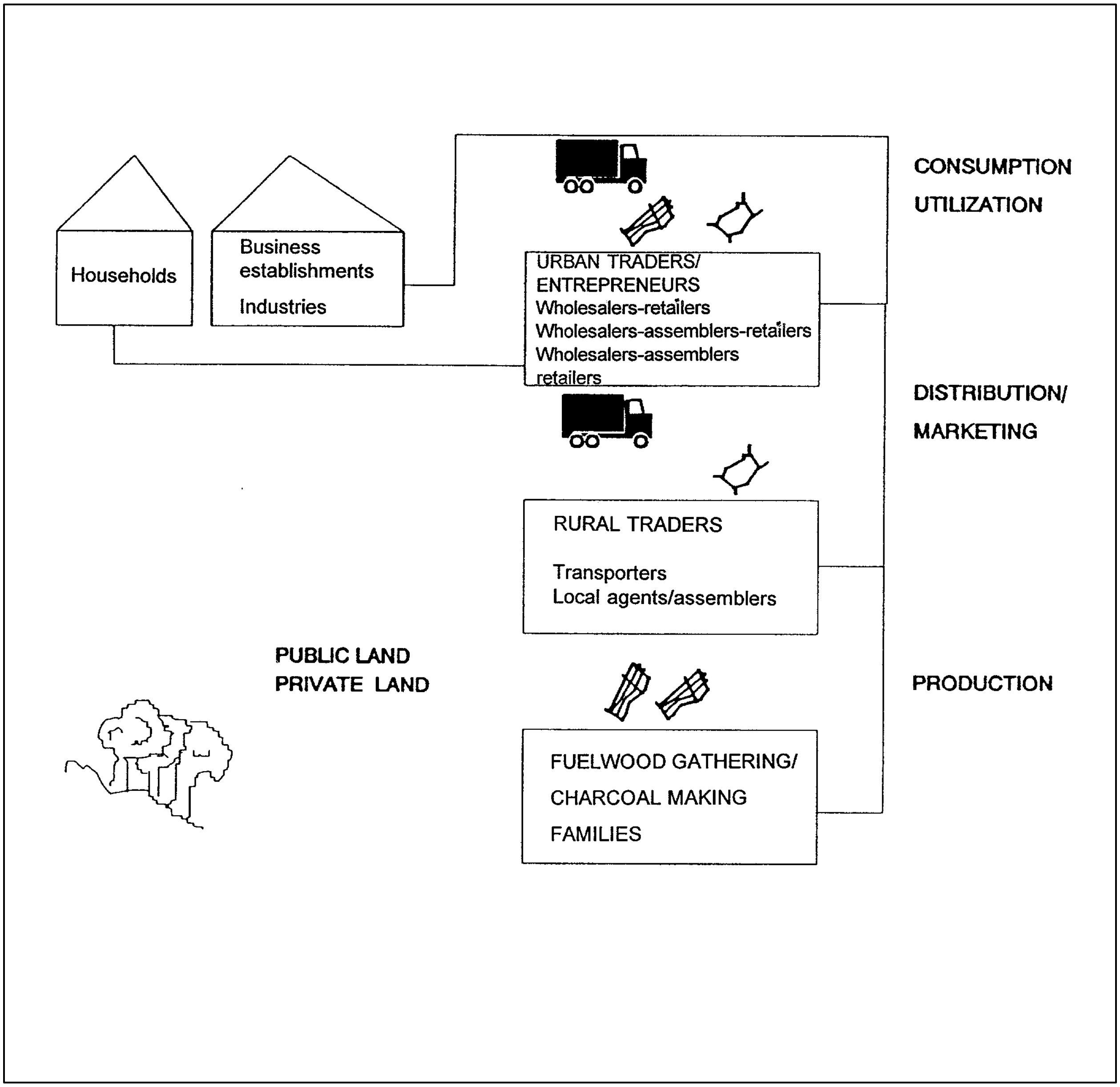
Woodfuels supplied from the forests will be relatively easy to quantify, since the volume produced and traded will be recorded formally in the registry of the concerned forestry departments and/or parastatals, which issue the permits for woodfuel collection and conversion. These agencies also control the flow of woodfuels in most countries of the region. It was observed in Myanmar that even the woodfuel gathers had to register themselves with the Forestry Department and obtain a document identifying them as certified woodfuel gatherers. On the other hand, in the same country, bamboo fuel was exempted from such a restriction and did not require an extraction permit. The royalty on bamboo wood was charged only after it was brought to certain specified check points, which also left room for manipulation by government officials. This may be one of the reasons why trade in bamboo fuel in Myanmar was considered a lucrative business (RWEDP 1993 b).

In most countries in the region, there is a concession granted by the state to the local people living in the vicinity of natural forests. This concession confers on them local rights to collect woodfuel free of cost for home consumption, or at a nominal cost. Part of this finds its way to the market but is difficult to quantify as it is transported as head-or back loads. Woodfuels produced in non-forest areas are also difficult to quantify, both in terms of the volume of production and the amount traded for it. The problem is further complicated where the amount removed is small and does not require prior approval (for cutting, conversion and sale) from the government forest department.

In Pakistan, except for certain tree species which are classified and cannot be cut anywhere, whatever their origin, trees on private landholdings may be cut down without restrictions. In certain specified areas trees require prior permission for cutting from the concerned agency. Although many rural users may not feel the effect of control measures imposed by the government agencies for collection of woodfuels as long as it is produced and consumed locally. For example, in the Philippines and Nepal farmers are allowed to cut down privately owned trees on their own land and use them at will, but if the product of such trees is to be traded or transported outside the production area, a transport permit will be required from the concerned forestry departments.

Much more information, specific to woodfuel type and/or geographical area of a particular country, is now available to improve our understanding of the issues of the woodfuel sub-sector. These studies were either directly sponsored by FAO, RWEDP as part of its previous phase activities, or conducted in collaboration with other agencies interested in the subject. Most of these studies were completed in the early 1990s, and the important ones include: Charcoal Production and Marketing in Gujrat (FD No.36); Marketing of Woodfuels in Peshawar City, Pakistan: A Case Study (FD No.38); Woodfuel Flows in the Dry Zone of Myanmar: A Case Study (FD No.39); and, Patterns of Commercial Woodfuel Supply, Distribution and Use in Cebu, Philippines (FD No.42).

Figure 1: Conceptual framework used in the analysis of the fuelwood and charcoal supply systems.



Source: Pujanes (1993), taken from the Philippines Household Energy Strategy Study: *Preliminary Findings of the Joint OEA/ESMAP Study Team,* World Bank/ESMAP, 1990.

Similarly, the World Bank sponsored study in Pakistan (i.e., the Household Energy Strategy Study (HESS), 1993); and the other jointly sponsored studies of the World Bank with UNDP in Indonesia and the Philippines (i.e., the Indonesia Urban Household Energy Strategy. Study, 1990; the Philippines Household Energy Strategy Study, 1992) provide an invaluable insight into various aspects of woodfuels. The information generated by these studies on woodfuels marketing mechanisms has greatly enhanced our understanding of how and under what conditions woodfuel is produced and moved to the market, both from the forest and non-forest sources. Figure 1 provides the conceptual framework of woodfuel supply systems. These reports now serve as a vital source of information and help to identify the gaps that exist in the prevailing forestry sector policies of these countries designed to initiate and improve the supply side management of wood energy.

Table 3 Overview of the Amount of Forest and Non-forest Woodfuel Consumption.

Country	Total Amount of Fuelwood Consumed (Million ton)	Share of Forest Wood (%)	Share of Wood from Non-forest Sources (%)
Bangladesh	5.5	13	87
India	94.5	26-53	47-74
Nepal	11.3	66	34
Sri Lanka	9.1	25	75
Philippines	25.3	15	85
Thailand(1)	8.8	48-50	50-52
Thailand(2)	16.0	50	50
Pakistan(3)	29.0	10	90-
Vietnam (3)	33.0	25	75

Note: 1 Wood used as fuelwood
2 Wood used for the production of charcoal
3 Shares based on estimates
Source: Koopmans (1993).

Woodfuel Trading Channels, Transport and Trade

Channels

RWEDP (1994) identifies the actors of the woodfuel subsector as producers, which includes the "collectors/gatherers" of woodfuel as well as the landlords or lessees who are the legal "owners of the trees" producing woodfuel. Woodfuel collectors/gatherers may collect the woodfuel from forest or non-forest sources. They may collect it as dead and/or fallen wood from all types of lands (i.e. along roads, rivers, scrap-wood, driftwood, etc), or after lopping the branches or pollarding the trunk of standing trees, or after felling the standing trees purely for the purpose of obtaining woodfuels, etc. Hulsebosch (1993) defines the suppliers of woodfuel (generally called the producers) as "a homogenous group of actors marketing fuelwood". Within this broad group a further distinction was suggested so as to separate the producers from woodfuel collectors (free collectors). The argument for this separation rests on the view that producers posses legal ownership/access to land and manage the woodfuel resources, collectors on the other hand are mostly poor farmers and the landless who only gather/harvest or convert the woodfuels at the production source; they do not own the resources or have any active role in the management of the resource base.

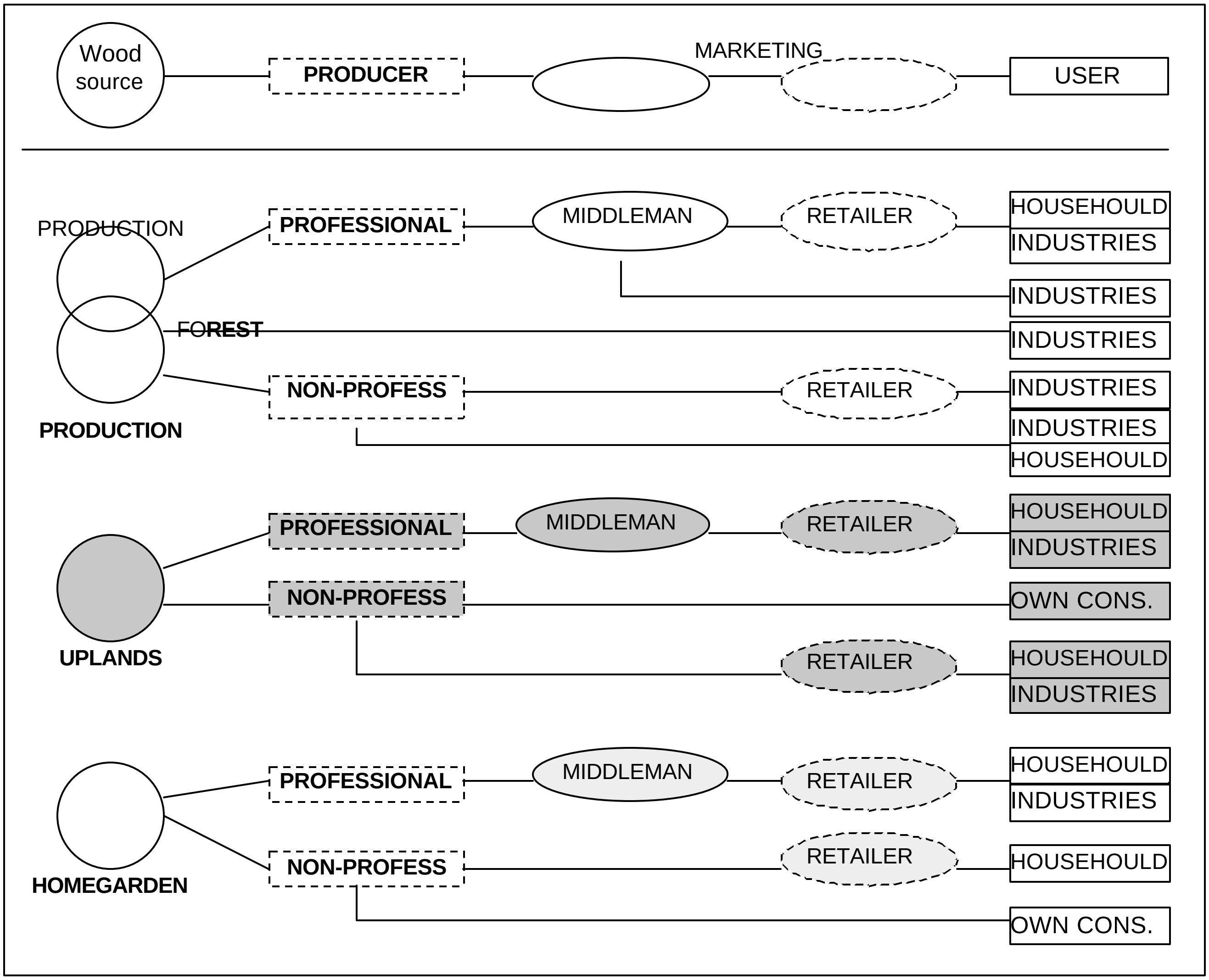
Producers have also been differentiated into two types: (a) those producing for their own consumption, and (b) others, producing for the market. Similarly, collectors may also be collecting either for their own use or to earn an income from its sale in the market. Where fuelwood collection is unlikely to offer a vast profit, this business tends to be dominated by poor people. But it is also stated that, as woodfuel shortages cause prices to rise more entrepreneurs will become motivated and get involved in woodfuel marketing, especially in areas with good markets or with round the year road access. Long and uneconomic transport distances, long collection times, physically inaccessible terrains, certain tree sizes and certain species can all hinder woodfuel collection. If traded, the preference is for roundwood rather than deadwood or branches. In fact, even the considerable efforts required for getting the larger size of roundwood is no deterrent to collectors.

Ellenbroek (1988) (in RWEDP, 1994) categorically states that "where the sources of collected wood are near to urbanized areas (larger villages and cities) where a ready market may be found for the relatively small amounts collected, a larger part of this collected wood could end up in the market, providing a ready source of cash for the gatherers". In many areas this practice is the main source of cash income for the poor and landless. Non-tradable woodfuel from less desirable tree species and other easily available inferior biomass sources (i.e. small twigs, leaves, crop-and livestock-residues, etc) are the common energy sources they use to satisfy their own requirements. Therefore, it is also believed that woodfuel collected for self consumption by the poor generally does not require large and expensive tools which would lead to deforestation.

The nature of woodfuel flow is different from one country to another. In Myanmar, the trade in woodfuel is dominated by formal woodfuel traders. In Pakistan, the Forest Department owns and manages forest plantations, where prepared fuelwood lots (by size and species) are sold through open auctions (above the reserve price fixed on the basis of the price realized at earlier auctions). Woodfuels acquired from non-forest lands involves local traders, who buy from woodfuel cutters or farmers and sell it to wholesalers/retailers or to users who come to buy at the woodfuel depots, mostly located along the road sides. In Indonesia, on the other hand, a considerable amount of charcoal is derived from logging residues. Forest companies announce bid notices to charcoal makers for disposing of its logging residues. Both forest and non-forest sources supply woodfuel in the Philippines. An RWEDP study in the city and province of Cebu, Philippines revealed that most of the woodfuel produced there comes from non-forest sources. In Cebu a permit is required from the Department of Environment and Natural Resources (DENR) to transport the woodfuel, and to obtain the permit. To obtain the permit it has to be proven that the wood was obtained from non-forest land. Supplies are also to be cross checked or verified at stated/mobile check posts.

Wood producers may be the owners of private trees or gatherers and/or convertors (charcoal makers) who belong to the informal and unorganised sector. On the other hand, the traders of woodfuels and the consumers represent both the formal and informal sectors, either in groups or as individuals. Figure 2 presents the basic woodfuel flow system.

Figure 2: The basic woodfuel flow system.



Source: RWEDP (1993).

Hulsebosch (1993) describes the basic marketing channel for fuelwood, where the suppliers (producers and collectors) harvest the fuelwood and sell it in medium to large quantities to wholesalers or assemblers. They in turn transport it to areas where markets for woodfuel exist and sell the fuelwood to retailers. Most retailers work closely with the consumers and often are not specialized in the woodfuel trade. The consumers usually purchase small quantities of fuelwood and most use this source for energy due to economic reasons. Indeed, most users (mostly the middle income group) spend a considerable amount of income on procuring cooking fuels. The position of woodfuel markets in many parts of Asia has been represented as not functioning efficiently due to numerous factors such as: incorrect stumpage fees and regulations; inadequate infrastructure for transport; monopoly in trade.

Transport

Woodfuel gatherers often carry the supplies to local markets and sell them directly to users as head-, back-, cart-loads, etc. Sharma (1994) estimated between 2,000 - 2,300 persons bringing in 10,000 to 1,000 headloads of firewood per day in Mandala and Dindori towns of Mandala district in Madhya Pradesh, India. The amount carried/traded in this way is usually quite small, even though many people may be involved. Another considerable amount of woodfuel is reported to be handled by the non-professional or occasional traders (i.e. woodfuel carried in public transport vehicles as piggyback loads). This type of occasional trade is quite common in most areas where forests are owned by the state and managed as common property resources. The exact volume of woodfuels supplied from these sources remains mostly unknown, although most forestry agencies consider the amount "not very significant".

The bulk of woodfuel supplies which are traded is thought to be handled by woodfuel traders, who bring the supplies in large quantities from the sources to the end users. Transport of woodfuel sold to buyers in Pakistan is done either by truck or by train. In Myanmar, one trader made his own road in the Yinmabin Reserve and now monopolizes the collection of bamboo fuel from the area (RWEDP 1993b). The supplies are acquired from various channels, either bought directly from the tree owners or gatherers and/or from the respective forest departments through auctions or permits. Transport is considered an important aspect of the woodfuel trade, where traders with their own transport are considered to hold greater power. Ouerghi (1993) (in Hulsebosch 1993) address the issue of unhindered transportation in the marketing of woodfuels. Besides the length and operating capacity/conditions of existing physical facilities, (inclusive of river, road and railway transport networks used in woodfuel transport), seasonal variations in their effectiveness in functioning, and the cost and availability of labour can influence the unhindered movement and price of woodfuel in the market. For example, rainy season versus road/rail (surface) transport dry season versus river transport, and peak agricultural seasons versus labour supply/availability. Bullock carts, farm tractors, tailors, trolleys and trucks are the most important means of woodfuel transport at a commercial scale. Transportation of woodfuel generally follows a trend in movement from the resource rich rural areas to rural and urban markets. A variety of modes are used for transportation from the production site to the consumption site (e.g., head-back-loads, carts, bullock-carts, bicycles, tractors, trucks, other transport vehicles of different kinds) depending upon the nature of the terrain and upon the modes and infrastructure that are available at the time.

Trade and Traders

Fuelwood trade does not follow a standard system of grading or unit of measurement in local markets. The common methods and measures that have been adopted in the trade of woodfuels depend very much upon the local practice and commonly understood units of measurement, which varies from one place to another reflecting the commonly understood measures in practice from the traditions existing in any particular area. Hulsebosch (1993) cites Ouerghi (1993) to characterize the woodfuel trade. It is mostly done in "the cash and carry" way, without any close relationship between sellers and buyers. In the case of charcoal the market price is determined according to the quality and quantity of material supplied.

In Thailand, only producers who have established a relationship with regular clients bring fuelwood into the town (Jameson 1991, in Hulsebosch 1993). The distribution of different categories of woodfuel traders in Pakistan was revealed by the HESS report of 1993. The wholesalers were concentrated at the roadsides, indicating the importance of access since they themselves had to provide transportation. The retailers, on the other hand, were found situated close to the clients, primarily to reduce the distance the clients had to come to buy the products (HESS 1993, in Hulsebosch 1993). Bensel et al. (1993) report the case of Cebu City where commercial sector woodfuel users received around 37% of their fuelwood directly from the rural retailers, against only 3% at the household level. RWEDP (1993a) explained the quality control system adopted by the Trader's Association in Gujrat State of India to determine the purchase price of charcoal from producers (i.e. dust, chips and adulterated material) and suggested a random verification of quality by examining two bags per truck load of charcoal. RWEDP (1993b) categorically states that "the prices of different types of woodfuel, vary very little among different supply centers, basically because they are competing with each other. However, the prices are increasing largely due to the scarcity[of woodfuel] which has increased the collection distance from the villages and the access from the roadside." The other reason presented concerned the natural increment in labour cost. Siddiqui et al. (1993) state that "the marketing of woodfuels in urban areas has received little attention ...[it is] a sellers' market where effective demand exceed[s] the availability of the supplies". The same source states that 13.4% of the households in Peshawar City used woodfuels, total demand for woodfuel was 44,600 tons per annum (household 40,874 tons and commercial sector 3,725 tons), and the low level of income and non-availability of other alternatives were the two important causes of woodfuel use there. Charcoal was found mostly used for room heating during cool winter days in government offices, and a small quantity was also used in private and commercial establishments. Total consumption amounted to only 3,500 tons/year. The retail price of fuelwood varied according to species and the charcoal price was fixed at Rs.5.0 per kg irrespective of quality. Transportation cost accounted for 25% of the retail price of fuelwood in the market.

Very little information is available about the woodfuel price fluctuations over time at real terms, although Leach (1987) (in RWEDP 1994) reports an increased woodfuel price in real term by 34% in 10 major cities of South Asia during the period 1970-1982. The aggregated country specific data on woodfuel trade, with adjustment for price inflation, is difficult to find. Therefore, the assessment of both short-and long-term effects of time, variations in seasons and labour supply, etc. on woodfuel price and volume of trade has become very difficult, if not impossible.

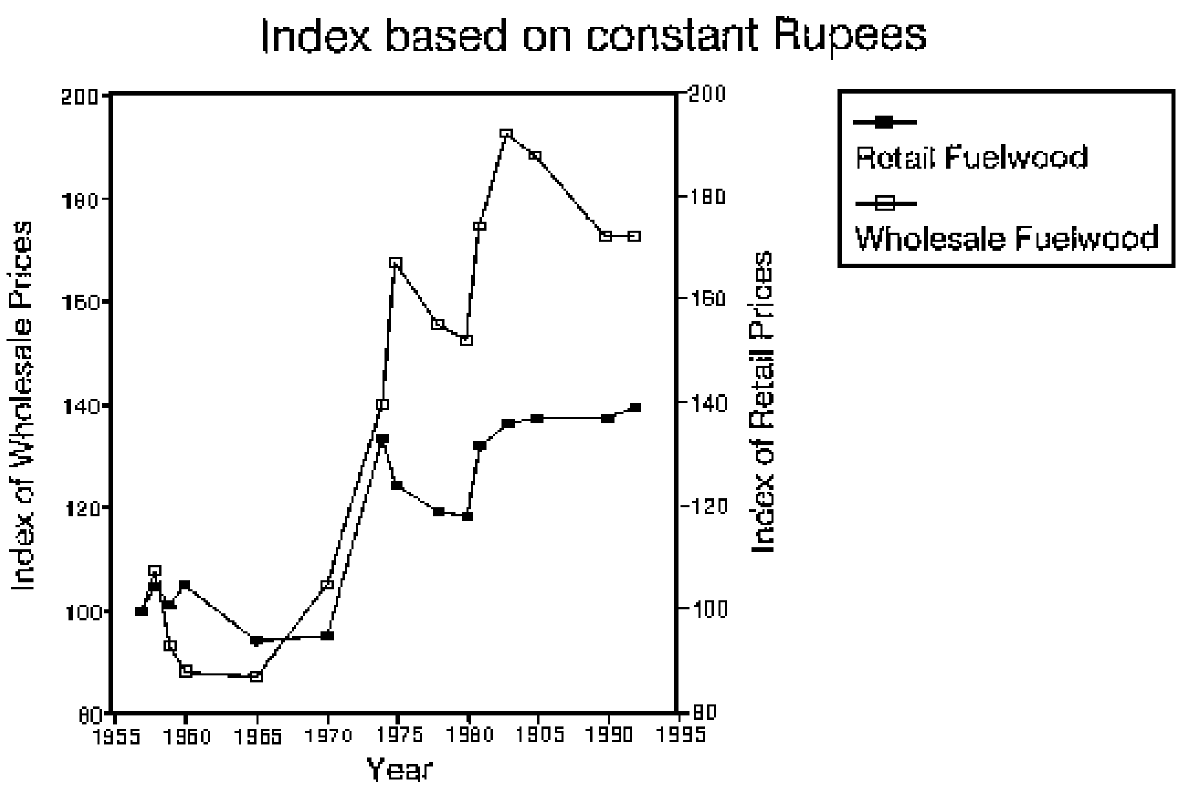
Some major findings of a number of studies are presented below to give a general feeling of the scale/volume of woodfuel use which may be used to guess-estimate the size of trade in the market:

- In Pakistan, 79% of all households (91% in rural and 52% in urban areas) used 29 million tons of fuelwood per year, mostly (81%) for cooking. In rural areas 69% of woodfuel is collected by users spending about PRs. 2,800/year (US$ 1 = PRs. 25 in 1993) worth of collection time, total value PRs. 19 billion or PRs. 5 billion more than the market value (av. market price PRs. 0.98/kg). In urban areas 86% of the woodfuel is purchased which constitutes over 57% of total fuel expenditure (Ouerghi 1993).

- In 1992, woodfuel consumption in the residential sector of Cebu City amounted to 43,000 metric tons of fuelwood and 6,900 tons of charcoal. This was equivalent to 220,000 barrels of oil worth US$ 4 million (P 100 million) at 1992 prices (Bensel, et al. 1993).

Information on woodfuel prices over time is only available for Pakistan, while prices of charcoal are known also for Myanmar and India. The HESS study in Pakistan gives an overview of the wholesale and retail price indices using constant 1957 prices and show these two indices maintaining a more or less constant level until the early seventies, but thereafter the wholesale price index rises faster than the retail price index, which indicates a narrowing of the retail margin. Figure 3.

Figure 3: Wholesale and retail price indices.



Source: WB, 1993 - Leach (in RWEDP 1994).

The difference between the price paid by traders at the source for the procurement of woodfuels and the price he/she receives at the market from its sale is the "mark-up". It includes many variables such as transportation costs, taxes, interest rate for borrowing working capital, loading and unloading charges, plus all other associated seen and unseen charges. The higher the sum of all these costs, the lower will be the income to the trader of woodfuels. Therefore, in a competitive market traders' profit margins depend largely upon their own efficiency of production (larger mark-ups). The other factors which influence the retail price according to Leach and Gowen (1987)(in Hulsebosch 1993) are: the cost of competing fuels, the cost of transport , the size of trade, the quality of the product and the location of the sale. When fuelwood prices become too high compared to other substitutes, consumers generally tend to switch to more economical sources. The gross margins earned in Cebu, Philippines by various intermediaries in the woodfuel trade who produced woodfuels from plantations of *Leucaena sp*. and/or from mixed species of secondary forests, ranged from 10% - 15% to the traders (both urban and rural traders), 17% - 20% to the landowners, 35% to the transporters and 33% - 40% to the fuelwood cutters. In Peshawar, the gross margin to the wholesalers after they sold fuelwood to retailers was about 12.5%, to the retailers the gross profit margin was 11-16% of the retail sale price, and to the producer 50% share of the resource cut at the farmgate. It is also stated that roadside traders usually do better economicallyhaving the highest mark-up percentage. The consumers of woodfuels are the last in the marketing channel. They have only a limited bargaining power where the possibility of switching over to other energy sources is bleak. Factors that influence the woodfuel price are related to: stumpage fees; over or under pricing of woodfuels, government regulations; market characteristic (i.e., competition, monopoly), seasonal variations, availability and affordability of substitutes, cultural influences, etc. which affect the marketing and use of woodfuel (Hulsebosch 1993).

Employment Generation

Many actors are involved in the handling of woodfuels. It is labour intensive both in production and in distribution to end-users/consumers. Handling of woodfuel involves cutting/gathering, conversion, transportation, collection, sales (wholesale and retail), etc. The findings of recent studies indicate that woodfuels contribute considerably to the rural incomes of men and women who have few alternative sources of income. The World Bank (1992) (in RWEDP 1994) estimated over 830,000 households employed in woodfuel related activities, from gathering to retailing (i.e., 536,000 in gathering, 158,000 in charcoal making and selling, 40,000 as rural traders, and 100,000 as urban traders). Trade in woodfuel constituted the main source of income for about 10% of all rural households, which contributed about 40% of their cash earnings.

Another study of the World Bank in Pakistan showed about 100,000 people involved in the woodfuel trade, 73% permanently employed and the remaining 27% temporarily employed. Agrawal (1987) (in RWEDP 1994) estimated not less than 3-4 million people involved in the woodfuel trade, which was considered the largest source of employment in the energy sector of India. Poudyal (1986) (in RWEDP 1994) estimated about 6% of the population in Pokhara, Nepal involved in woodfuel supplies. In most cases, women and children were the main collectors of woodfuels, primarily for their own use.

Implications of Policy on Woodfuel Flows

APDC/GTZ (1993) identified some common barriers to the dissemination of decentralized energy options in the developing countries of the Asia-Pacific region. These barriers relate to policy, planning, institutions, cost (and pricing mechanism), financing and information. Although these issues are applicable to the energy sector as a whole, those which significantly affect the wood energy sub-sector are:

Policy Related

- poor appreciation of the significance of energy in rural development; limited fiscal and financial incentives for decentralized renewable energy systems
- a bias towards the expansion of bulk energy supply capacity through development of centralized systems
- weak research and development (R&D) and linkages with its outputs. Among the planning issues, low level of attention to social and environmental concerns in energy development
- lack of attention to social and environmental costs in technology choice; avoidance of rural energy systems for the sake of numerical consistency
- centralization of the planning process and its poor co-ordination with other relevant sectors (forestry, agriculture, small-scale industries etc).

Institution Related

- the overwhelming influence of centralized energy supply agencies
- lack of technical skills and suitable analytical tools to address decentralized rural energy development
- the marginalization of decentralized agencies with low levels of resource and manpower allocation
- insufficient participation of local communities in planning and implementation process.

Similarly, a number of issues related to technology, cost, financing and information that affect the development of wood energy which need to be addressed to suit local needs and conditions have been identified in the above studies.

RWEDP (1991), as a part of the training course in Rapid Rural Appraisal (RRA) in collaboration with the Khon Kaen University, Thailand tried to analyze the impact of energy and forest sector policies on wood energy as well as on the increasing uses of non-renewable energy sources in urban areas in four of its member countries (i.e., Indonesia, Nepal, Philippines and Thailand). The other issue it tried to analyze was sustainability and sustainable natural resource management in a subsistence economy and identify its policy implications. With the energy sector, it raised a number of fundamental questions regarding wood energy policy, such as:

- How should the energy sector respond to this important, enduring and valuable component of the energy system, which has been playing a key role in the economies and socio-cultural lives of most developing countries?

- Should the wood energy sub-sector receive additional support for its efficient, sustainable and equitable development, rather than be suppressed in favour of the so called "modern energy"?

Concern was raised about the constraints posed by prevailing policies and regulations on wood energy development which make this energy system less efficient. Calls were made for further study of issues such as: how to maximize the benefit per unit of wood and per unit of cost, by increasing efficiency in acquisition, processing, distribution and consumption of wood energy? How to utilize all potential sources of wood energy, including those so far unutilized, to substitute for scarce and expensive energy sources, by discovering, developing and disseminating ways of using them economically?

Regarding the forestry sector policy, the question of how can we increase wood production for energy and maintain a steady supply on a sustainable and equitable basis was raised.

And, regarding policy related to socio-economic development, the issue of how to integrate the acquisition, production, processing, distribution and sale of wood energy into the subsistence economy so that wood energy increasingly contributes significantly and reliably to the reduction of poverty and to the amelioration of its dreadful human consequences was addressed. Which in efect means how can wood energy be made an integral part of development planning for upland and midland areas, and for other marginal zones where poverty is high and agricultural productivity is low?

All the above issues (related to wood energy) must be addressed while planning development in the energy sector. All sectors which directly impinge upon or influence the development of the wood energy sub-sector must be co-ordinated and their sectoral policies must be integrated to make them conducive to economic, environmental and social sector development goals of member countries. If poorly thought out a narrow sectoral development policy could have undesirable adverse impacts on the national economy/environment. As wood energy is a source of both income and energy for the poorest of the poor, the human dimensions of the system should not be neglected while formulating and implementing the energy sector policy and plans (RWEDP 1991).

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2. SESSION 1: PATTERNS OF SUPPLY AND USE OF TRADED WOODFUELS

2.1. Wood Fuels Study of Woodfuel Flows in Six Urban Areas of the Philippines

by

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Introduction

Woodfuels are widely used in urban areas of the Philippines. These fuels are supplied from surrounding rural areas, and are used in the household sector and by a variety of small enterprises such as bakeries, restaurants and food processing industries. Until recently, not much was known about the organization and operation of these supply systems. This situation prompted the then Office of Energy Affairs, Non-Conventional Resources Division (OEA-NCRD), now the Department of Energy-Non-Conventional Energy Division (DOE-NCED), to commission a series of studies on the supply systems of six urban areas of the Philippines.

This paper reports the results of this research, which was conducted between August 1989 and August 1990. The research aimed to determine the sources of traded woodfuels, patterns of distribution and the consumption market mechanism of distribution from the rural areas to users in the urban areas and to identify any trading problems.

The service of the University of the Philippines at Los Banos-Forestry Development Center (UPLB-FDC) was contracted to prepare a methodology and survey instruments for the supply studies. The UPLB-FDC was also in-charge of conducting the urban supply surveys in Metro Manila.

The survey instruments and methodologies prepared by UPLB-FDC were also used by the various Affiliated Non-con Energy Centers (ANECs) to conduct a similar study for their respective areas of coverage. The ANECs are strategically located colleges and universities which act as the technical extension arm of NCED in the promotion of non-conventional energy systems. Five ANECs were involved in this study, namely: the Don Mariano Marcos Memorial State University (La Union), Isabela State University (Isabela), University of San Carlos (Cebu City), Visayas State College of Agriculture (Tacloban) and Xavier University (Cagayan de Oro). The results of four of these studies are available and the socio-economic and environmental impact of these supply systems will be discussed below.

Three main groups of actors have been investigated, namely:

- Fuelwood gatherers and charcoal makers - the former extract the fuels from the rural environment and the latter convert in to a more convenient form. Most are farmers for whom fuel gathering is a supplementary means of earning cash income.
- Rural traders - those who purchase the fuels from the first group, i.e., fuelwood gatherers/charcoal makers and in most cases, transport it to the urban areas in either their own or hired transport.
- Urban traders - those who are mostly small retailers who operate shops or market stalls. They sell wood or charcoal alongside other goods.

These categories are not discrete and the market chains discovered in the studies are not simple. For example, many rural traders also gather fuel or make charcoal, or some gatherers sell the fuel directly to urban traders. There can be several stages in the market chain in the city (with large wholesalers selling to smaller retailers) and so on. Similarly, in some areas, logging and sawmill residues are an important source of urban fuelwood, linking the supply system to these industries.

Despite these complications, the information collected in the studies permits some clear conclusions on the following issues:

- The main sources of the wood used to supply urban fuel markets, including how these vary in different regions.
- The actual and potential environmental impact of urban fuelwood and charcoal markets.
- The economic significance of fuelwood markets for the rural supply areas, including the numbers of people involved and the contribution the trade makes to their household income.
- The efficiency of the operation of these market systems.
- The sustainability of fuelwood and charcoal as urban household fuels, including preliminary estimates of the scale at which supplies of these fuels can be sustained without serious environmental implications.

Findings of the Study

The following sections summarize the main results from the four cities, namely: Metro Manila, Cebu City, Tacloban and Cagayan de Oro. These four areas are representative of different sized cities and of different resource positions in the regions surrounding them.

Metro Manila stands out as the primate city of the Philippines and has a very different household energy economy to other urban areas in the country. Cebu City is located in a region which has few forest resources left, and is a representative of the more densely-settled regions of the Visayas and Luzon. Tacloban is a small city in the Eastern Visayas and is close to both densely-settled areas of Leyte and the substantial forests of Samar. Cagayan de Oro is smaller and is in a region with more plentiful forest resources.

Cagayan de Oro:

<u>Uses of Traded Fuels</u>

Cagayan de Oro is a city of approximately 430,000 people in Misamis Oriental Province on northern Mindanao. Total annual fuel consumption in Cagayan de Oro is estimated to be approximately 82,000 tons of fuelwood and 7,000 tons of charcoal.

The majority of fuelwood resources go to households, urban traders, commercial establishments such as bakeries, restaurants and eateries. Surprisingly, the majority of the charcoal supply is intended for industrial use as activated carbon. Households, restaurants, bakeries and other establishments are also considered as charcoal users.

If the above-mentioned total consumption for fuelwood and charcoal is translated into LPG demand, simple calculations indicate that a total of US$ 0.73 million or P 21.87 million as foreign exchange savings will be realized (1989 prices).

Apart from these savings, fuelwood is considered as a source of income for many of the households. The wood gatherers interviewed collect an average of 4.9 tons per annum, which would suggest that around 17,000 households gain income from supplying wood to the city's market.

Almost all of the charcoal produced in this area is coconut shell charcoal and an estimated 70 percent of it is not used as fuel. There are two companies in Cagayan de Oro which purchase coco charcoal and ship it out for industrial use as activated carbon. This is an important local industry, providing a regular source of income to a large number of poor households. The supply of coco-shell is plentiful and this industry does not impact on household fuel availability. The charcoal makers income from charcoal (including that sold for activated carbon) averages P 11,300 per year or around US$ 435.00 which is about 50 percent of their cash income (with most of the rest coming from farming).

<u>Supply of Traded Woodfuels</u>

The wood supplies in Cagayan de Oro come from a variety of sources. Wood from private lands, including some coconut fronds, makes up 38 percent of the total supply. Government forest land is the source of 29 percent of the wood, but most of this is residues from logging activities. This includes tree bark, which is stripped from logs being shipped to sawmills in Cagayan de Oro and sold by the truck crews to roadside dealers. The rest of the wood from forest areas comes from secondary growth in former logging areas. A further 29 percent of this wood sold in Cagayan de Oro is residue from the city's sawmills, which is sold directly to urban dealers or large consumers such as restaurants. The remaining 3 percent is driftwood collected from the seashore. As such, the supply of wood to Cagayan de Oro is strongly tied to the region's logging industry.

The rural traders act as intermediaries between the gatherers and the urban market. Most are small, dealing with an average of 9.7 tons per year, and many are part-time operations. Although the picture is complex, most of the transportation is done by the rural traders, who hire jeepneys to ship the wood to the city, usually a distance of 30 to 45 kilometers. The urban traders are mostly small stall holders or shopkeepers who sell other household goods, but there are a number of larger traders who deal in large quantities of wood from the sawmills.

Ipil-ipil, coconut fronds, *molave* are the dominant wood species in the area.

Cebu:

Uses of Traded Fuels

The island of Cebu is in the central Visayas, in Region VII. It has a population of 2.5 million, 40 percent (1 million) of which live in urban areas. Total urban fuelwood consumption is approximately 180,000 tons per year and charcoal consumption is an additional 15,000 tons per year.

Overall, it appears that the commercial sector accounts for 49 percent of charcoal consumption and 37 percent of fuelwood consumption in Cebu City. The rest is utilized by the household sector. The commercial sector is also somewhat less dependent on primary fuelwood than the residential sector, with certain commercial end-users such as eateries, food vendors, and various industrial establishments making extensive use of coconut fronds and scrap wood. Aside from households, charcoal is used primarily by barbecue and lechon vendors, restaurants and bakeries. Much of the charcoal sold in Cebu is reportedly used for ironing and it is not an important cooking fuel.

With the utilization of these resources, a total of around 43,000 barrels of oil equivalent valued at US$ 0.73 million or P22 million at 1989 prices will be saved in foreign exchange savings.

The fuelwood gatherers collect an average of 5.9 tons of wood per year, but this varies from over 40 tons to less than 200 kilograms. This suggests that about 30,000 households are engaged in wood gathering in Cebu. Wood gathering is an important source of income, with earnings averaging over P3,500 per year or about US$135.00. This is about 40 percent of total cash income for these households. There are around 2,000 rural wood traders in Cebu City and many of them employ laborers.

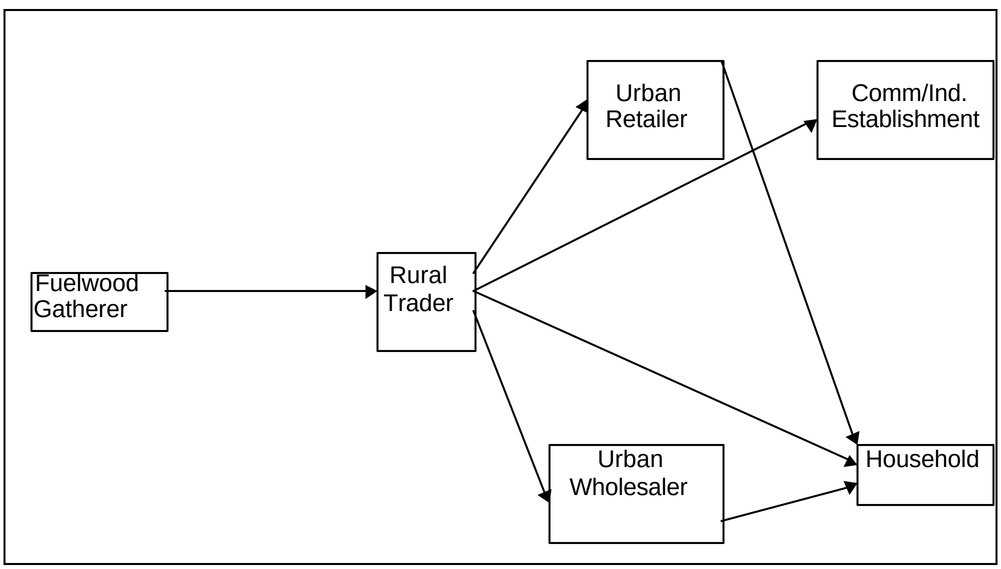
Charcoal is not widely used in the urban areas of Cebu, with an average household consumption rate of less than 5 kilograms per month. Charcoal making is a supplementary activity for farmers. They receive around P5,000 per year or about US$ 417.00 which represents more than 30 percent of their cash income.

Supply of Traded Fuels

The wood supplying the urban market comes primarily from agricultural areas, with "village woodlands" (trees on farms and small patches of woodland scattered throughout the agricultural landscape) providing 66 percent of the total supply. The remaining 34 percent is reported to come form forest land, meaning that some 60,000 tons of fuelwood is reported to come from forest land (although this includes vestigial woodland patches outside the main forest area).

The fuelwood gatherers mostly sell to rural traders, who have substantially bigger operations. The traders transport the wood to the city, where they sell it on to urban traders, wood-using industries or households. The urban traders sell wood usually in small bundles and usually alongside other household goods in small shops or market stalls (Figure 1).

Figure 1: Fuelwood Supply System in Cebu City.



The charcoal makers sell the product to rural traders who have larger enterprises. They usually pay the transport costs and sell on to small urban traders. The final retailers are small shops and market stalls.

Fast-growing varieties like *Leucaena leucocephala* and *Gliricidia sepium* account for close to 60 percent of fuelwood (excluding non-woody biomass) and over 70 percent of the charcoal being sold. Fruit bearing trees such as mango, star apple and tamarind are the second most important category in terms of woodfuel production accounting for 23 percent of the fuelwood and 14 percent of the charcoal traded. Naturally-growing shrub and tree species common in patches of secondary regrowth, including *Vitex parviflora, Psidium guajava* and *Buchanania arborescens*, still make- up 16 percent of the fuelwood and 12 percent of the charcoal commercially traded in the city.

Metro Manila:

Uses of Traded Fuels

The fuelwood and charcoal markets of Metro Manila differ from those of other urban areas in a number of important ways. Firstly, wood and charcoal are not important fuels in the National Capital Region, supplying less than 10 percent of the energy used for cooking. Secondly, the distances over which the fuels are transported are far greater than those of other regions of the country (and include a significant inter-island trade from Mindoro and elsewhere). Thirdly, commercial alternatives and especially LPG, are more readily available and are cheaper than in other parts of the country. Finally, the population of Manila is more prosperous and, in many cases, more cosmopolitan than that of other urban areas. All of these factors mean that the propensity of Manila's population to use charcoal and fuelwood is much lower than that found in other urban areas; a fact reflected in the relative unimportance of the capital's market in national and charcoal demand.

Total fuelwood demand in Metro Manila was estimated to be less than 60,000 tons and charcoal demand was less than 50,000 tons in 1989. The total quantity of wood used (including that used to make charcoal) is estimated to be approximately 350,000 tons per year, a quantity which is small compared to the resources of the regions which supply the city. As such, there is no reason why existing levels of wood and charcoal cannot continue to be supplied to Manila for as long as a market exists in the city, although localized impacts of the demand (for example, on mangrove areas) may need to be addressed.

The majority of the fuelwood supply in Metro Manila goes to industries or commercial establishments such as bakeries, restaurants, textile factories, etc. Another 21 percent of fuelwood supply goes to local fuelwood agents or middlemen. The remaining 36 percent is distributed to wholesalers/retailers and households.

Charcoal supply is distributed among retailers (30 percent), traders (23 percent), households (21 percent), industries (11 percent) and transporters (8 percent). The remaining 7 percent is intended for non-fuel uses, i.e., for orchids and activated carbon.

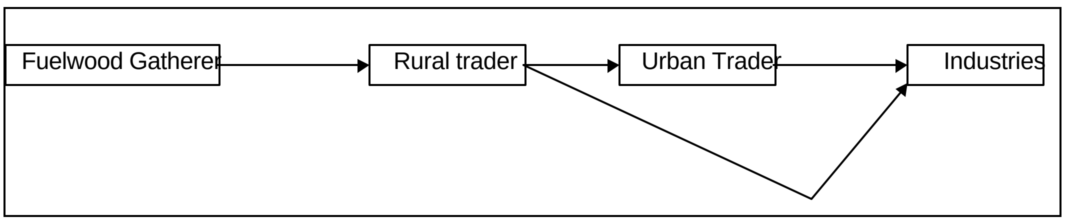
Overall, 1989 woodfuel consumption in Metro Manila is equivalent to around 80,000 barrels of oil, worth an estimated US$ 1.32 million or 40 million at 1989 prices.

Supply of Traded Woodfuels

Woodfuels supplies in Metro Manila are reported to come from all over Luzon and the surrounding islands, but southern Luzon (in particular Quezon Province) is one of the most important sources of supply. The fuelwood gatherers supplying Manila tend to sell larger quantities than those in other areas. These primary producers sell on to rural traders, who are frequently local actors who in turn sell on to transporters or urban-based wholesalers.

Within the city, there are a number of stages between the city gate and the final consumer. The wood gatherers sell fuelwood to the rural traders and then sell on to the transporters (who may be urban wholesalers as well (Figure 2).

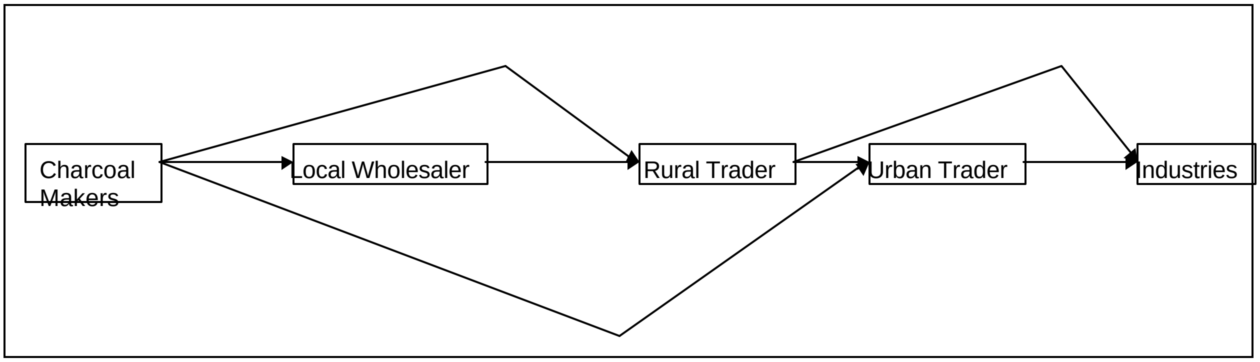
Figure 2: Fuelwood Supply System in Metro Manila.



Higher prices were reported in Mindoro, a province in Luzon. This appears to reflect the premium price which is paid for large stems of mangrove wood, which, reportedly, supply commercial consumers such as bakeries and restaurants in Manila. The scale of this trade is unknown, but it is a cause for concern as the extraction of fuelwood from mangrove areas is a contributing factor to the rapid deterioration of mangroves found in islands such as Mindoro.

The charcoal supply system is more complex than that of fuelwood. This is because charcoal is easier to transport. All of the charcoal requirements of the industries are purchased from the rural traders as well as from urban traders like market retailers and wholesaler-assemblers. Urban traders avail of the cheap charcoal by buying directly from charcoal makers in Rizal, Batangas and Quezon. The rural traders deliver the fuel needs of industries and the charcoal supplies sold by the urban traders. Rural traders come to the provinces of Luzon. In some cases, rural traders resort to purchasing from middlemen in the person of the wholesaler-assemblers in town because charcoal makers are located in far-flung areas, often inaccessible by poor roads.

Figure 3: Charcoal Supply System in Metro Manila.



Several wood species are utilized as fuelwood in the city. These species include: Dipterocarps or the premium species; the fast growing species and the lesser-known species.

The premium species come from sawmill wastes and are utilized as fuelwood. *Kakawate* (*Gliricida sepium*) and *ipil-ipil* (*leucaena* sp.) are the most notable fuelwood species purchased from suppliers. The lesser known species such as *batino* (*Alstonia macrophylla*), *tibig* (*Ficus nota*) and *antipolo* (*Artocarpus blancoi*), among others.

Dead and senile fruit trees are made more utilizable by charcoaling them. Some of the commonly enumerated fruit tree species were guava (*Psidium guajava*), tamarind (*Tamarindus indicus*), mango (*Mangifera indica*), duhat (*Syzygium cumini*) and santol (*Sandorium koerjape*).

Tacloban:

Uses of Traded Fuels

The 1990 population of Tacloban, the capital of Leyte is estimated to be 170,000. It is one of the principal towns of the Eastern Visayas and is the administrative center for Region VIII. Total annual fuelwood consumption in Tacloban is estimated at 61,000 tons, with charcoal consumption estimated at 5,000 tons.

Households utilize a major share of fuelwood supply in Tacloban City, accounting for 49 percent. Retailers (36 percent) and commercial establishments such as oil mills (15 percent) have been identified as consumers of this resource.

Charcoal is utilized mostly by households (60 percent), commercial establishments such as bakeries and restaurants (17 percent) and retailers (17 percent). The other 9 percent goes to wholesalers.

Woodfuel trade is considered an important income source in Tacloban City. The fuelwood gatherers collect an average of 4.4 tons per year, which would suggest that close to 14,400 households, i.e. 46 percent of the total households, are involved in fuelwood collection to serve Tacloban's market.

The rural traders are fairly small-scale operators, purchasing an average of 12.8 tons per year. Fuelwood trading is a secondary activity for all of the traders interviewed, with farming and shop keeping the principal sources of income for most of them. Almost all the urban traders are small shopkeepers or stall holders in the market who sell wood as one of a number of household items.

Charcoal is of minimal importance as a household fuel in Tacloban, with an average consumption of 30 kilograms household per year. This is mostly used for ironing or specialized cooking. There are considerable quantities of coco-shell charcoal made in this region for export as activated carbon for industrial use. This is often done by professional charcoal makers, some of whom are organized into co-operatives. The rural traders, who are again small, part-time dealers sell charcoal on to urban traders (who are again small shopkeepers). Overall, the charcoal market of Tacloban is so confined that the number of actors involved is small and the impact on the region's wood resources is minimal.

Using 1989 prices, foreign exchange savings generated from the consumption of these woodfuels amount to US$ 0.24 (P7.36 million) or 14,700 barrels of oil.

Supply of Traded Woodfuels

The supply of fuelwood in Tacloban City principally comes from two municipalities in Samar, namely Basey and Sta. Rita, and two municipalities in Leyte, namely Babatngon and San Miguel. Fuelwood coming from Samar is brought to Tacloban either by boat or by public utility vehicles via the San Juanico Bridge. On the other hand, fuelwood from the two municipalities of Leyte is brought to Tacloban through public utility vehicles only.

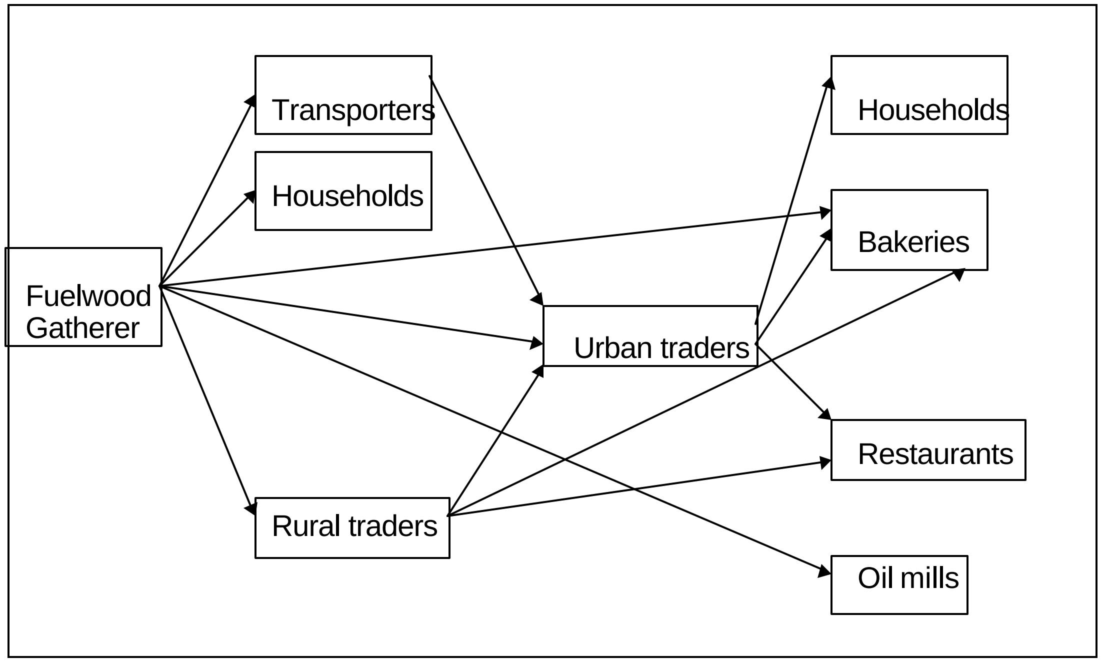
Fuelwood from these four sources is collected from family woodlots(47 percent), land belonging to landlords (26 percent), nearby public forests (21 percent), and mangrove areas (6 percent). Few of the respondents interviewed reported collecting mangrove wood, but field observations in Tacloban's markets found quantities of mangrove wood for sale and the remaining mangrove areas of both Leyte and Samar appear to be an important source of fuel for the urban market.

Figure 4, indicates the flow of fuelwood from the gatherers to the users. Fuelwood gatherers sell the bulk of the fuelwood collected to the transporters, households in the locality, and rural traders in the locality. However, some fuelwood gatherers sell fuelwood directly to urban traders, bakeries and oil mill in Tacloban City.

Transporters sell their purchased fuelwood only to urban traders in Tacloban City. Rural traders, on the other hand, sell the fuelwood purchased to urban traders, bakeries restaurants, and oil mills in Tacloban City.

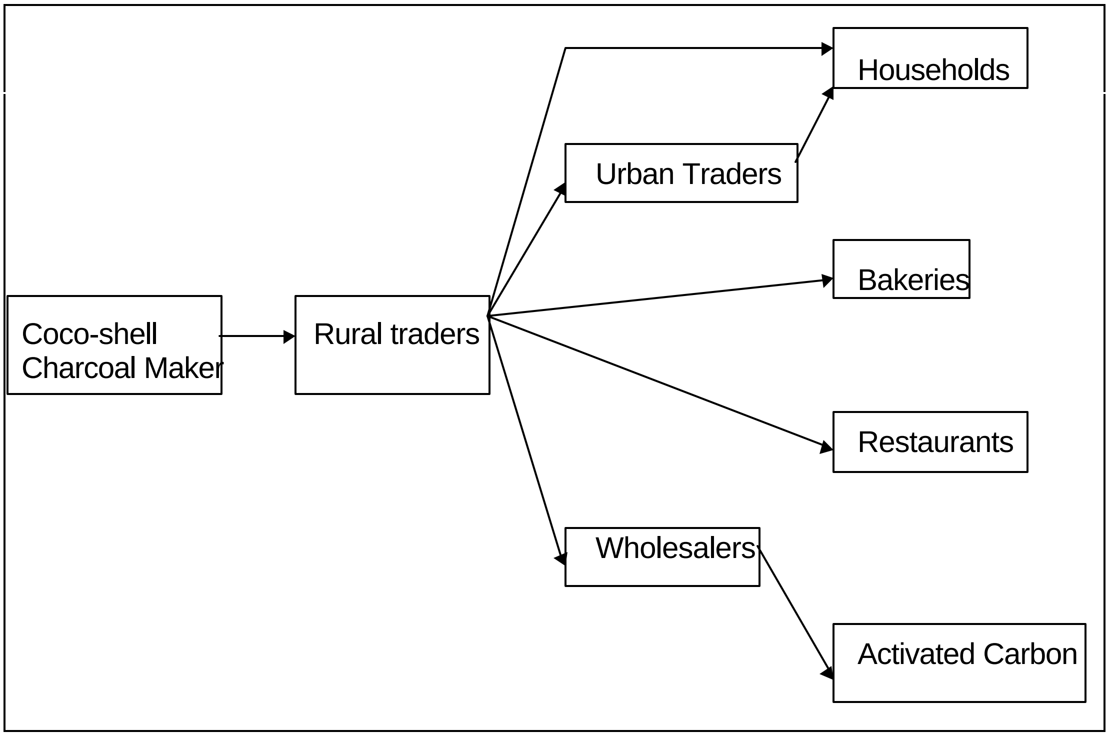
Urban traders then sell the purchased fuelwood to households, bakeries and restaurants in Tacloban City. The end users of fuelwood are the household bakeries, restaurants and oil mills in Tacloban City.

Figure 4: Fuelwood Supply System in Tacloban City.



The flow of coco-shell charcoal from the makers to the users is summarized in Figure 5. Coco-shell charcoal makers sell their charcoal to rural traders. Some of these rural traders also produce their own coco-shell charcoal. The rural traders then sell their coco-shell charcoal to urban traders/retailers and wholesalers in Tacloban City. However, some rural traders sell charcoal directly to households, bakeries and restaurants. Urban traders/ wholesalers sell their purchased coco-shell charcoal to households and bakeries.

Figure 5: Coco-Shell Charcoal Supply System of Tacloban City.



Wholesalers sell their coco-shell charcoal directly to activated carbon processing companies outside Leyte. The ultimate users of coco-shell charcoal are bakeries, households, restaurants and activated carbon industries.

There are two supply systems for charcoal in Tacloban City. This is because there are two types of charcoal supplied namely, coco-shell charcoal and wood charcoal.

The wood charcoal supply system is much simpler. Wood charcoal makers sell their wood charcoal directly to urban traders and restaurants in Tacloban City. The urban traders then sell their wood charcoal to households, roasted chicken stands and some restaurants.

Woodfuel Supply Systems:

<u>Summary</u>

The foregoing sections set out the main findings from four of the detailed market studies undertaken by the NCED in cooperation with the different ANECs. The results of these surveys, along with some preliminary findings from two other study areas, permit us to identify a series of important conclusions concerning commercial woodfuel supply and demand in the Philippines.

Sources of Fuelwood Supply

The sources of wood used to supply these markets vary greatly from one region to another. Government forests are an important source of these materials, but there are a number of other sources and the impact of these markets on the forest resources is less severe than expected at the outset of the study.

Residues from logging and sawmills are important sources of fuel in areas where these activities continue to operate, representing an efficient and economic use of a resource which would otherwise be wasted. There is undoubtedly scope for increasing these flows if production continues at current levels. Essential to this is the legitimization of this trade and the removal of bureaucratic restrictions on the use of logging wastes. Also, active intervention and provision of incentives or improvement of market infrastructures may also be worth considering. Finally, greater use of logging waste in remote sites to make charcoal and improvements in the efficiency of charcoal production should be encouraged. If logging activities cease, there will be a need to develop alternative sources which can be managed on a sustainable basis in regions which use logging residues.

Village woodlands in agricultural areas (including the mixed extensive farming areas on designated forest land in the uplands) are an important source of fuel in most regions. This provides a source of income for farming families and is intensively managed in some cases. However, little is known of village or farm woodfuel management practices in upland areas.

Environmental Impact

There is little evidence from the survey to suggest that these resources are under significant pressure, but they play a vital role in the household economy of rural areas and there are some indications that the management of these areas could be significantly improved. The model of community management being introduced into designated forest land has some potential for these areas in A&D land. A prerequisite for this is the clarification of the tenure status in these areas in favor of farmers.

Both upland forests and mangrove woodlands are sources of urban fuelwood in many areas. The extraction of wood resources for commercial fuel markets does give some cause for concern in regions which are less well-endowed with forest resources. The mangroves are more accessible especially by boat and provide wood which is considered to be excellent for fuel, in particular for informal sector commercial fuelwood users such as bakeries.

Mangroves are degrading rapidly and urgent action to protect them is needed. Action to mitigate the effects of fuelwood extraction is part of this wider need for better management of the mangrove resources, and should be approached from this perspective.

Economic Significance

The fuelwood and charcoal supply industries are extremely important sources of income for many rural households. The supply studies provide data on the amount of wood gathered and charcoal produced by individual households. This information has been combined with estimates of national urban fuelwood and charcoal demand to estimate the number of households engaged in wood gathering, charcoal making and wood and charcoal trading in rural areas. It is estimated that 536,000 households are engaged in gathering and selling wood, 158,000 households make and sell charcoal (this does not include those households who make coco-shell charcoal for activated carbon, a major rural industry in some areas) and 40,000 households act as traders in rural areas. An estimated additional 100,000 households are urban traders. Almost all of these households have other main occupations. In rural areas this is mainly farming and the traders are mainly shopkeepers or market stall operators selling wood and charcoal as part of a range of goods.

As such, close to 10 percent of all rural households receive income from selling wood or charcoal. The survey found that the urban-fuel markets provided an average of 40 percent of the cash income for these households. Many were poor households with few alternative sources of off-farm income, and for them the urban fuel trade is a vital component of their household economy.

Efficiency of Operation

Wood and charcoal markets operate totally outside the formal regulatory mechanism of the state. They are a classic informal sector activity--a characteristic which is reinforced by the formal illegality of much of the industry. The supply studies indicate that they operate efficiently to link fuelwood resources with urban markets, and do so without utilizing significant quantities of capital. The lack of price variation indicates that supply systems appear to be flexible and responsive to consumer demand. Informal markets such as these expand or contract according to the level of demand for the fuels, and in particular are able to increase supplies to make up for any potential shortfall in the availability of non-biomass alternatives. This is particularly true for urban areas outside Metro Manila where wood and charcoal are still the main fuels and the market structures are more fully developed. These actual and potential roles need to be recognized and action taken to legitimize and encourage the wood and charcoal markets in areas where they do not have an adverse environmental impact.

Sustainability of Fuelwood and Charcoal

The analysis of the biomass situation of the Philippines indicates that the overall national picture for these fuels is extremely favourable and there is no immediate cause for concern about widespread woodfuel shortages for the household sector. There is, however, clear evidence of poor management and possible over-exploitation of mangrove and upland resources in some areas.

As determined by this study, woodland plots in agricultural areas are a vital energy resource but little is known about the efficiency of their management or how management can be improved. The basis for these improvements will be through some form of community-based venture with the specific techniques used varying from place to place. An investigation of the management of woodland plots should be an explicit focus of these studies. In general, numerous ways the government could assist farmers to better manage the resource base include: providing training and extension to farmers, establishing improved seed supply sources, giving farmers long term leases or tenure, introducing them to improved tools and possibly increasing their monetary reward.

All of these interventions will therefore require detailed study and co-ordination between the agencies responsible for the management and use of the renewable resource base, namely the Department of Environment and Natural Resources, the Department of Agriculture and the Department of Energy.

2.2. Woodfuels Trade and Marketing in Pakistan

by

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Introduction

As the development transition takes place, energy planners often strive to ensure that supplies of energy keep pace with the rapid increase in demand. The household sector is a very important component of the energy consumption matrix in Pakistan, yet, until recently, little was known about the energy-use patterns of the household sector, particularly relating to biomass fuels, and this hindered the development of a comprehensive strategy capable of fully addressing the issue of sustainability of the resources. The realization of the importance of the household energy sector led the Energy Wing of the Government of Pakistan to undertake the Household Energy Strategy Study (HESS) with the support of the UNDP/World Bank. The main objective of the HESS project was to estimate, analyze, and understand the role of the household energy sector in Pakistan so as to formulate a strategy for the sustainable growth of energy resources.

The findings of the HESS project also underlined the importance of fuels consumed by households in the overall energy balance of Pakistan. According to HESS demand estimates, Pakistan's household sector consumed about 20 million tonnes of oil equivalent (MTOE) out of 38 MTOE in 1991, or about 52% of the total energy consumed by the country, thus emerging as the single largest energy-using sector of the economy. Within the household sector, nearly 86% (17.8 MTOE) of energy is comprised of biomass fuels (predominantly woodfuels) which is 46% of the total national consumption. Given that the fuel mix of the household sector is dominated by woodfuels, it is generally believed that this heavy consumption of woodfuels by the household sector is the major cause of deforestation in Pakistan. Overall wood consumption, including that of other consumers besides the household sector, stand at 32.4 million tons. According to HESS supply estimates, with total standing wood stock of 210.7 million tons, the annual wood productivity is about 22.7 million tons, to which the country’s forests contribute only a small share. Although there is a gap of about 10 million tons which raises the question of sustainability of wood sources it does not provide ground for supporting the prevailing general notion of "deforestation". In fact, according to HESS findings most of the demand is met by wood obtained from private farmlands, so the so-called "pressure on forests" could never have arisen from this activity in the first. Moreover, the real prices of woodfuel over the years have been quite stable and do not reflect any scarcity of woodfuels as such.

Furthermore, the HESS woodfuel market survey provides, firstly, an important link between the findings of demand and supply surveys and, secondly, a framework that helps explain the stability of fuelwood prices and thus wood scarcity. Although it does not solve the riddle of the gap and sustainability it clears the smoke screen created by the general notion of woodfuel collection causing "deforestation". According to the HESS market survey, the woodfuel markets operate under highly competitive conditions with mainly retail outlets which obtain most of their supplies from nearby farmlands (with the exception of Balochistan province) and thus are able to meet the demand. Most of the traded woodfuel comes from private farms constituting a substantial earnings for farmers. It also constitutes an important activity for the transport sector as the woodfuel transport effect is believed to exceed 100 million ton-kilometers per year.

This paper, in the light of the HESS findings, presents, in the next four sections, information on almost all aspects of woodfuels including demand of woodfuels, quality of wood used, the main consumers, consumption patterns, the supply picture, and, more importantly, the structure of woodfuel markets, the question of sustainability and, last but not the least, suitable policies and strategies in order to address the future of woodfuels.

Uses of Traded Woodfuels

Consumption Level

Out of the total amount of fuel consumed by households (20.7 MTOE), nearly 54% consists of woodfuels. Total fuel wood consumption by households stands at 29.4 million tons per year. About 32.4 million tons of wood were consumed in Pakistan in 1991 including other sectors as well. The household sector consumed about 90% of this amount as fuel. A rough estimate based on household responses showed that this sector consumed 12.4 million tons of round wood and 17 million tons of small twigs and bushes and an additional 3 million tons of industrial wood (round wood for timber, poles etc). As much as 60% of the wood consumed by the household sector was collected. A large proportion of the collected fuelwood is made up of small twigs and shrubs. The traded woodfuel amounted to about 12.4 million tons in 1991-92 which represents only 41% of the total fuelwood consumed in Pakistan in that period. However, woodfuel trade plays an important role in the economy by generating considerable employment opportunities. Table 1 below provides details about total consumption by households and its break-down into purchased share and collected share.

It can be observed that the largest proportion of the total amount of woodfuel consumed by households is supplied from collection rather than from purchases. The purchased wood (or traded wood) constitutes only about 41% of total woodfuel consumption. About 79% (91% Rural, 52% Urban) of the households use firewood with an average of 2,324 kg/year/household. In rural areas much of the fuelwood is collected and in urban areas purchasing dominates. In urban areas the number of fuelwood users declines as income levels rise and households switch to modern fuels.

Table 1: Collected and Purchased Fuelwood Consumption in Urban and Rural Households in Pakistan.

	Proportion of woodfuel from collection (1)	Average consumption kg/year accounted for by collection	Total consu-mption /000 tons	Proportion of woodfuel from purchases (1)	Average consumption kg/year accounted for by purchases	Total consum-ption /000 tons
URBAN	14.1	1,841	655	85.9	1,848	4,119
RURAL	65.7	2,581	17,000	34.3	2,187	7,555
TOTAL	55.0	2,547	17,655	45.0	2,042	11,674

(1) for woodfuel users

Quality of Firewood

Households which purchase firewood generally use better quality wood than those which rely on collection for their needs. Marketed fuelwood is normally round wood which mostly is obtained through harvesting the whole tree, and not through lopping branches or through harvesting of shrubs. Households collecting to meet their needs for firewood most often report using leaves, twigs, shrubs and sometimes even roots. However, this should not necessarily be taken as an indicator of a scarcity of better quality wood. A number of factors may explain why stem wood is not collected. Firstly, because stem wood has a higher financial value, it is more likely to be sold, possibly by the same people who prefer to collect lower quality wood for themselves. In other words, it may be that the benefits of selling stem wood outweigh the value assigned to the labor time of collectors. Secondly, since the majority of firewood collectors mainly rely upon human transportation, the collection of stem wood may be precluded since it is too heavy to carry in single headloads. Finally, collectors often will not have the tools required to cut large tree stems and so the resources are simply not available to them.

Major End-Uses

Firewood used in traditional fireplaces generally serves multiple end-uses simultaneously (for example: cooking, water heating and space heating). Thus it is not possible to quantify accurately the proportion of firewood used for each end-use. Nevertheless, the HESS survey did attempt to get some indication of the relative requirements of each end-use. Households were asked to indicate the end-use for which they used firewood. Major end-uses with their shares in consumption are given below in Table 2.

Table 2: Firewood end-uses.

	Consumption (kg/h.hold/day)	Share of total consumption
Cooking, Space & Water Heating	8.6	20.6%
Cooking & Space Heating	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%

Households were asked to indicate the end-uses for which they used fuelwood. Using these results, rough estimates of the share of each end-use was deduced. Cooking is the major consumer of fuelwood followed by two smaller end-uses (space and water heating) which accounts for an equal amount of wood. Other end-uses account for a small fraction of fuelwood use.

Consumption Pattern

Patterns of woodfuel consumption have an important bearing not only on the energy sector, but also on wider development issues and on questions of environmental sustainability. There is conflicting evidence about the impacts of woodfuel use on the environment in Pakistan. On the one hand, it is feared that the present heavy reliance on woodfuels is not sustainable and that firewood may be becoming scarce in some areas, causing hardship particularly to subsistence households. The widespread use of inferior fuels such as dung and crop residues is cited as evidence of this. On the other hand, the relative stability of woodfuel prices over the past decades may indicate that the level of supply has been satisfactory.

The analysis of the demand survey confirmed that fuelwood is a major source of energy in the household sector. Its use is widespread in rural and urban areas, across provinces and across agro-ecological zones. The results revealed that 79% of all household use fuelwood and consume about 29 million tons per year. In rural areas 91% of the households use this fuel and consume an average of 6.7 kg/day; whereas in urban areas 52% of household are fuelwood users and burn an average of 5 kg/day. Most of the fuelwood is consumed for cooking purposes (81.1%). Water heating and space heating end-uses represent only 9.8% and 8.3% of the total consumption respectively.

Although fuelwood is widely consumed by households all over the country, consumption levels differ according to location, income level, household size and availability of other fuels. Households that have 16 or more members consume 2.17 times more than those having less than 5 members. As expected, the per capita consumption of large households is much lower than that of small households i.e. 198 kg/year and 568 kg, respectively, making a ratio of 0.35 compared to the above mentioned 2.17. A larger household size also leads to a substantially larger economic contribution from its large number of earners.

Rural and urban households have completely different woodfuel consumption patterns as well as different driving factors. It clearly indicates that the fuelwood transition is driven by urbanization and that income plays an important role only in urban areas. In urban areas the size of the city is strongly correlated with the proportion of fuelwood users and their level of consumption. Only 28.5% of households residing in large cities of 1 million inhabitants and above, which house about half of the urban population, use firewood and their average consumption is almost 30% lower than consumption of households living in smaller cities.

In rural areas, where about 84% of the fuelwood is consumed, the level of consumption was not found to be sensitive to the level of income. However, the patterns varied significantly from one province to another denoting agro-ecological influences. A closer analysis of consumption patterns helped to develop an understanding of why consumption levels in rural areas are not sensitive to income. The database revealed that most of the fuelwood is collected (69% of the total amount consumed) and therefore considered financially free. However, in urban areas over 86% of the fuelwood is purchased which constitutes a direct financial burden. This makes urban households more sensitive to relative prices and inter-fuel substitution as their income changes. Fuelwood collection is widely practised in rural areas where households satisfy over 69% of their needs through collection. This activity is of course time consuming as rural households spent on the average 699 person-hours per year. If this labor is valued, it would cost a rural household almost Rs.2,800 and the economy almost Rs.19 billion, whereas the market value of the collected fuelwood does not exceed Rs.14 billion (in 1991).

It is clear that the city size and the income level are the major driving factors of woodfuel transition. In rural areas, where almost all households use fuelwood, the consumption patterns are not affected by the income level. They are rather linked to the availability of alternative fuels and woody biomass resources on the one hand and the availability of free labor to collect fuelwood on the other. The four provinces display different consumption patterns reflecting the influence of their respective agro-ecological conditions.

Prices and Expenditure Patterns

The average market price of firewood was Rs.0.98/kg in 1991 with a variation of about 27% between the highest and lowest recorded figures in 7 major cities. In terms of delivered energy for cooking, firewood is a relatively expensive fuel at Rs.0.47/MJ, comparable to kerosene at Rs.0.48/MJ, and more expensive than dung cakes and crop residues at Rs.0.37/MJ and Rs.0.36/MJ, respectively. Of course, in comparison to modern fuels there are little or no equipment costs for using biofuels. Real firewood prices in Pakistan have remained relatively stable in recent years. Furthermore, there has been a relatively small spatial variation in the recorded prices among the different major cities in Pakistan.

Although firewood use is common, the average total household expenditure of firewood using households in 1991 (Rs,31,147) was still much lower that of electricity using household (Rs.38,599/year), or of natural gas using households (Rs.54,330/year). For the approximately 45% of firewood using household which purchase their needs, firewood expenditures represent approximately 6% of their total expenditure. On average, total fuel expenditures represent 10.6% of total household expenditure. This figure is broadly comparable to values for other developing countries. As would be expected, the percentage of total expenditure devoted to energy is seen to decrease as income levels increase.

Woodfuel Transition

Woodfuel is an important fuel in Pakistan and will continue to play a major role in the future. According to the findings of the demand forecasting model of the HESS project, the consumption of total woodfuel will increase during the next quarter of a century, firstly, due to increase in population and secondly, due to substitution of dung and crop residue for woodfuels. The transition between firewood and other fuels is already happening in urban areas and is mainly driven by income and urbanization. Since urban households purchase 86% of their woodfuel needs it constitutes a direct financial burden and makes the demand more sensitive to relative prices and income changes. On the other hand, over 69% of the total consumption is collected in the rural areas mostly by women and children and therefore does not constitute any direct financial burden and hence the demand in rural areas is non-sensitive to relative prices and income levels. Under the status quo there is no incentive as such for the rural household to switch from collected fuelwood to purchased fuel wood or other fuels.

Among the fuels that could substitute fuelwood only natural gas is a totally indigenous source. It should be noted, however, that negotiations are underway to import natural gas through pipeline from Qatar, Iran and Turkemanistan. However, it is unlikely that rural households will get significant connections in the next two decades due to limited reserves discovered so far and the amount of infrastructure related investments required to connect a widely scattered rural population. About half of the amount of kerosene consumed is imported and substituting, for example, total rural fuelwood consumption would have cost the country an additional $ 650 millions in foreign exchange in 1991. This would have further deteriorated the balance of payments situation. Very little LPG is locally produced and there is evidence that a significant proportion is being used by the transport sector. Recently the country started importing through private firms to make up for the present shortage. However, it is expected that LPG prices will increase substantially, deterring its use in the transport sector but also putting it out of reach of poor households. At present it is reported that an 11.8 Kg LPG cylinder costs over Rs.130 compared to Rs.52 two years ago.

If an accelerated inter-fuel substitution program is introduced to reduce the pressure on biomass resources it would place severe stress on the modern fuel supply infrastructure, so that considerable investment will be required to keep pace with the increasing demand. Woodfuel is an indigenous resource and does not require foreign exchange and it is renewable if managed in a sustainable way. Hence, if the woodfuel is managed sustainably it would be unnecessary to force inter-fuel substitution in the rural areas.

Supply of Traded Woodfuels

Biomass Assessment

The woody biomass supply component of the HESS project has produced estimates of tree standing stocks, stocking densities, size distributions and growth rates for all of Pakistan as of 1991. For the whole country, the study estimated that there were some 1,435 million standing trees with a total wood weight (air dry) of 210 millions tons, or an average of 2.4 tons per hectare. Very close to half the trees and standing weight were on farmlands, where the average stocking density was 4.9 per hectares or just over twice the all-country average. The average number of trees per hectare was found to be 16.8, with twice this density on the farmlands. The total growth of wood per year was estimated to be 22.7 million tons or 10.9% of the standing stock (see table 3). This includes a sustainable supply of the order of 10 million tons of round wood (including off-cuts from industrial wood), 10.1 million tons of small twigs and shrubs, and 2.6 million tons of timber (as final product). This sustainable supply of firewood at only 22.7 million tons compared with an estimate for total firewood consumption of 29 million tons, suggests that the present level of consumption may not be sustainable. On the other hand the farm tree survey conducted for the Forestry Sector Master Plan (FSMP) which sampled 3,230 farmland plots of 0.25 hectare each and tallied nearly 16,600 trees on them, concluded that the standing stock of farmland trees was 76.6 million m^3 with an annual growth of 7.9 million m^3/year. At first sight, these results are markedly different from those of the HESS supply survey. However, when appropriate adjustments are made it turns out that the FSMP survey findings are reasonable comparable to those of the HESS project . Most importantly, the HESS results are for total woody biomass whereas the FSMP estimates excluded small twigs and roots, etc. To bring the HESS findings in line with FSMP results, trees outside farmland areas (e.g. road sides, canal sides, homestead trees, and so forth), trees with stem diameters below 5 cm (including shrubs), and citrus trees must be excluded. When the HESS results are adjusted to take these differences into account, the HESS standing stock is reduced to 67.7 million air-dry tons (approximately 96.7 million m^3) and the annual growth to 5.3 million tons (approximately 7.6 million m^3). The difference in standing stock can reasonably be explained by difference in survey methodology i.e. whereas the HESS survey used strictly controlled stratified sampling, the FSMP survey selected plots which were 2, 3 and 5 kilometers from town and villages. The difference in growth is not large but the HESS survey has much lower productivity per unit of standing stock.

Although many tree species are grown in Pakistan, a relatively small number dominate the mix. According to the HESS biomass supply survey, just over a third of all trees in Pakistan are of only three species: *shisham* at 16.6%, *Ailanthus* species at 9.5% and *babul* at 9.4%. A further three species or groups - Citrus trees at 7.0 %, *Acacia modesta* at 6.7% and *Populous sap*. at 6.0% bring the share of the leading six species up to just over 55% of all trees.

Table 3: Woody Biomass Assessment for Pakistan, 1991.

	Punjab	Sindh	NWFP	Baluch.	N.A./AJK	Total
Total standing stock	90.06	24.98	45.24	13.82	36.67	210.78
Total wood growth	11.12	3.96	3.39	1.88	2.35	22.70
Total fuelwood growth	9.60	3.73	2.96	1.79	2.05	20.13
Out of which Twigs/leaves growth	4.12	2.64	1.29	1.15	0.90	10.10
Round wood growth	5.49	1.08	1.67	0.64	1.15	10.03

Estimated Supply-Demand Balance 1991

The wood stock and production figures are categorized by the quality of the wood: timber being the highest quality wood, followed by round wood, then twigs, and finally shrubs. Total wood stocks were estimated at 210 million tons of woody biomass and total annual yields were estimated at 22 million tons. Wood consumption is broken down by fuelwood use by rural and urban households, and wood used as feed-stock and fuel by industries. The total wood consumption for 1991 is estimated at 32 million tons. This gives an estimated national wood deficit of 9.7 million tons. (See table 4). If these numbers are accepted as being accurate and no changes in the wood consumption and supply situation were to occur in the immediate future, all of Pakistan's wood resources might be anticipated to disappear in the next 20 years. As is explained below, this is not the conclusion reached by the HESS project team.

The Gap and Deforestation

The most frequently cited link between population growth and excessive forest resources utilization is fuelwood use. As population grows, the need for subsistence fuelwood for cooking increases. The logical jump from increased fuelwood use to decreasing forest area is easy to make. However, it is not always true. If firewood becomes scarce, rural households may increase efforts to harvest mature trees, but they will also rely increasingly on dung and crop residues. Furthermore, their efforts might lead to forest degradation if they live in the vicinity of accessible forests, but access to forest resources is obviously far from universal. With most land being privately-held, many rural households do not have access to forest trees. Although exceptions to the rule do exist, their efforts to obtain subsistence fuelwood needs rarely result in wholesale forest destruction.

Most rural households collect their own firewood; mostly (86%) small branches, twigs and shrubs. Although less than 30% collect only dead round wood, about 40% claim to collect only dead twigs and shrubs. This evidence contrasts with that for households purchasing fuelwood. In both urban and rural areas, nearly 90% of households purchasing fuelwood preferred to purchase round wood. Thus, the supplying of fuelwood to the market can be linked more directly to the harvesting of entire trees than to supplying fuelwood for own consumption. Although this is not direct evidence of a deforestation-fuelwood link, it does demonstrate that trees are more likely to be cut down to supply the market than to provide rural households with collected firewood. But is this harvesting of trees likely to lead to the destruction of indigenous or natural forest cover?

Table 4: Pakistan Wood Balance, 1991.

Standing Wood Stock	(000 tons)
Timber	73.326
Round wood	96,393
Twigs	31,304
Shrubs	9,635
Total Stock	210,658
Annual Productivity	
Timber	5,129
Round wood	7,509
Twigs	4,217
Shrubs	5,837
Total Growth	22,693
Wood consumption	
Urban Fuelwood	4,778
Rural Fuelwood	24,607
Industrial T&FW	3,000
Total Wood	32,385
Wood Balance	
Annual Production	22,693
Annual Consumption	32,385
Net Balance	(9,692)

It is important to distinguish between trees grown on farm lands, which will be regarded as commercial/industrial trees, and trees grown in natural forests to protect and preserve the eco-systems. The former are treated by farmers as any agricultural crop and their fate will be dictated by market mechanisms including the risk of glut. The latter will have to be protected by the state because of broader environmental implications and conflict of interest. Although households spend considerable time and effort collecting fuelwood, most of them (91.1%) did not experience any problem concerning shortages. Moreover, almost half of all fuelwood users reported higher consumption levels compared to four years ago (certainly due to larger family size). Furthermore, the survey results indicate that the majority of those who stopped using fuelwood did not switch because of scarcity. On the contrary, they switched to better fuels, i.e. natural gas (41.9% of the cases and kerosene (35.8%). However, the vast majority of those who switched fuel are located in urban areas which enjoy a better supply of alternative fuels and a good woodfuel marketing system. Therefore, although the supply survey indicated that the present level of consumption is not sustainable, households seem not to be preoccupied by the scarcity. This attitude seems to be in contradiction with the popular wisdom according to which there is a severe woodfuel shortage and confirms the irrelevance of the gap as an indicator of scarcity and depletion rate.

It is not clear from this national-level data what the most serious sources of continuing pressure on Pakistan's forest areas are. Part of the pressure undoubtedly comes from continuing land clearance for agriculture, even if it is unrecorded, illegal, and undertaken in small parcels. Some of the pressure probably comes from forest encroachment for grazing and expanded pasture lands. Part of the pressure probably also comes from illegal felling for timber sales. Some small portion of the pressure on forest resources undoubtedly does come from the increased demand for firewood. But is unfair and simply untrue to claim that the continuing pressure to clear forest resources is largely attributable to fuelwood demand. Forest pressure comes from multiple sources. More focused studies are necessary to establish the primary source of forest loss for any period of Pakistan's history, including the present.

Scenarios of future wood supplies reveal five lessons about the woodfuel supply system. First, for woodfuel supplies to continue as the most important energy supplies in the country, there must be a transition from exploiting existing trees to exploiting trees planted for timber and fuel (farmland). Second, as a result, it is important that tree planting on farms continues at a high and increasing level. Third, the management of trees on agricultural land must be improved. Fourth, although the gains to be expected from improved efficiency can be easily overestimated, they cannot be ignored. Pakistan needs to begin improving the efficiency of wood use. Finally, unbridled population growth without increases in income to provide for inter-fuel substitution could lead to the eventual destruction of the fuelwood supply system.

There is evidence of vigorous on-farm tree planting activities, not primarily for firewood, but for timber and fruit trees. As indicated above, farmers have already realized that tree growing could be a lucrative activity and have started planting trees on a large scale to meet the increasing demand. The demand survey indicated that household farmers planted a total of 125 million trees in 1990-91, a rate which if sustained could generate a substantial amount of wood. If the observed wave of tree planting by farmers is sustained and assuming a survival rate of 80% and a growth rate of 17 kg per tree per year, the standing stock would even increase by some 10 to 15% by the year 2,008. However, the gap would widen. This suggests that the gap is not a good indicator of sustainability and is totally inappropriate as a measure of the rate of resources depletion. (For a rigorous analysis of gap theory see Richard Hosier, 1993).This concept has been widely misused as it has invariably predicted a complete depletion of biomass cover within a few decades in several countries. This of course did not happen. It is even suspected that the gap has existed all along in Pakistan and any similar study conducted a few years ago would have identified a gap. The growing demand is actually being met through extensive tree planting. Monitoring tree planting trends through periodic agricultural surveys and wood prices can provide early warnings of a danger that demand will not be met.

Wood Markets and Trade

Structure of Wood Markets

Extensive field surveys were conducted over the course of winter and summer during the year 1991-92 by HESS to trace the flow of wood stocks from the point of origin to the final rural or urban consumer. According to the findings of these surveys (See William Dougherty, 1993), firewood markets in Pakistan operate under an organized set of arrangements and structures which are responsive to economic conditions. Trading networks are regulated by a number of interacting factors such as supply locations, transport requirements, alternative fuel availability, and purchase and sales prices. The manner in which traders cope with these factors has resulted in a market which attracts an enormous number of businesses. About 40,412 establishments are currently operating throughout Pakistan with the highest proportion found in rural, village areas. These operators employ roughly one out of every 1,185 people in the country and sell firewood to a combination of households and commercial establishments, as well as other traders. There is a woodfuel business for every 2,500 inhabitants in Pakistan and about 80,000 to 100,000 people are directly involved in this trade. The business generates annually about Rs.11.4 billions ($ 450 millions) which is equivalent to about 10% of the value of all Pakistan's exports in 1991-92.

Sources of Traded Wood

A clear linkage exists between the private farmer who plant trees and the wood traders who facilitates their downstream movement. Most of the major wood catchment sites are either located within irrigated high productivity *tehsils* or in close proximity to them. Thus the distribution chain, typically originates at the farm site, is kept as short as possible, and is characterized by numerous levels of exchange prior to its purchase by the final consumer. In this present system, farmers are functioning merely as suppliers, selling their trees most often on a standing tree basis. Their reluctance to market their own trees puts them at a disadvantage to traders and seriously limits their profits. A program of information dissemination is recommended for farmers in heavy wood producing areas to enable them to better grow and market their trees. Most rural-based wholesalers obtained their supplies directly from private farmers, confirming the importance of these supply sources to the firewood trade. Urban retailers have the shortest distribution chain as most do not venture into rural areas to procure their supplies, preferring instead to buy from large wood depots located just beyond municipal borders or from local wholesalers.

Market Prices

Annually, about 12.4 million tons are sold to the final consumer compared to 3.4 million tons sold to other traders. Hence, on an annual basis, wood markets generated 16 million tons in sales volume during the year 1991-92, or roughly 135 kg/cap/yr. The sale prices of wood producers vary on the basis of tree type and quantity sold. The price for all sales ranged from 125 to 1000 Rs/ton, with an average price of about 450 Rs/ton. *Babul* prices were the lowest, fetching about 350 Rs/ton, while assorted other species fetched roughly 50% higher prices (530 Rs/ton). *Shisham* wood was valued at 450 Rs/ton. The average retailer purchase price was Rs.678 per ton and was roughly consistent for urban, rural, and roadside dealers. The average retailer selling price of Rs.880 per ton included a mark-up of about 30%. Considering all sales, wood markets generated about Rs.13,375 million per year, or roughly Rs.115 per capita. Monthly revenues net of expenses are approximately Rs.4,400 per retail dealers.

Size of Market

About 40,412 businesses operate in firewood markets throughout Pakistan. Roughly 32% are found in urban centers, 52% in villages, and the remaining 16% are located along metalled roads. In addition, about 4,800 timber traders also sell wood though at lower levels. Retailers dominate the firewood market in numerical terms totaling over 36,000 or 91%. Sales to the household and commercial sectors comprise the bulk of their revenue. The sale structure of wood markets is retail dominated. Firewood trading businesses are generally small-scale operations that remain open year-round. About 71,848 people were working on a permanent basis during the winter of 1991-92, roughly 87% in retail. A further 26, 928 people were employed as part-time staff. Even though wood is a primary commodity with a low value added content, it provided substantial profit margins in a retail-dominated market. At the national level, wood markets generated about Rs.13,375 million during 1991-92 or roughly Rs.115 per capita. This roughly equaled 10% of total monetary assets in circulation in 1991 (PSY, 1991). On average, retailers earned a net margin of Rs.53,000 each during 1991-92. This appears to be a reasonable level in the context of annual earnings by skilled craftsmen in Pakistan. Leach (1993) notes that the average annual income for carpenters and masons is about Rs.36,000. Thus although retail establishments are doing well, their annual incomes are by no means excessive or disproportionate. The average number of permanent staff for retailers is 1.7, including the owner of the business.

Wood Transportation and Costs

High tonnages of firewood are transported over large distances in Pakistan, especially during the peak winter months. The most common form of transport is a 6-wheel Bedford truck although a variety of other modes are used such as tractor trolleys and animals. Transport costs are the largest component of the wood purchase price, accounting for 67% of *en route* and yard arrivals cost. Most of the wood transported is medium to large diameter round logs. Transit taxes applied to these hauling trips show considerable variation depending on location. Overall transit taxes take up the same share as costs involved in unloading and other yard arrival tasks and about half the total *en route* costs in the case of traders in Punjab. This is a high tax burden for a non-manufactured good. The tax structure appears to be poorly understood by transporters and thus subject to widespread abuse which adversely affects not only the final consumer but producers as well. A review of the country wide *zila* and *octroi* tax system is recommended with a view towards simplification and standardization.

Most of the wood sold in a province originates in that same province. This situation holds true for every province except Balochistan, where firewood is drawn mostly from the neighbouring Sindh province. This pattern of cross-province transport reflects physical scarcity of wood resources in this province. Transport costs figure prominently in the price structure of firewood. They account for 67% of *en route* and yard arrival costs. Costs are lowest for roadside traders operating closer to farm sources. The tariff structure used by transport agencies includes a fixed overhead and a distance dependant freight cost. Average wood transport costs are estimated at Rs.0.53 per ton-kilometer for a fully loaded 8-ton truck. And lastly, transit taxes applied to these hauling trips show considerable variation per province. Overall transit taxes take up the same share as costs involved in unloading and other yard arrival tasks and about half the total *en route* cost in the case of Punjabi traders.

Future Prospects of Woodfuels

Farm Trees

According to the HESS demand survey, 125 million trees were planted during 1990-91 with the share of non-fruit trees at almost 90%. The largest proportion of the planted trees (44.9%) was for timber and a significant proportion of 29.8% was destined for fuel purposes. So farm trees seems to be the only option for Pakistan to meet its growing demand, and as agricultural self-reliance is an important Government policy, there are apprehensions that if growing trees become more lucrative farmers may substitute their agricultural crops with block plantations. The HESS project conducted a detailed analysis to understand the economics of farmland trees, comprehend farmers motivations and expectations and to identify major obstacles that could impede the observed trend.

Economics of Farm Trees

The majority of farmers (about 73%) who were involved in non-fruit tree planting during 1990-91 planted less than 20 trees each. The low number of trees planted per acre suggests that these trees are scattered or planted in rows, and therefore are not displacing other agricultural crops. It has also been observed that farmers harvest their trees at a rather short rotation of about 6 years, which minimizes the negative impacts generally attributed to the shade of trees and maximises their returns at 10 and 15% discount rates. The commercial benefits from this form of tree growing should therefore be regarded as a supplement, not as an alternative, to the income from conventional agriculture. The relative size of this extra income is a good measure of the commercial interest which farmers have - and might show in future - in tree growing on this scale. Estimates of the income from trees are more problematic because of uncertainties about growth rates and wood prices. However, reasonable estimates for the average number of trees on irrigated land, based on the results of the HESS biomass supply survey, are presented in the following section. Trees are harvested at a 6 years interval since this is the rotation which gives the highest annual revenue when revenues are discounted at 10% and 15%.. Calculations for 100 linear trees are given in Table 5. This leads to the fact that farmers need extension services from forestry departments to be trained how to maximize yields and manage their plantations as a business. The issue of wood prices is very critical as it could affect very much the viability of farm forestry in Pakistan. Excessive supply of industrial wood or market imperfections could contribute to lowering the prices leading to a crash. When no account is made for land rents, it is observed that 100 border trees give a discounted annual revenue of 5% to 6% of the net returns from cotton-wheat double-cropping, the most profitable crop combination. For rice-wheat and sugar cane the returns from the trees are much greater at 10-11% and 16-17% of the discounted revenues from the corps.

Table 5: Calculations for 100 Linear Trees.

Woody biomass after 6 years		9.3 tons; 232 maund (air-dried)	
Standing sale price		Rs.18/maund	
Revenue		Rs.4,180 (average Rs.695 per year)	
Revenue discounted at 10% p.a:		Rs.2,360 (average Rs.390 per year)	
Revenue discounted at 15% p.a:		Rs.1,805 (average Rs.300 per year)	
Annual revenue from trees as percentage of net revenue from crops:			
Cotton-wheat	7.2%	5.5%	4.9%
Rice-wheat	14.4%	11.4%	10.2%
Sugar cane	17.4%	16.6%	15.9%

According to the result given in Table 6, some of the tree species gave higher net returns per hectare than all of the major agricultural crops, even when using a 15% annual discount rate for costs and revenues. One of the major findings of the study is that returns from wood plantations are very sensitive of wood prices, yields and the discount rate.

Table 6: Comparison Figures for Selected Tree Species and Agricultural Crops.

	Rotation period (Years)	Annual net returns per hectare (Rs.) (15% discount rate)
Poplar sap.	12	7,454
Sumbal/semual (Salmalia malbarica)	15	6,976
Other trees	15	6,430
Sufaida (Eucalyptus sap.)	12	6,100
Kikar/babul (Acacia nilotica)	14	5,804
Shisham (Dalbergia sissoo	17	4,816
Wheat + Cotton		4,319
Wheat + Rice		761
Sugar Cane		462

Government Policies

Farmers and farmlands are therefore increasingly seen as the key resources on which to build a more sustainable system of forestry and wood production. The Forest Sector Master Plan, for instance, proposes that, "virtually all future increase in wood supply would be on private lands." Government forests and plantations alone cannot meet wood requirements. Much greater private sector involvement in the growing of trees is called for. Massive planting programs on private lands can significantly narrow, but not necessarily close, the gap between wood consumption and sustainable supply. This in turn would take pressure off natural forests, which could be managed as much for environmental as for productive functions.

Many foresters believe that farmers are failing to get the best returns from tree growing because they do not practice sound principles of tree management. In particular, it is alleged that they do not lop and prune trees, or thin block plantations, or delay harvesting sufficiently to attain good-sized stems and branches for the timber market. There is presently little incentive for most farmers to follow this advice because the way in which most wood is now sold strongly discourages classic forestry practices of growing mature trees for timber and encourages short rotations and the sale of young trees. This situation will change only when farmers are able to sell directly at higher prices to wood-based industries, felling and transporting the wood themselves.

Governments can normally achieve little if anything by trying to intervene in the working of privately-run fuelwood and timber markets. In Pakistan there is anyway little need to intervene. The system of wood trading and transport appears to be working effectively and with good economic efficiency. The large number of traders and the diversity of transport and trading channels ensures a high degree of competition. Most traders are making reasonable but not excessive incomes from their businesses. Government policy should be to maintain this private market system with the minimum of intervention.

Amongst other things, it shows that there is reasonably good agreement on tree stocks and productivities between the recent large-scale surveys of farmland trees by the HESS project and by the Forest Sector Master Plan project. Nevertheless, because both the of these surveys were snapshots for a single year they can say little about the changes which may be occurring over time in such crucial factors as planting and felling rates, the establishment of boundary trees versus block plantations, or farmers' attitudes to trees versus other agricultural activities. Trend information of this kind is vital to policy development and planning for this sector, which is in turn critical to the balance of wood supply and demand in the country. A major policy priority is therefore to:

- Establish regular surveys to collect key data on farmland tree planting, management, production and economics (costs, revenues and prices etc.) and farmer's attitude to trees. These surveys must be consistent so that periodic data can be compared.

- Improve information and advice to farmers on tree-growing and marketing.

- Institute a country-wide review of taxes on wood transport across division boundaries and permits and payments for wood harvesting, with a view to simplifying and standardizing them. The revised tax and permits system should be widely publicised, for example, at all transport check points. The present tax system is onerous and reduces incentives for tree growing and effective marketing. It is grossly inconsistent and poorly understood, increasing opportunities for abuse and damaging exploitation of wood producers and traders.

- A small but detailed study could usefully be made on the costs of wood transport to Balochistan and from NWFP to the large southern cities such as Karachi and Hyderabad. These costs are abnormally high and could be severely affected by further increases in diesel prices or other factors.

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2.3. Woodfuel Flows in the Dry Zone of Myanmar

by

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Fuelwood Situation in Myanmar

Foresters in Myanmar are generally trained and basically aligned with the conservation and management of forests for commercial purposes. Although foresters pay due attention to the basic needs of the rural as well as the urban community in matters of timber supply, consumption of firewood is generally regarded as being of minor importance.

As the population increased and agriculture expanded, the forest cover of the country decreased from 57% in 1958 to 47% in 1980. Although this situation is due to many factors, one of the major reasons is the use of biofuel in terms of firewood and charcoal, not only for domestic uses but also for industries such as lime burning, brick making and palm sugar production, etc. Heavy reliance on biofuel is reflected in the World Bank report of Myanmar for 1991 and may be presented as follows: (Table 1).

With 47% of its land area under forests, Myanmar can still be considered fortunate when compared to other Asian countries. (Table 2).

However, due to continued heavy reliance on wood as a source of energy, the woodfuel situation has become critical in several areas. Various surveys and studies on the energy situation in Myanmar have indicated that out of 14 states and divisions, two states and six divisions are now classified as fuel deficit areas (Figure 1).

Of those fuel deficit areas, Mandalay Division, located in the dry zone of central Myanmar, has been facing an acute scarcity of fuelwood for a long time. In order to meet the demand, fuelwood is transacted from the wetter fringe areas to the sparsely forested dry zone. This is the area of the case study on woodfuel flows which is presented here. The study highlights the source of fuel supply from the eastern fringe areas, and the trade mechanism involved in ensuring that the product ends up with the consumers of the central dry zone (Figure 2).

<u>User Groups</u>

Woodfuels are used extensively by both domestic and industrial sectors. However, there have been substantial changes in the past due to the shift in the availability of other fuels. Before 1970, when kerosene was available, both in urban and rural areas, the government through the Industrial Development Co-operation (IDC) introduced the kerosene stove which was widely accepted because of its efficiency, low cost and convenience in handling.

However, in the mid-seventies, kerosene became a scarce commodity and the kerosene stove had to be abandoned. Later, the government tried to introduce gas stoves but due to the supply problem, gas fuel could not be relied on for daily use. At present, both domestic and cottage industries depend largely on bio-energy, especially woodfuel in the form of firewood, charcoal, mill off-cuts, saw-dust, bamboo fuel and agricultural residues. In urban centers, where electricity is available, electric stoves are also used. But due to the erratic supply of electricity, this source can not be relied on. As such, consumers have switched back to woodfuels which in turn is leading to the exhaustion of the supply area.

Populations and households in the user area

The user area which consists of one of the most densely populated divisions in the country has a density of 320 persons per square mile which is about double the national average. The populations and households in 1991, covering 8 townships which account for the major consumption of wood and bamboo fuel derived from the eastern fringe resource area can be seen in table (3).

Although there are 67,037 and 308,474 urban and rural households, respectively in the user area, consumption is mainly focused in the two urban centers of the dry zone nearest to the supply area, i.e. Thazi and Meiktila.

In these two centers, 153,703 tons of fuelwood and 604,800 bundles of bamboo fuel were consumed by (58) cottage industries, (293) foods stalls and 21,570) households. This can be seen in table 4.

Supply Groups

The supply area in the fringe consists of 13 reserves called Local Supply Reserves with an area of 61,500 acres. Surrounding these areas, there are 6 main villages and 5 smaller villages from where labour for fuel gathering is drawn. These 11 villages are important in woodfuel transactions and considered as the main supply centers of the resource area. Most of the people in these villages who are engaged in fuel collection and trade are primarily farmers. For generations, they have been supplementing their income, particularly during the off-farm season, by extracting forest products. The population size and the number of households and the number of people engaged in woodfuel collection and trade from these villages can be seen in table 5.

Woodfuel Types

The supply area produces woodfuel in the form of firewood, charcoal, mill off-cuts, sawdust and bamboo-fuel which is mainly used by the evaporated milk cottage industries.

Woodfuel

In order to prevent forest degradation and soil erosion, the Forest Department introduced a selective system for fuelwood extraction. A list of fuelwood species has been drawn up in order of suitability. According to the annual prescribed quota, selective trees with fixed girth limit are allowed to be cut for extraction. In the area, 23 species have been listed as fuelwood species and can be seen in table 6. The species most attracted by consumers are *Than, Dahat, Kyungauknwe*, etc.

Besides fuelwood from the area, a considerable amount of supporting fuel is derived from the dry zone area, in the form of stems, twigs and uprooted stumps of mesquite trees. This species, *Prosopis juliflora* was introduced into the dry zone around 1950. Although regarded as a pest in the area, it is now increasingly used in evaporated milk production, caustic soda boiling, palm-sugar production and yarn dyeing.

Bamboo

Out of 75 species of bamboo found in Myanmar, the species most widely used in the area is *Hmyin* (*Dendrocalamus strictus*). The resource area provides the bamboo which is significantly used as a source of energy. It is particularly used, mainly in its dried form, for the production of evaporated milk. Evaporated milk producers prefer bamboo-fuel to other biomass fuels because fire can be started very fast and the amount of heat generated can be easily controlled. Besides, by using bamboo as fuel, the colour of the milk product remains whitish which results in a higher price for the finished product. With other biomass fuels, the colour is often brownish and this lowers the price of the product.

Hmyin is a common bamboo in upper and lower Myanmar, particularly in dry soil types. Under favourable conditions, the culms are 50' long, 3-4 inches in diameter. In dry localities, the size is much smaller and the culms are much more solid - hence, male bamboo. Where *Hmyin* is scarce, thick-walled bamboos are substituted such as *Thaik* and *Wanwe.*

Charcoal

Charcoal is seldom used for domestic cooking in rural areas but is an important source of energy for small-scale industries such as black-smithies. In urban areas, it is used for domestic cooking as well as in restaurants, tea-shops, noodles shops where instant cooking is essential. The species commonly used for charcoal making are *Than,Dahat* and *Sha.*

Mill off-cuts

Saw-mills in the resource area produce mill off-cuts which are taken to re-cutting mills in the user group area, particularly to Thazi and Meiktila. The mills process the off-cuts into smaller pieces and bundle them for sale as fuelwood. Users prefer this type and pay higher prices as fuel is dry, consists of assorted commercial timber, easy to use and has a higher heating value.

Sawdust

The same saw-mills produce sawdust which is increasingly used for institutional cooking but rarely for domestic purposes because of its inconsistent supply and the difficulty of controlling fire in stoves commonly used by the households.

Agricultural residues

Agricultural residues such as pigeon pea stalks, ziziphus husks, sesame stalks are obtained from agro-processing centers in the dry zone. Exceptions are rice-husks, paddy-stalks and coconut shells which are transported from the southern fringe areas. However, agri-residues have other competing uses such as fodder, organic fertilizers etc.

Resource Potential of the Supply Area

The resource area is under the management of the Forest Department, which is the principal agency responsible for regulation, control and development of woodfuel in Myanmar. Although the Department has long recognized the role of woodfuel as the principal source of energy for the country, not a great deal has been done towards managing the woodfuel resources on a sustainable basis.

Around 1960, attempts were made for the sustainable management of woodfuel through the application of coppicing with a standard system in the local supply reserves which constitute nearly 5% of the total forest area. It was designed to provide woodfuel and other forest products to nearby towns and villages. However, as the demand outstripped the supply, the attempts at sustainable management ceased. This situation has resulted in the resource areas, particularly in the plains, being over-exploited, and now the plain reserves are virtually denuded.

In 1983-84, the Forest Department carried out an inventory of 7 forest reserves which are designated as the fuel supply sources of the supply area. The inventory data indicates that woodfuel supply could be sustained for 16 years and bamboo-fuel for 6 years with the present rate of prescribed cuts. Inventory data for woodfuel and bamboo can be seen in tables 7 & 8.

Socio-economic Status

Woodfuel gathering and trade is normally considered as a secondary source of income, particularly during the off-farm season in the supply area. Traders and middle-men also come into existence to fill the gap between the gatherers and the end-users, most of them from the villages of the supply area. Although woodfuel gathering is secondary, the income generated is considerable compared to other categories of casual labour. However, the majority of people involved are not well-off mainly due to increase in the prices of basic commodities. Traders are better-off financially than the gatherers, but they also have to face the same situation of increasing prices in transportation due to the increase in the price of oil and other commodities used for transport. The socio-economic status of traders and gatherers can be seen in table 9.

Present Situation

- Due to heavy reliance on bioenergy, the resource area is considerably exhausted. This is mainly due to two factors:
  - Consumers have very little alternative but to depend on biofuel, mainly woodfuel.
  - Most of the people in the plains have no other job opportunities, and therefore rely on exploiting natural forests for their living. Some migrate and settle in the resource area and gather woodfuel which is easily available for ordinary workers.
- Due to over-exploitation, biofuel trade in the resource area is also not stable. This situation affects the socioeconomic status of all parties: gatherers, traders and consumers of cottage industries.
- The Government has initiated UN aided projects to prevent the degradation of the environment and at the same time to develop the living conditions of the people especially in the rural communities. The projects dealing with sustainable development for resource areas are:

– Community Multipurpose Fuelwood Woodlots Project in the Dry Zone

– Watershed Management for Three Critical Areas in Shan State

– Agricultural Development and Environmental Rehabilitation in the Dry Zone.

– Community Development of Ayeyarwady Mangroves in the Delta

– Human Development Initiative (HDI), an umbrella UNDP Project, covering 7 townships and 2 states (includes the Dry Zone, Shan State and Ayeyarwady).

All of these project activities are mainly centered on the formation of community forests, woodlots and greening of the dry zone. They also emphasise the dissemination of efficient cookstoves and alternative fuels other than woodfuel.

Although the Government is implementing projects which are relevant to conservation, during the transition period serious consideration should be given to government-subsidized interventions such as introducing gas, kerosene or electricity. Otherwise, degradation of the environment, which is closely linked to socio-economic deprivation of the rural community, can never be checked or stabilized.

Figure1: Map of Myanmar showing the provinces and the location of the study area.

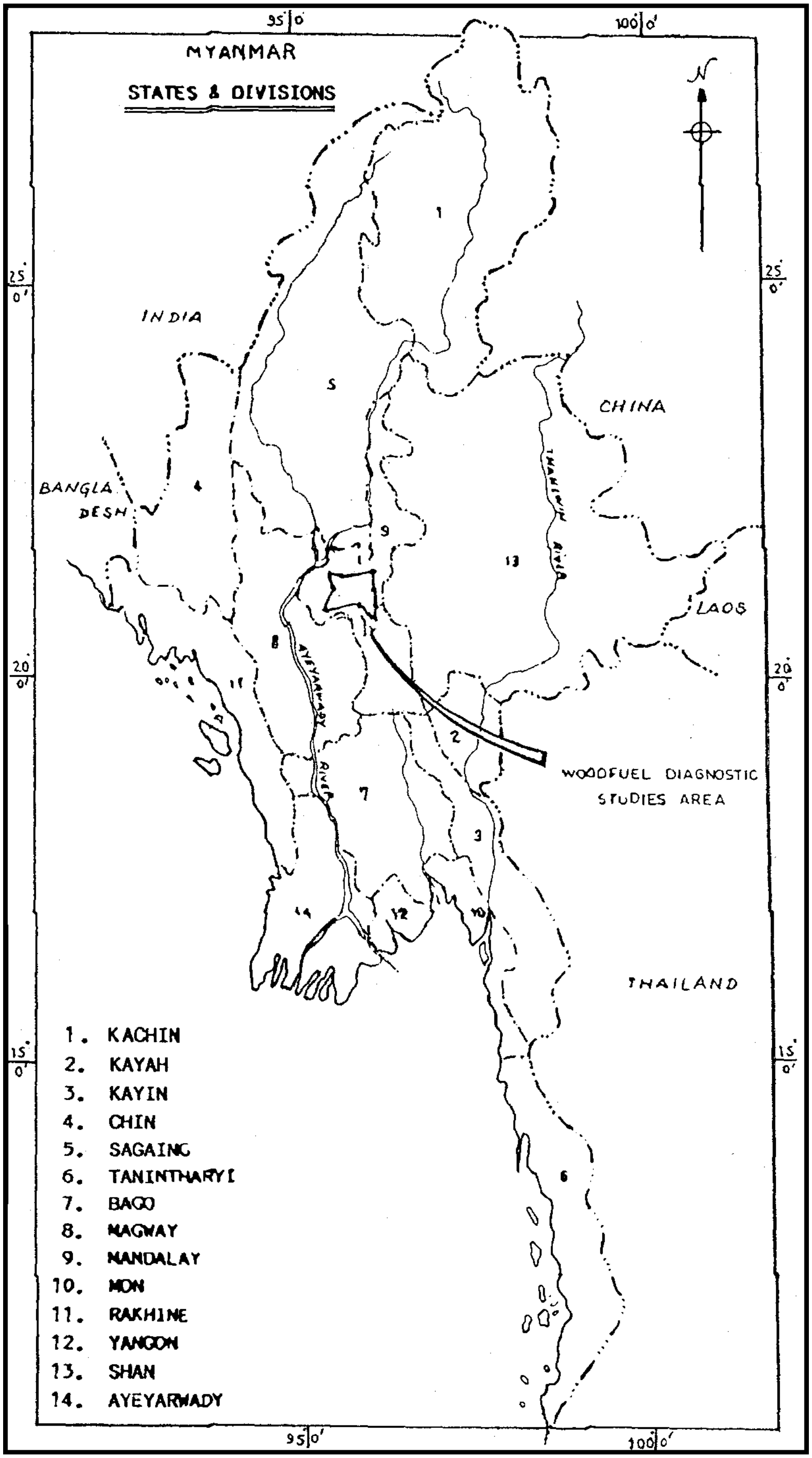
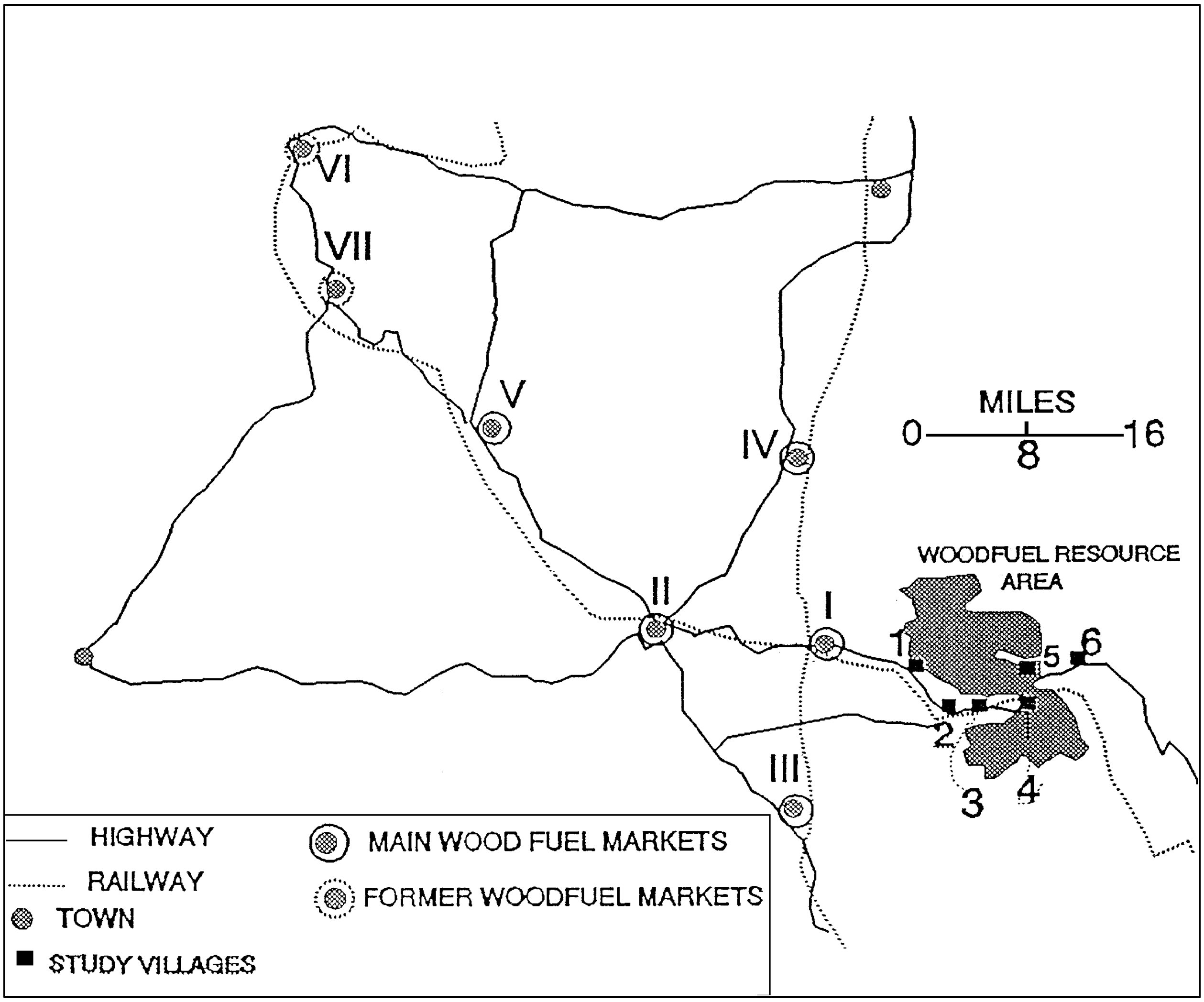


Figure 2: Woodfuel study area with main supply and market centres.



1.	Hlaingdet	I	Thazi
2.	Thahtaygon	II	Meiktila
3.	Kywetatson	III	Pyawbwe
4.	Yinmabin	IV	Wundwin
5.	Yebokson	V	Mahlaing
6.	Pyinyaung	VI	Myingyan
		VII	Taungtha

Table 1: Primary Energy Supplies in 1991.

Energy	Gross Supply [Thousand (TOE)]	Percent of Total
i. Fuelwood	943Type o7.60	76.70
ii. Biomass Residues	764.70	6.20
iii. Crude Oil	695.40	5.70
iv. Imported Diesel	43.70	0.40
v. Natural Gas	1012.50	8.20
vi. Coal	25.60	0.20
vii. Hydro Power	321.60	2.60
Total	12301.10	100.00

Table 2: Status of World Forest Cover.

I. Forest Cover of the Whole World	27%
ii. Forest Cover of the Continents:	
South America	50%
Asia	18%
iii. Forest Cover of Some Countries in Asia:	
Cambodia	71%
South Korea	66%
Japan & Malaysia	63%
Brunei	61%
Laos	58%
Myanmar	47%
Philippines	32%
India	19%
Nepal	16%
China	13%
Bangladesh	8%
Pakistan	3%

Table 3: Populations and Households in the Study Area.

	1983				1991 (projected)			
Name of Township	Population		Households		Population		Households	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
i. Thazi	18,440	129,210	3,570	23,771	22,015	154,263	4,262	28,380
ii. Meiktila	96,496	183,215	17,513	32,641	115,206	218,739	20,908	38,969
iii. Pyawbwe	23,857	182,532	4,355	32,342	28,482	217,924	5,199	38,612
iv. Wundwin	21,301	157,190	4,340	29,342	25,431	187,668	5,181	35,031
v. Mahlaing	14,717	134,965	2,824	26,196	17,570	161,134	3,371	31,275
vi. Taungtha	14,126	194,236	2,735	37,865	16,864	231,897	3,265	45,206
vii. Kyaukpadaung	28,718	206,594	5,311	40,686	34,286	246,651	6,340	48,574
viii. Myingyan	77,060	183,043	15,505	35,537	92,001	218,534	18,511	42,427
Total	294,715	1,370,985	56,153	258,380	351,855	1,636,810	67,037	308,474

Table 4: Estimated Woodfuel Consumption in Two Urban Centers in 1991.

Consumer	Meiktila		Thazi		Total	
	Woodfuel (ton)	Bamboo fuel (bundles)	Woodfuel (ton)	Bamboo fuel (bundles)	Woodfuel (ton)	Bamboo fuel (bundles)
i. Cottage industries	4,128	4,968,000	792	1,080,000	4,920	6,048,000
ii. Food stalls	8,148	-	1,590	-	9,738	-
iii. Households (urban) 20,908 x 6.1	127,538	-	-	-	127,538	-
4,262 x 2.7	-	-	11,507	-	11,507	-
Total	139,814	4,968,000	13,889	1,080,000	153,703	6,048,000

Table 5: Villages Engaged in Woodfuel Collection and Trade in the Study Area.

Village/ Sub-village	No. of households	Population size	No. of people regularly engaged in		
			Trade	Collection	Total
Hlaingdet	1,408	7,044	13	100	133
Thahtaygon	77	511	2	40	42
Kywetatson	197	1,063	3	110	11
Yinmabin	768	4,097	10	176	186
- Madan	90	572	n.a.	n.a.	n.a.
- Monpinson	150	976	n.a.	n.a.	n.a.
Yebokson	229	1,195	6	130	136
- Kubyin	21	79	n.a.	n.a.	n.a.
- Monpin	51	225	n.a.	n.a.	n.a.
- Oakkyin	59	322	n.a.	n.a.	n.a.
Pyinyaung	313	1,376	17	91	108
Total	3,363	17,460	51	647	698

Table 6: Selected Fuelwood Species in the Yinmabin and Pyinyaung Areas.

Fuel species		Average weight at 12% (m.c.)		
Local name	Botanical name	Kg/m^3	lbs/cft	Main use
Than	*Terminalia oliveri* Brandis	895	56	Fw/Ch
Dahat	*Tectona hamiltoniana* Wall	879	55	FW/Ch
Gyo	*Schleichera oleosa* (lour.)Merr.	1,087	68	
Kyun-gauk-nwe	*Vitex limonifolia* Wall	991	62	
Thanbe	*Stereospermum neuranthum* Kurz.	655	41	Fw
Bebya	*Crotoxylon neriifolium* Kurz.	863	54	Fw/Ch
Te	*Diospros burmanica* Kurz.	1,119	70	Fw/Ch
Pyaukseik	*Holoptelea integrifolia* Planch	639	40	Fw
Yinzat	*Dalbergia fusca*	-	-	Fw
Kuthan	*Hymendictyon excelsum* Wall	543	34	
Thitpalwe	*Balanites triflora* Van Tiegh	767	48	Fw
Zibyu	*Emblica officinlis* Gaertn.	831	52	Fw/Ch
Thitsanwin	*Dalbergia paniculata* Roxb.	639	40	Fw
Thitni	*Amoora rohituka* W. & A.	639	40	Fw
Nibase	*Morinda tinctoria* Roxb.	-	-	Fw
Kazaw	*Myrsine semiserrata* Wall.	815	51	Fw
Chinyok	*Garuga pinata*	639	40	Fw
Nabe	*Lannea grandis* Engler.	559	35	Fw
Taung-gwe	*Eriolobus indica* Schn.	415	26	Fw
Kathit	*Erythrina suberosa* Roxb.	320	20	Fw
Bonmeza	*Albizia chinensis* (osbeck.)Merr.	415	26	Fw
Didu	*Salmalia insignis* Schoot. & Endl.	495	31	Fw
Aukchinsa	*Diospros ehretioides* Wall.	703	44	Fw

Table 7: Growing Stock of Trees in the Study Area.

Girth (GBH) classes (in feet and inches)						
Group	2'-2' 11"	3' and over	Total	2' -2' 11"	3' and over	Total
Number of trees				Quantity in stacked tons		
0	91,675	89,316	180,991	22,716	49,210	71,926
1	450,613	545,448	996,061	81,852	245,973	327,825
2	419,041	440,513	859,554	89,028	192,678	281,706
3	114,140	186,432	300,572	22,135	77,006	99,141
4	32,354	84,106	116,460	6,360	55,409	71,769
5	34,150	33,814	67,964	6,768	17,107	23,875
6	318,375	403,188	784,563	69,620	194,654	264,274
Total	1,523,348	1,782,817	3,306,165	298,479	832,037	1,130,516

Table 8: Growing Stock of Bamboos in the Study Area.

Local name	Scientific name	Number of culms (,000)			
		1 year old	2 yearsr old	3 years old	Total
Hmyin	*Dendrocalamusstrictus*	2,130,02	1,926.70	774.55	4,831.27
Thaik	*Bambusa tulda*	271.09	329.19	338.87	939.15
Wa-myin	*Bambusa griffithiana*	38.73	67.77	96.82	203.32
Wanwe	*Dinochloa m'clellandi*	242.05	435.69	319.50	997.24
Thana-wa	*Thyrostachys oliveri*	1,365.15	1,278.01	1,394.20	4,037.36
Tin-wa	*Cephalostachyum pergracile*	19.36	38.73	38.73	96.82
Kyathaung	*Bambusa polymorpha*	3,301.53	4,163.22	4,579.54	
	Total	7,367.93	8,239.31	7,542.21	23,149.45

Table 9: Average Income and Expenditure of Woodfuel Traders and Gatherers.

Occupation	Income in Kyats/year			Expenditures Kyats/year	Surplus
	Woodfuels	Others	Total		
Illaingdet					
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)

Note: BF denotes bamboo fuel while FW denotes fuelwood

3. SESSION 2: ISSUES IN THE TRADING AND MARKETING OF WOODFUELS

3.1. Woodfuel Production for Urban Markets in Cebu: Issues and Challenges

by

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Introduction

The Role of Woodfuels in the World's Energy Requirements

Every civilization in nearly all societies has relied on the energy of fire for warmth, protection from predators, lighting after dark and cooking food. Today, especially in the developing economies, the world has not changed much. Woody and non-woody biomass fuels in the form of fuelwood, charcoal, crop wastes and animal dung, remain a dominant source of fuel. No one knows exactly how much of these fuels is being used but a conservative estimate of 35 percent of the total energy consumed in developing countries has been suggested. Likewise, woody and non-woody biomass fuels currently meet 14 percent of the world's energy requirements (Goodman 1987; Rosillo-Calle and Hall 1992).

In the Philippines, around 36 percent of all wood energy consumed is purchased in commercial markets (UNDP/ESMAP 1992). In Pakistan, the commercial woodfuel trade is a US $ 450 million a year industry, employing more than 100,000 people (Ouerghi 1993). And in India, commercial woodfuel markets are estimated to employ as many as 4 million people (Saxena 1993).

The Cebu Woodfuel Study

The objective of this paper is to briefly present the most significant findings of a recently-completed study entitled "Patterns of Commercial Woodfuel Supply, Distribution and Use in the City and Province of Cebu, Philippines", which looked into how wood energy is produced, traded and consumed in Cebu Province, and the economic and environmental impact of these activities. The research was undertaken jointly by experts from the University of New Hampshire in the US and the University of San Carlos, and was sponsored in large part by the Food and Agriculture Organization of the United Nations-Regional Wood Energy Development Programme and the Winrock International Forestry/Fuelwood Research and Development Project. The primary objectives of the study were to estimate the volume of woodfuel consumed in Cebu City annually, examine woodfuel production, how these fuels are transported into and sold within the city, estimate the importance of the woodfuel trade to local employment and income generation, and explore the ways in which commercial demand for woodfuels in urban Cebu affects the rural environment of the province.

The paper will point out that woodfuel continues to be a major source of energy in urban Cebu, that the trading network for these fuels provides income and employment to thousands of rural and urban Cebuano households, and that commercial demand for these fuels in urban regions of the province may actually be stimulating rural farmers to plant and manage more trees on their own lands, and may, therefore, be helping to provide the conditions necessary to achieve greater reforestation success on the island.

This conclusion is based on the results of an examination of three aspects of the commercial woodfuel trade in Cebu: (1) the residential and business sector demand for woodfuels in urban Cebu; (2) the trading network which moves woodfuels from rural producers to urban consumers and (3) the woodfuel production and management practices of Cebuano farmers and landowners. This paper deals more with the second and third aspects of the research. For a more comprehensive discussion on urban woodfuel consumption patterns in Cebu, see Bensel and Remedio, 1993, 1995.

Before presenting the details of the results of the study, it is best to review the link between woodfuel use, environmental destruction and woodfuel scarcity which are the main issues of this paper. The case outlined here will show that there are many reasons for scarcity. Furthermore, these reasons often interact in different combinations in different regions and thus a "site-specific" understanding of the problem is required.

Woodfuel Use and Woodfuel Scarcity: Is There a Connection?

In developing countries, the widespread use of woodfuel is often cited as the major cause of tropical deforestation (Hertzmark 1987; Hume 1988; Park 1992; Rowe et al. 1992). Because of this deforestation, over one billion people in these developing regions are said to be living in "woodfuel deficit areas", with 100 million residing in areas of "acute woodfuel scarcity" (De Montalembert and Clement 1983). Policy and program interventions in many developing countries have been established because of this seeming association between woodfuel use and woodfuel scarcity (Baldwin et al. 1985; Pitt 1985; Munslow et al. 1988; Dewees 1989; Soussan et al. 1990, 1992).

Supply-side programs encouraged the establishment of woodfuel plantations, increased planting and management of trees by farmers in woodfuel deficit areas. Demand-side interventions moved toward the promotion and dissemination of improved wood stoves and accelerating inter-fuel substitution away from woodfuels.

With some exceptions, the contemporary literature shows that many of these projects have failed to achieve their objectives (Foley 1987; Gill 1987; Leach and Mearns 1988; Dewees 1989; Cline-Cole et al 1990a). Their failures have been attributed to the following reasons: (1) they were based on an erroneous association between woodfuel use and deforestation (2) they exaggerated the degree of woodfuel shortages, and (3) they failed to recognize that adaptions to impending woodfuel shortages may have already begun in effective but not so obvious ways.

For instance, according to Foley (1987), official concern over impending woodfuel shortages in the Sahelian region may be exaggerated since the importance of agricultural fallow areas and trees grown on farms have not been considered in estimating regional woodfuel demand. Likewise, in a number of places in Africa, woodfuel producers and consumers have implemented various schemes to adapt to a woodfuel crisis situation such as fuel-switching, changes in cooking patterns and more intensive tree-planting and management of farmlands (Dewees 1989; Cline-Cole et al

1990a). A World Bank-funded program designed to increase woodfuel supplies by encouraging small holder tree-farming in two northern Philippine provinces generated little interest on the side of the farmers since they were already producing large quantities of fuelwood from intensively-managed shrub fallows which had been overlooked by project planners (Wiersum and Veer 1983). Also, Saxena (1993a) comments that in India, official estimates of woodfuel supply potential fail to account for large areas of public lands covered in *Prosopis* shrubs, even though such places produce abundant quantities of fuelwood. These examples are not meant to suggest that there is no longer a woodfuel problem in developing countries, or that woodfuel extraction is never a cause of deforestation. Rather, these examples are presented to show that projected woodfuel shortages sometimes do not materialize because important factors such as woodfuel production management practices and consumption patterns are far more complex and adaptive than is often recognized.

A common assumption is that urban woodfuel demand results in intense woodland destruction and woodfuel shortages in surrounding areas However, empirical data to show the connection is scarce (Bowonder et al. 1987; Sagawe 1991; Soussan et.al. 1991; Boberg 1991). Interestingly, there is growing evidence to suggest that tree planting and other forms of intensive biomass management may actually increase if the rural regions have a close link to urban economies with well-established land tenure systems (Arnold 1992). Often times this situation is brought about by increasing population which entails changes in the intensity of farm management, changes in local labor markets due to the presence of off-farm urban employment opportunities, and changes in land use and cropping patterns due to the presence of commercial markets for woodfuel and other wood products.

Godoy (1992) cites cases in Kenya and Indonesia where farmers devoted most of all of their lands to tree-farming in order to free themselves to pursue off-farm wage labor in nearby urban areas. In Kakamega District, Kenya, Bradley et. al (1985, 1988) found that areas with the highest population densities support the greatest amounts of on-farm woody biomass due to an increase in the intensity of farm management. Olofson (1985) reports that farmers in Rizal Province, Philippines, often devote large portions of their lands to trees and shrubs when faced with labor shortages within the family, while Saxena (1992 a,b, 1993 b) found that in the state of Uttar Pradesh and other agricultural regions of India, commercial tree farming is an attractive option for "off-site" (urban-based) farmers and landowners because it is easier from a management point of view. Finally, Gregersen et. al.(1989) and Smiet (1990) cite commercial markets for woodfuel and other wood products as an important reason for increased tree-planting among upland farmers in various parts of Java, Indonesia.

The cases cited above raise a number of important issues to be considered in assessing woodfuel production and or in designing woodfuel policies in a certain area. One issue, in most developing countries, is that the bulk of woodfuel comes from trees and shrubs grown on farms and managed fallow systems, not from forests (Leach and Mearns 1988; Smiet 1990; Soussan 1991; Mercer and Soussan 1992; Ouerghi 1993; Koompans 1993). Second, tree-planting and farm management decisions are influenced by factors far more complex than are conveyed by the notion of a general woodfuel shortage (Hosier 1989; Barbier 1990; Godoy 1992). Lastly, the intensity of tree-farm management and types of trees planted are influenced by the existing land tenure system, labor markets, wood product markets and government regulations regarding cutting and transporting of trees and shrubs on private lands. Stated differently, Goodman (1987) observed that in developing regions, decreasing woodfuel availability is caused by various factors such as culture, demography, ecology, socio-politics, land-use and economic processes and systems.

Over-cutting of trees in Cebu for local woodfuel use and sale in urban markets is commonly assumed to be one major cause of deforestation on the Island (Zafra n.d., Seidenschwarz 1988; Alino 1989; DENR 1991; Garcia et. al. 1994). Cebu is also widely cited as a "fuelwood deficit zone" by an FAO report (De Montalembert and Clement 1983), and a more recent government study classifies Cebu as one of the nine provinces nationwide experiencing "very heavy stress" in terms of biomass fuel supplies.

Our research findings led us to a contrary assessment. Our conclusion is that the overall biomass supply-demand picture in Cebu is favorable, and that supplies will remain adequate if current woodfuel-producing land use practices do not undergo significant change in the future.

The Study Site

Cebu is situated in the Central Visayas region of the Philippines, 550 kilometers southeast of Manila, the capital city. The island is a narrow strip of land, stretching 220 kilometers on a north-south trend, and only 40 kilometers in breadth at its widest point. The coastal plain is narrow while the dominant topography is that of a steep terrain and a central mountain range which reaches 1,000 meters and runs almost the entire length of the island. Almost three-fourths of the land area is over 18 percent in slope, and half is greater than 30 percent in slope. Soils are primarily of limestone origin. Total annual rainfall is 1,638 mm (64.5 inches). There is no pronounced dry or wet season (PPDS 1987).

The Cebu City metropolitan area is the commercial and industrial center of the southern Philippines. Key industries include coconut oil, carrageenan, rattan furniture manufacture, handicrafts, watches, semi-conductors, toys, clothing and dried fruits processing (RDC, 1993). Job prospects in industry, retail establishments and in the booming construction industry of Metro Cebu have drawn increasing numbers of migrants from rural areas of the province as well as from surrounding islands. Between 1980 and 1990, the population of Metro Cebu grew at an average rate of 3.1 percent per annum, while the rural population grew only 1.9 percent a year over the same period (NSO 1992).

Marginal farming and near-subsistence fishing characterize a large part the rural economy of Cebu, although cash-cropping and small rural industries are locally important in some areas. Corn is the staple crop among rural Cebuanos, which is often grown together with coconuts, root crops, or in recently cleared shrub fallows. Even in very steep areas, corn can be found, often with little effort to minimize soil erosion. These agricultural practices over time have subjected many interior portions of the island to heavy soil erosion (Vandermeer 1963). The Department of Agriculture estimates that nearly 60 percent of the island's land area is suffering from moderate to severe soil erosion (DA 1985). Coconuts are the second most widely cultivated crop on the island, with some 29 percent of the total land area under coconut or a crop/coconut mix (World Bank 1989). Less than one-half of one percent of the island is covered in primary forests, with this area consisting mainly of vestigial patches of open dipterocarp communities (World Bank 1989).

Most woodfuel production takes place in some 15 percent of Cebu's land area which is categorized as having a "mixed extensive" land use. These mixed extensive lands cover about 73,000 hectares consisting largely of secondary/shrub forest, cultivated area mixed with brushland, tree fallows, woodlots, and some agroforested lands (World Bank 1989). This ecosystem is very important in sustaining Cebu’s upland environment, as well as in producing significant quantities of woodfuels. If this magnitude and importance is not recognized, then it would be easy to perceive Cebu as an ecological disaster and categorize it as a woodfuel deficit area. As a matter of fact, present land use patterns and the extent of forest destruction in Cebu are not a new phenomena.

As early as 1870, historical evidence shows that 90 percent to 95 percent of Cebu's primary forests were already cleared for cultivation of corn and other crops(Vandermeer 1963; Roth 1983; Poffenberger 1990). Since 1870, most of Cebu's population has relied continually on wood as a household cooking fuel, and there is evidence as well of a thriving commercial trade in woodfuels in urban areas of the province since at least the 1920's (Pendleton 1935; Spencer 1952;Bensel and Remedio 1993).

Woodfuel Producing Lands

Exploratory surveys were conducted in eight different regions of Cebu between May and November 1992. Sites chosen for study varied in terms of distance from the city, elevation, land use, ownership patterns and woodfuel production and management practices (Remedio 1993). During the conduct of each survey, guide questions were used to direct open-ended interviews with local government officials, rural woodfuel trades, landowners, wood-cutters, charcoal-makers and other local residents.

The interviews were done in order to gain a qualitative sense of how local people currently manage woodfuel resources, how these resources were managed in the past, what types of land use patterns and cropping systems are common in the area, who is involved in local woodfuel production and trade, why they participate and what, if any, are the impacts of government regulation of the woodfuel trade has on decisions to grow trees for sale in urban markets.

Aside from the interviews, supplemental data was obtained from the Department of Environment and Natural Resources (DENR) on woodfuel transport permits which provided information on the origin, destination, volume and species composition of each woodfuel shipment for a one year period.

A well established commercial woodfuel trading system has existed in Cebu City since at least 1920. Much of the early trade centered around the harvesting of naturally growing shrub and secondary forest species in mountainous regions just west of the city, although intentional propagation of trees and shrubs for woodfuel production and other purposes was also practiced. MacDicken (1990) reports that Cebuano farmers developed a rotational agroforestry system of *Leucaena*, corn and tobacco as early as 1900, with *Leucaena* intentionally planted and maintained as a fallow crop, soil stabilizer, and source of green manure. Writing in 1935, Pendleton reported "plots and groves" of *Leucaena* and other planted species in the hilly lands of Cebu City, as well as intensive cutting of a variety of trees for sale as fuelwood and timber. Bensel reports interviewing charcoal makers whose families have been using the same charcoal kiln, fed by the same tree fallow area of *Leucaena glauca* and *Gliricidia sepium* for over sixty years (Bensel 1993).

Today, intentionally planted tree and shrub species account for the largest portion of commercially-traded fuelwood and charcoal in the province. Based on our observations, surveys of over 100 rural and urban woodfuel traders, and a review of all woodfuel transport permits issued by DENR in Cebu over a 12-month period in 1991-92, the current species composition of commercially-traded woodfuels in Cebu was determined. Four varieties of fast-growing tree and shrub species account for 58 percent of the primary fuelwood (excluding coconut fronds and other non-woody biomass) and 71 percent of the charcoal sold in the province (Table 1).

These trees and shrubs are popular in upland areas of the province because they are easy to establish, easy to harvest and split, they coppice extremely well, fix nitrogen with the exception of *Cassia siamea*, provide high quality green manure and/or fodder for cattle and other ruminants, are tolerant of long dry spells and are generally well-suited to the topographic, soil and climatic conditions found throughout Cebu (NAS 1980; Davidson 1987). Fruit-bearing tree species account for 23 percent of the fuelwood and 14 percent of the charcoal traded (Table 1). Naturally-growing secondary forest/shrub land species still account for 16 percent of the fuelwood and 12 percent of the charcoal traded (Table 1) despite the fact that there are stricter regulations on the cutting of these trees. Lops and tops from high-value species grown in commercial reforestation and tree plantation sites also make their way into commercial woodfuel markets, meeting around 3 percent of fuelwood needs and 2.4 percent of charcoal demand (Table 1).

Seven broad types of woodfuel-producing land use and tree management systems practiced in Cebu were identified over the course of our field work (Table 2).

Table 1: Wood species and production of fuelwood and charcoal.

Category	Common Name	Scientific Name	Percent of Total	
			Fuelwood	Charcoal
Fast-growing Trees and shrubs	Giant ipil-ipil	*Leucaena leucocephala*	32.6	29.3
	Madre de cacao	*Gliricidia sepium*	17.1	27.9
	Native ipil-ipil	*Leucaena glauca*	7.0	12.0
	Yellow cassia	*Cassia siamea*	1.3	1.7
Fruit-bearing trees	Mango	*Mangifera indica*	7.4	5.1
	Caimito	*Chrysophyullum cainito*	4.7	4.1
	Lomboy/Java Plum	*Eugenia cumini*	2.2	0.3
	Nangka/jackfruit	*Artocarpus integra'*	2.2	1.5
	Sambag/Tamarind	*Tamarindus indica*	1.9	1.0
	Santol	*Sandoricum koetjape*	0.8	0.4
	Avocado	*Persea americana*	0.6	0.9
	Other species	--	3.2	1.1
Secondary forest and shrub-Land species	Anan/Balinghasai	*Buchanania arborescens*	4.1	-
	Bayabas/Native guava	*Psidium guajava*	2.2	0.9
	Tugas/Molave	*Vitex parviflora*	-	6.3
	Kamanchilis/Manila tamarind	*Pithecellobium dulce*	1.7	0.3
	Bagalnga	*Melia dubia*	0.9	-
	Malatamban	*Cyclostemon Bordenii*	0.8	0.4
	Dita	*Alstonia scholaris*	0.5	-
	Agoho	*Casuarina rumphiana*	0.3	-
	Cha	*Ehretia microphylla*	--	0.5
	Other Species	--	5.6	3.3
High-value species	Mahogany	*Swietenia mahogoni*	2.0	1.9
	Gmelina/Yemane	*Gmelina arbora*	1.0	0.9
Total %	-	-	100.0	100.0

Table 2: Woodfuel-producing land use and tree management system.

Land Use System	Usual Location	Sizes Encountered	Method of Establishment	Common Ownership/Management Practices	Common Species	End Uses
Tree and shrub fallows	Steep hillsides, abandoned plots	2-12 hectares	Spontaneous regrowth, cuttings, seeds	Absentee landlords/ extensively managed by tenants, wood-cutters	*Gliricidia sepium, Leucaena glauca*	charcoal, fuelwood
Smallholder woodlots	Near homes, along roads	<1-2 hectares	Intentionally established from cuttings, seeds or seedlings	Smallholder-owned/ extensive management for fuelwood, intensive for higher-value species	*Leucaenia leucocephala, Acacia auriculi-formis, Gmelina arborea*	Charcoal, fuelwood, mine props
Agroforestry systems	Agricultural areas	Non-contiguous	Intentionally established	Smallholders/intensive management	*Leucaena leucocephala, gliricida sepium,* fruit-bearing species	fuelwood, charcoal, fodder, green manure, shade, live fencing, soil conservation and enhancement
Isolated/ scattered trees	Around homes, along roads	Non-contiguous	Intentionally established	Smallholders, other landowners/ intensive management for some fruit species (mango), extensive management for shade, decorative, other trees	Mango, Jackfruit, Tamarind, Avocado, Caimito	fruit, shade, charcoal and fuel wood from fallen branches and storm-damaged trees
Commercial tree plantations/ reforestation Sites	On better quality lands near roads and water	5-20 hectares	Intentionally established	Larger contract reforestation projects, private companies/intensively managed by tenants or paid laborers	*Leucaena leucocephala, Gmelina arborea, Swietenia mahogoni, Acacia auriculi-formis*	timber, high value wood products, mine props, fuelwood and charcoal from lops and tops
Shrub/ secondary forest areas	Isolated, remote areas, distant from urban center	<1 - 15 hectares	Naturally growing	Absentee owners, public lands, common lands/extensively managed	*Buchanania arborescens, vitex parviflora, Pithecellobium dulce, Psidium guajava*	fuelwood, charcoal, lumber, woodcrafting, tool handles, fruits, medicine
Coconut plantations	Coastal plains, better quality interior lands	3-40 hectares	Intentionally established	Larger landowners/ managed on a share-crop basis with tenants or hired laborers	*Cocos nucifera*	copra, fuelwood and charcoal from fronds , husks, shells and inflorescence

a. Tree/shrub fallows

Tree and shrub fallows are widespread in many mountainous areas of central Cebu. They often cover very steep slopes which have gone in and out of corn cultivation over time. Some fallows were intentionally established, others have come about through spontaneous regrowth and expansion of adjacent fallows in the wake of agricultural abandonment. Tree/shrub fallows are usually under the ownership of absentee landlords or claimants, and managed by tenant farmers or local woodcutters who contract with the landowner for harvest rights. Off-site landlords are often motivated to keep their lands fallowed so they won't be affected by land reform laws covering areas planted to corn and rice. These lands are also often too steep, too far from water, and too distant from existing road networks to be used for cultivation of vegetables, cut flowers or other high-value marketable products, or to be supervised effectively by urban-based landlords. Instead, many landowners appear satisfied with the returns from woodfuel production since this provides them with enough income to pay land taxes and since they often hold fallow lands primarily for speculative purposes.

b. Smallholder woodlots

In many parts of Cebu, smallholder farmers have established "backyard" woodlots ranging in size from 100 square meters up to two hectares in area. Woodlots are generally established in marginal areas, or in fields not well-suited for agricultural production, but there are instances where trees are planted on most or all available land. The latter practice is often a consequence of the availability of off-farm employment opportunities in factories, retail stores and construction sites in Metro Cebu, with tree-farming offering a non-labor intensive and flexible source of supplemental or emergency income. Woodlots established to produce fuelwood and charcoal require little attention, compared to trees planted for higher-value end uses, such as underground mine props and log bolts, while fruits and lumber require more periodic pruning and maintenance.

c. Agroforestry systems

Common agroforestry approaches include the planting of *Leucaena leucocephala* in strips along field contours, a sequential inter-cropping of coppiced *Gliricidia sepium* and corn, the planting and management of *Leucaena, Gliricidia* and other species as boundary markers and live fencing, and a rotational fallowing of *Leucaena leucocephala* or *Leucaena glauca* with corn (and in some cases tobacco) similar to that reported in MacDicken (1990). Unlike pure stands of woodfuel-producing trees and shrubs grown in fallow areas or woodlots, trees incorporated into agroforestry systems are intended to provide multiple benefits - such as soil conservation, soil enhancement, fodder, fruit, building material - and are therefore managed on a more intensive basis.

d. Isolated/scattered trees

Substantial quantities of woodfuels are produced in Cebu from trees found singly or in clusters throughout coastal and upland areas of the province. Many of these trees are fruit-bearing, and were planted mainly with that end in mind. Others were planted for shade or for decorative purposes. Rarely are such trees felled solely for woodfuel purposes. Instead, fallen branches and trees uprooted in storms provide supplies of good quality fuelwood or are mixed with other species in charcoal kilns.

e. Commercial tree plantations/reforestation sites

Location, size and intensity of management distinguish plantation from smallholder woodlots. Plantations are usually established on better quality lands with access to water, and tend to be larger in size, generally ranging from five to over twenty hectares in area. Private plantations of *Leucaena leucocephala* and *Acacia auriculiformis* of from five to ten hectares in size produce mainly woodfuel and underground mine props on a short rotation (2-5 years) basis, while larger corporate plantations set up under government sponsored contract reforestation or industrial tree-planting programs produce higher value wood products from species like *Gmelina* and mahogany on a longer rotation of 8 to 15 years. Rural and urban woodfuel traders reported an increasing volume of charcoal and bulk fuelwood logs coming from the lops and tops of these operations.

f. Shrub/secondary forest areas

A portion of commercially-traded woodfuel in Cebu still originates from the remaining forested areas despite strict government regulations on the harvest and transport of "naturally-growing" species. One factor responsible for continued woodfuel harvest from secondary forest areas is the strong preference among many consumers for fuelwood and charcoal produced from forest species. Charcoal produced from *Vitex parviflora* (molave) is generally sold in urban markets at a price of 20 to 30 percent higher than that of regular charcoal. Taste preferences, combined with the popularity of molave and other secondary forestry hardwood species for rural home construction, woodcrafting and other end-uses, has resulted in widespread over-cutting of these trees in many parts of the island (Bensel and Remedio 1993).

g. Coconut plantations and crop/coconut farming systems

Nearly one-third of Cebu's land area is devoted to coconut plantations or crop/coconut mix, with the largest number of palms found in relatively flat areas within a few kilometers of the coast. Harvesting of coconuts in larger plantations is usually accomplished by hired laborers working on a share-crop basis. The by-products of coconut production (including fronds, husks and shells) are widely utilized as fuels throughout the province, and are often demanded by laborers harvesting coconuts as part of the sharing arrangement reached with the owner of the palms.

Except for the over-cutting of some hardwood species like molave in the remaining secondary forest areas, the bulk of woodfuel production in Cebu is occurring on a sustainable basis. Trees and shrubs harvested for woodfuel in fallow areas, woodlots, plantations and agroforestry systems are coppiced on a regular rotation and left to regenerate from the stump. Typical coppice rotations for species like *Leucaena* and *Gliricidia,* which make up 60-70 percent of the fuelwood and charcoal traded commercially, are around two years. In some cases, trees and shrubs in fallows or woodlots will be uprooted in order to facilitate a return to regular cultivation of food crops. However, it is more common to allow these areas to regenerate, or for one or two crops of corn to be planted around coppiced stumps. Woodfuel management and harvest practices are particularly well-suited to the economic and environmental constraints faced by many Cebuano farmers. The most widely grown species do well on the thin limestone soils and steep slopes of the island, and serve as a more benign form of land cover than the most widespread alternative, corn mono-cropping. Woodfuel production practices require relatively little in the way of labor and capital - important factors given the presence of off-farm employment opportunities and lack of smallholder financial resources.

Despite the apparent economic and environmental advantages of woodfuel management and production practices in rural Cebu, government officials in the province continue to view the cutting of trees for fuelwood and charcoal as a major source of local environmental degradation. This view is manifested most clearly in government restrictions on woodfuel harvest and transport. Recently, Cebu City government officials went as far as calling for a ban on the sale of charcoal in the city in order to halt deforestation. While Cebu is certainly suffering from a host of serious environmental problems, it is difficult to see how current woodfuel production and management practices contribute in any significant way to, or are the primary cause of such problems.

Commercial Woodfuel Markets

Most of the commercial woodfuel markets in developing countries operate largely outside the purview of state management or control as an informal sector economic activity. This informal status, combined with what Soussan (1991) has labeled the "contrived illegality" that often surrounds woodfuel marketing activities, tends to result in negative perceptions of the woodfuel trade among government officials, planners and aid workers (FAO 1991). There is a perception that unscrupulous traders monopolize and exploit rural woodfuel producers and urban consumers. Contrary to these beliefs, case studies of commercial woodfuel marketing systems in a number of developing countries including India (Alam et.al. 1985), Tanzania (Boberg 1991), Nigeria (Cline-Cole et. al. 1990b), Haiti (Stevenson 1989), and the Philippines (Soussan 1991) have generally found that the woodfuel trade is a well-organized, highly efficient and competitive industry. Rural and urban woodfuel traders are often found to play a critical and irreplaceable role in the functioning of the market, investing substantial quantities of financial and human capital into the purchase and transport of a commodity subject to seizure by forestry authorities, theft and other hazards (Leach and Mearns 1988; Godoy 1992).

In Cebu, the commercial woodfuel trade suffers from the same reputation, with many local government and NGO officials suggesting that the trade should be more tightly regulated, and that rural and urban traders should be replaced with either a government-run marketing system or a network of producer/consumer cooperatives. In order to explore the veracity of this argument, we investigated price and cost data related to all aspects of the woodfuel trade in rural as well as urban areas of Cebu. Overall, more than 100 rural and urban traders were interviewed, as were wood-cutters, charcoal-makers, truck drivers and other actors involved in the trade.

Cutting of trees and shrubs for woodfuel in Cebu is managed by a well-established system of harvest and use rights. Smallholders growing trees in woodlots or in agroforestry systems will typically do their own harvesting. In tree plantations and larger tree/shrub fallow areas, harvesting is usually accomplished either by tenants or local wood-cutters working on a sharing contract or daily wage basis. The most common sharing arrangement is for the tenant/woodcutter to receive two-thirds of the farmgate value and the landowner one-third. In a contract arrangement, a landowner is paid a fixed sum of money in exchange for the privilege of cutting all trees on a given piece of land. Contract arrangements are often facilitated by rural traders who have the financial capital to approach landowners with an advance cash payment.

Depending on conditions at point of harvest, trees are either sized, split and bundled immediately, converted to charcoal on site, or carried to another location for sizing and splitting or for charcoal-making. The fuelwood and charcoal is then carried to a trader's home or left at roadside drop-off points. Traders generally assume responsibility for securing the necessary permits for a delivery of woodfuels from the DENR, and for making arrangements for transport. In order to ensure an adequate supply of fuelwood or charcoal to fill a conveyance, traders usually have to provide cash or in-kind advances to wood cutters and charcoal-makers, often as far as three months in advance of actual delivery. Some traders have their own vehicle(s), but most depend upon hired transport. Because DENR can seize both the cargo and conveyance in cases where permits are not in order, vehicle owners usually insist that traders secure the necessary permits.

Rural traders typically deliver woodfuels to urban wholesalers and retailers on a consignment basis, with payment to be made at the time of the next delivery. However, urban buyers are frequently delinquent in their payments. This combined with the prevalence of rural traders providing cash advances to woodcutters suggests that these traders often have substantial amounts of financial capital "tied-up" in the trade at any given point in time. Many rural woodfuel traders are considered wealthy individuals in their own villages, which partly helps to explain the perception that traders earn excessive profits. Instead, it's more likely to be the case that a trader entered the business because they were already "wealthy" and therefore had the financial capital necessary to operate. Some traders expressed a social obligation to people in their area who rely on them as an outlet for woodfuels and other wood products, as well as for cash or in-kind advances. Interviews with woodcutters and charcoal makers often confirmed this claim, with many pointing to the additional advantage of not having to hassle with permits, transportation and urban buyers, even if they could earn larger gross margins by marketing woodfuels themselves.

Price data were collected at every step in the marketing process for six different cases of woodfuel trading encountered during the course of the field work. Four of these cases involve fuelwood, two charcoal. Each case is different in terms of whether the fuelwood or charcoal was produced by smallholders or hired labor, the number of traders and other intermediaries involved in the delivery, and whether the woodfuel was finally marketed by urban wholesalers and retailers or delivered directly to commercial establishments.

Fuelwood-cutters and charcoal makers typically earn from 30 to 50 percent of the final selling price if they work on a sharing basis, 40 to 60 percent if they are cutting trees from their own lands, and much less if hired on a daily wage basis. Landowners typically earn close to 20 percent of the final selling price. Owners of transport earn from 7 to 35 percent of the final selling price depending on distance to the city, road conditions, and the type of fuel being conveyed. Rural traders rarely earn more than 25 percent of the final selling price, usually only around 10 percent. Urban traders typically earned another 10 - 20 percent of the final selling price. These figures suggest that there is little substance to claims of traders earning excessive profits. In fact, given the risks involved in the trade and the opportunity cost of the financial capital tied-up in the business, traders operate on extremely tight margins.

While the commercial woodfuel trade in Cebu is largely an informal sector economic activity, it is not inefficient or uncompetitive in its operations. Existing arrangements between woodcutters and charcoal makers, landowners, rural traders, vehicle owners, urban traders and consumers represent the product of decades of market development, intelligence and competition. The contribution of woodfuel harvest and sale to the local economy should also be considered. Based on our estimates of the magnitude of commercial woodfuel demand in the province, the wood energy trade in Cebu is worth approximately US $ 10.1 million a year (Bensel and Remedio 1993). Given average production levels per woodcutter or charcoal maker (Remedio 1991), it is estimated that around 35,000 rural households (15 percent of the population) derive some cash income from the sale of fuelwood and charcoal. Another 5,000 earn income as rural and urban traders, transporters and helpers in the trade. After accounting for the share of the trade accruing to traders, transporters and landowners, the fuelwood cutters and charcoal makers still receive around US$ 4.8 million a year, with the average family earning between US $ 120-160/year.

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3.2. Marketing of Woodfuels in Peshawar City, Pakistan

by

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Introduction

In most Asian countries, the rural population mainly depends upon non-commercial fuels to meet its domestic energy needs. They do not purchase any fuel from the market as fuelwood is a non-tradable commodity in rural areas. The land owners obtain fuelwood supplies from their farmlands and other people collect it as a free good from the wastelands and public forests. But the situation in urban areas is altogether different. Here people purchase many types of fuels from the market to meet their domestic energy needs. Commercial fuels such as natural gas, kerosene oil and liquefied petroleum gas (LPG) are the most popular. Those who use fuelwood and charcoal also purchase it from the market. Thus, in a strict commercial sense a market for woodfuels exists only in urban areas. Each urban center has a number of firewood sales depots which sell fuelwood to the consumers. In some cases the firewood sales depots also sell charcoal.

A number of people are employed in the marketing of woodfuels as wholesalers, retailers and ordinary workers. Although the marketing of woodfuels in urban areas is an activity of sizable proportion, very little information about it is available. Perhaps this is attributable to the fact that woodfuels fall into the informal sector of the economy. Because of numerous difficulties in collection of data from the informal sector, the statistical organizations usually ignore it. However, the data on woodfuel markets has assumed added importance in recent years in the wake of the implementation of large scale social forestry programmes. As a result of these programmes, fuelwood production has increased substantially in rural areas. Some areas have even produced surpluses of fuelwood. Future planning of these programmes must take into account changes in the urban fuelwood markets. Price and consumption trends for fuelwood and charcoal in urban markets have crucial implications for fuelwood production programmes. A declining consumption trend does not augur well for these programmes. The success of these programmes depends to a large extent on the retention and expansion of the urban woodfuel markets. Taking cognizance of the importance of information on woodfuel markets, the Regional Wood Energy Development Programme for Asia Pacific Region of FAO, initiated a series of micro-level studies in major urban centers of the Asia Pacific Region. As a part of the series, a study on the marketing of woodfuels in Peshawar city of Pakistan was undertaken. This study focuses on the total size of the fuel market, fuel consumption pattern, market demand for woodfuels, marketing channels, infrastructure and the operating environment of woodfuel marketing.

National Energy Situation of Pakistan

The main characteristic features of the national energy situation in Pakistan are:

- Low per capita energy consumption--in 1990-91 the per capita energy consumption was 11.45 million kg.
- Rapid growth in national energy consumption--it increased by 68% during the eighties and reached 29.2 million TOE in 1990-91, an annual growth rate of 4.3%.
- Increasing reliance on commercial fuels--the share of commercial fuels has increased from 62% in 1980-81 to 74% in 1990-91.
- Heavy reliance on imports--imports of oil and petroleum products reached 8.4 million tonnes in 1990-91 costing 37 billion rupees.
- Declining role of woodfuels which accounted for 15% of national energy consumption in 1990-91, against 21.6% in 1980-81.

Woodfuels are used mainly the in household sector to meet domestic energy needs for cooking and heating. Its consumption was estimated at 16.8 million m^3 in 1980-81 which increased by 16% to 19.4 million m^3 in 1990-91, reflecting a growth rate of 1.5% per annum. In contrast, the consumption of gas and kerosene in the household energy sector increased at an annual rate of 14.2% and 5.5% respectively during the same period. Gas and kerosene are mainly used in urban areas where they are replacing woodfuel. However, fuelwood consumption is increasing in rural areas. In urban areas, the demand for wood is either static or declining. Ideally, in the present situation, woodfuels can replace gas and kerosene. It can release gas for more productive alternative uses and do away with imports of kerosene costing about 3.3 billion rupees per annum which will lessen the burden on the balance of payments.

Plan of Work

In order to carry out the study, reliance was made on primary data collection because requisite data were not available from secondary sources. On the demand side, to collect data on fuel consumption and the fuel consumption pattern in the household sector, a sample survey of randomly selected households was undertaken. This survey focused on the collection of data about household size, income level and fuel consumption pattern. Another sample survey was designed to collect information on the fuel consumption pattern in commercial establishments. On the supply side, a sample survey was conducted of firewood sales depots to collect information on prices, sales and marketing outlook. The information on fuelwood inflows through railways was collected from the Railways Department. The data on inflows of fuelwood through road transport were collected from the Forest Check Posts located at various entry points to the city. The data on city population was collected from different census reports. The data were processed using a Lotus 1-2-3 package. The analysis mainly focused on descriptive statistics. However, where necessary, certain hypotheses were also tested and a model involving the relationship of per capita energy consumption to household size, income level of household, and fuel type used was also developed.

Historical Perspective

Wood and charcoal have been the traditional fuels for cooking of food and heating of rooms in winter in Peshawar city. In the early fifties these were the only fuels used by the people of Peshawar. The commercial establishments such as restaurants, bakeries and ovens and traditional "kebab" shops also used woodfuels. The situation began to change in the sixties when kerosene stoves were introduced and people began to switch over to these. The displacement of traditional woodfuels received further impetus in the mid-seventies when natural gas was supplied to the city. As a result of these changes, the woodfuels have yielded prominence to the more convenient commercial fuels. The supply of gas has especially quickened the replacement of woodfuels. A large number of households as well as commercial establishments have switched over to gas.

The dependence on kerosene and gas has evidently increased over the last 3 decades. One reason for this trend is the comparative “cheapness” of kerosene and gas. The prices of kerosene and gas are controlled by the Government whereas firewood prices are determined by the open market.

Factors affecting choice of fuel type

The choice of fuel type used by a household is mostly influenced by the income level of the household. Households with high incomes use either gas or liquefied petroleum gas.

The survey of households in Peshawar city carried out in 1992 for the present study reveals the following general pattern (Table 1):

Table 1: General Pattern of Household Fuel Consumption in Peshawar.

Cooking fuel	% of households in Peshawar city
Wood	13.4
Charcoal	-
Kerosene	33.8
Liquefied petroleum gas (LPG)	7.8
Gas	38.7
Dung	6.3
Total	100.0

Table 2 shows the breakdown by income level. Here we can see that the percentage of gas using households in the higher income group is 86% , with 12% of households using liquefied petroleum gas and the remaining two percent using kerosene. In the middle income group, the percentage of households using gas drops to 76%, those using kerosene increases to 15% ,and those using fuelwood to 4%. In the lower income group, the percentage of households using gas drops to 40%, the percentage of kerosene users increases to 30%, and the percentage of fuelwood users increases to 16%.

Table 2: Household income level and choice of fuel type.

Fuel type for cooking	High income households (%)	Middle income households (%)	Low income households (%)
Wood	-	4	16
Charcoal	-	-	2
Kerosene	2	15	30
Liquefied Petroleum gas	12	3	2
Gas	86	76	40
Dung	-	2	10
Total	100	100	100

Per capita energy consumption in household sector

The annual per capita energy consumption in the household sector of Peshawar city (excluding electricity) is estimated at 4.578 million KJ (95% confidence limits equal 4.090 - 5.066 million KJ). However, it varies significantly with the level of household income, household size, fuel type used for cooking, and the availability of gas in the locality. Further, there is a moderate association between the annual per capita energy consumption and the level of household income. The households with a high level of income tend to have higher annual per capita energy consumption compared to households with medium and low levels of income. It is perhaps due to income effect i.e. consumers with higher income tend to consume relatively more of each of the commodities. The relationship is depicted in table 3.

Table 3: Household income level and annual per capita energy consumption.

Income level	Average annual per capita energy consumption (million KJ)
High	7.918
Medium	4.831
Low	4.163

As might be expected, the household size and annual per capita energy consumption are negatively correlated. The association is moderate (Cramer's v = 0.19). It is attributable to economies of scale. The relationship is given in table 4.

Table 4: Household size and annual per capita energy consumption.

Household size	Average annual per capita energy consumption (million KJ)
1-3	8.121
4-6	6.133
7-9	5.475
10-12	4.231
13 +	4.166

Influence of fuel type

There is a strong association between the annual per capita energy consumption and the fuel used for the cooking of food (Cramer's V = 0.42). Households which use gas tend to have larger per capita consumption figures and the households using dung tend to have the smallest per capita consumption figures. Table 5 shows the relationship.

Table 5: Fuel type and annual per capita energy consumption.

Fuel type	Average annual per capita energy consumption (million KJ)
Gas	5.876
Wood	5.367
Kerosene	4.098
LPG	1.777
Dung	0.990

A multiple linear regression model was built up to relate annual per capita energy consumption to the variables affecting it. The model is: Y = 4960 + 1409 G + 1.402 E - 385 H - 901 K. Where Y is per capita annual energy consumption in thousand KJ, G is availability of gas in locality, E is total household expenditure on fuel, H is the household size and K is the income level of the household. Three income levels were identified. High (1) if the household owns a car, medium (2) if household owns a TV set and a refrigerator, and low (3) all other cases. The co-efficient of determination (R^2) is 0.655 which indicates that 65% variation in per capita energy consumption is accounted for by the variation in these variables. The model is highly significant. The model displays that other things being equal, per capita energy consumption is greater by 1409 thousand KJ in localities with gas supply. An increase of one rupee in household expenditure on fuel results in an increase of 1.402 thousand KJ in per capita energy consumption. On the other hand, an increase of one member in the household leads to a decline of 385 thousand KJ in per capita energy consumption. Compared to high income households, per capita energy consumption is less by 901 thousand KJ in medium income households and compared to medium income households, it is less by 901 thousand KJ in low income households.

Household fuel expenditure

The average annual household fuel expenditure (excluding electricity) works out to 3,526 rupees. However, it varies with the type of fuel used by the household. It is shown in table 6.

Table 6: Annual household fuel expenditure.

Fuel type used	Annual household fuel expenditure	
	Rs.	US $
Wood	4,636	150
Kerosene oil	4,065	131
LPG	1,198	39
Gas	3,591	116
Dung	755	24
Weighted average	3,526	114

1 US $ = 31 Pak rupees

Composition of energy consumption in household sector

Total consumption of delivered energy in the household sector (excluding electricity) in Peshawar city is estimated at 105,000 TOE. This estimate is based on the proportion of the city population using a given fuel material and the average per capita consumption of energy of that segment of the population. Both the statistics i.e. proportion of population and the average per capita consumption of delivered energy were derived from the sample survey of households. Table 7 gives the break down.

Table 7: Estimated annual consumption of delivered energy in households of Peshawar city.

Fuel type	% of population using the fuel type (%)	Estimated population using the fuel in 1991 (000)	Average per capita consumption (million KJ)	Total consumption (TOE)[a]	% of each fuel type in total consumption (%)
Wood	13.4	136	5.367	16,456	15.7
Kerosene	33.8	343	4.098	31,899	30.4
LPG	7.8	79	1.777	3,160	3.0
Gas	38.7	392	5.876	52,136	49.6
Dung	6.3	64	0.990	1,408	1.3
Total	100	1014	4.578[b]	105,059	100

a. 1 TOE = 44.2 million KJ
b. Weighted average

It is evident from the above data that kerosene and gas are the pre-dominant fuels used by the people of Peshawar city. These two fuels together account for 80% of total estimated consumption. Woodfuels account for 15.7% of total consumption. The remaining 4% is accounted for by LPG and cow dung. It may be emphasized here that consumption is in terms of delivered energy. Since the burning efficiency of different fuels varies between 0.2 and 0.7 the net energy consumption will be less than the delivered energy. The ratio of net energy to delivered energy for different fuels is different, therefore different fuels cannot be equated with each other on the basis of delivered energy. The quantities consumed of different fuels in conventional units are shown in table 8.

Table 8: Quantities consumed of different fuels in conventional units.

Fuel type	Unit	Quantity
Woodfuels	Tonnes	40,874
Kerosene	Tonnes	31,090
LPG	Tonnes	2,923
Gas	Million cu.ft.	2,228
Dung	Tonnes	7,129

Comparative prices of different fuels

The price of different fuels consumed by the household sector shows that in terms of delivered energy, gas is the cheapest fuel and kerosene oil is the most expensive. This is brought out in table 9.

Table 9: Price of different fuels.

Fuel type	Unit	Calorific value KJ/unit	Price Rs./unit	Rs./million KJ
Wood	Kg	17,800	1.37	76.95
Kerosene	Litre	38,338	3.78	98.58
LPG	Kg	47,811	4.36	91.21
Gas	m^3	36,507	1.33	36.21
Dung	Kg	8,731	0.50	57.26

These price comparisons are, however, illusory because they do not take into account the burning efficiency of different fuels. For instance, the data in the table indicate that kerosene is more expensive than firewood. But the burning efficiency of kerosene oil is 3 times greater than fuelwood. Accordingly, on the basis of net energy availability, kerosene is far cheaper than woodfuels. The case of LPG is similar. Gas appears to be much cheaper than kerosene and firewood. However, this price does not include the capital cost portion of gas connection. There is a general feeling that the present price structure is encouraging substitution of fuelwood with gas and kerosene.

Future trend in market demand for woodfuels

The future trend in market demand for woodfuels in Peshawar city market will depend, inter alia, on the rate of growth in the city population, the growth rate in gas connections, future structure of fuel prices, pattern of income distribution and availability of kerosene and LPG. It is extremely hazardous to make any forecast about these parameters. Past trends may not continue in the future. They are a poor guide in this respect. Moreover, in the absence of time series data, no econometric model can be built up. As an educated guess, it may be asserted that future demand for woodfuels will decline or remain static at best.

Energy consumption in the commercial sector

The commercial sector also consumes a considerable amount of energy. The main establishments which use woodfuels or their substitutes (excluding electricity) are the following:

- Restaurants
- Tea bars
- Ovens
- Tikka shops
- Bakeries
- Barber shops
- Others

The others are milk shops, 'kebab' shops, sweet shops and 'pakora' shops. Except barber shops, all other establishments use energy fuels for the cooking of food or for making tea. Barber shops use fuels for water heating in winter.

In the sampled area of 4 wards of Peshawar city, out of a total of 45 wards, there were 224 commercial units.

Of the 224 commercial units in the sampled area, 22% used wood, 5% charcoal, 8% kerosene and the remaining 65% gas. The annual energy consumption of these units totalled 969.4 TOE of which 54% was accounted for by ovens and 79% by gas. The wood accounted for only 17%.

The estimated population of the sampled area is 106,000. This gives a per capita energy consumption in the commercial sector of 0.0091 TOE or 0.404 million KJ. On this basis, energy consumption in the commercial sector of Peshawar city with an estimated population of 10,14,000 works out to 9,227 TOE. Assuming that the composition of energy consumption in Peshawar city is the same as in the sampled area, the distribution of energy consumption by fuel types is as shown in table 10.

Table 10: Energy consumption by fuel type in commercial sector of Peshawar city.

Fuel type	Energy consumption (TOE)	Energy consumption in conventional units
Wood	1,587	3725.00 tonnes
Charcoal	83	186.00 tonnes
Kerosene	286	280.00 tonnes
Gas	7,271	311.00 million cu.ft.
Total	9,227	-

Woodfuel consumption in the Government sector

The Government sector, consisting of civil and military establishments, also consumes a considerable amount of energy fuels. It is mainly used for room heating in winter. Charcoal is the main fuel used. Inquiries made from the charcoal dealers reveal that about 2 - 3 thousand tonnes of charcoal is used in the Government sector annually.

Total market demand for woodfuels

The total annual demand for woodfuels in Peshawar city market is estimated at 44,600 tonnes of fuelwood and 3,500 tonnes of charcoal. Its sector-wise distribution is shown in table 11.

Table 11: Market demand for woodfuels by sector in Peshawar city.

(Tonnes)

Woodfuel type	Household sector	Commercial sector	Government sector	Total
Wood	40,874	3,725	-	44,599
Charcoal	300	186	3,000	3,486

Woodfuel supplies

The trade in woodfuels is roughly worth Rs.78 million (3.1 million US $) in the Peshawar city market. The people of Peshawar spend about Rs. 61 million on fuelwood and Rs.17 million on charcoal annually.

The city has always depended for its fuelwood supplies on the mountainous and sub-mountainous natural forests in adjoining tribal areas. The farmlands in the rural areas adjacent to Peshawar city also carry considerable tree growth and make a significant contribution to the city's fuelwood supplies. The remaining shortfall, if any, is met through imports from the Punjab province. As regards charcoal supplies, the city depends largely on imports from the Punjab province.

It is evident from the data in table 12 below that Peshawar city market obtains 50% supplies of firewood from natural forests in tribal areas, 16% through imports from Punjab, and the remaining 34% from local sources. The firewood supplies from tribal areas consist of *Oak*, *Kao* (*Olea cuspidata*) and *Phulai* (*Acacia modesta*) whereas imports from Punjab mainly consist of *Babul* (*Acacia nilotica*) and *Shisham* (*Dalbergia sissoo*).

Table 12: Distribution of fuelwood and charcoal supplies by source in Peshawar city in 1991.

Sl. No.	Source	Firewood including wood waste	%	Charcoal	%
1.	Supplies from tribal areas	22,370	50.2	-	-
2.	Imports from Punjab	7,230	16.2	3.500	100
3.	Local supply	15,000	33.6	-	-
	Total	44,600	100	3.500	100

Basic Marketing Factors

The marketing system of woodfuels in Peshawar city market has evolved over a long period of time. Although working primarily in the informal sector, it is well organized and performs the marketing functions in a reasonably efficient manner. The main ingredients of the marketing system are: the product, physical distribution system, marketing channels, price structure and the information system.

Compared to firewood, charcoal is a manufactured item. It has similar attributes except that its stock turnover rate is relatively higher as it does not require any drying before its use.

Quality of product

Households and other consumers demand firewood not for its own sake but for the sake of its heat value. Therefore, the quality of the product is to be judged by its heat value. The calorific value of oven-dry wood is about 20,000 KJ per kg. The chemical composition of woody substances is almost the same, therefore there is little variation in the calorific value of different species of wood. Each kilogram of wood, regardless of species, yields more or less the same amount of heat.

Marketing Channel

The role of middlemen is all the more important in the marketing of wood and charcoal for a number of reasons. It operates in the informal sector where organized institutions like banks play little role. The number of producers is too large and each produces only a small amount. Production takes place in remote areas which are geographically far away from the consumption centres. The consumers are too large in number and are spread over a large area. The product is purchased frequently and on a regular basis. It necessitates wide distribution which is simply not possible without middlemen.

Prices

The firewood prices are affected by a large number of factors. Among these are species, size of billets, rate of inflation, production point and its distance from roadside mode of transportation, freight charges, profit margins of wholesalers and retailers. On the whole it is the interaction of forces of supply and demand which determine the prices.

Charcoal prices

Charcoal is imported entirely from Punjab. The manufacturing cost of charcoal amounts to Rs.3300 per tonne. The manufacturer sells it at Rs.3600 per tonne. His mark up is about 9%. The transportation cost from point of production to Peshawar city averages Rs.500 per tonne. Thus, the wholesaler's cost price works out to Rs.4100. He sells to retailers at Rs.4400 per tonne. The retailer sells to the consumer at Rs.5/kg or Rs.5000/tonne. (These prices relate to the first half of 1992)

Price trends

The prices received by the producer and the prices paid by the consumer have exhibited a strongly upward trend in the eighties. The prices realized at auctions for “medium class” *shisham* firewood at Change Magna have increased at the rate of 6.6% per annum, for “thick” at10.4% and for “selected” at 9.5% per annum. The same trend is discernible in retail prices at Peshawar city. The prices of calker firewood and of charcoal in the last 10 years have gone up from Rs.27.10 in 1980-81 to Rs.47.94 per 40 kg in 1989-90. It shows an annual growth rate of 6.5 percent. Likewise the price of charcoal has risen from Rs.75.73 in 1980-81 to 133.48 per 40 kg in 1989-90, showing an annual growth rate of 6.6 percent. Inflation during 1990-91 and 1991-92 has been high and as a result prices in these years have risen much more rapidly.

Conclusions

Peshawar City, with an estimated population of 10,14,000, is a big market for woodfuels. The choice of cooking fuel by a household is influenced by level of income, availability of gas in the locality, education level of household head and occupation of household head. The use of wood as cooking fuel is positively associated with the non-availability of gas in the locality, low level of household income, illiteracy of household heads, and households heads whose occupation can be classified as general labourer. The household size has no influence on choice of cooking fuel.

In Peshawar City about 38% of households use gas for cooking, 33% use kerosene, 13% use wood, 8% use LPG, and 6% use cow dung. The per capita energy consumption is positively correlated with income level. The high income group has a per capita energy consumption of 7.9 million KJ compared to 4.1 million KJ for the low income group. Due to economies of scale, the per capita energy consumption is inversely related with household size. Per capita energy consumption is 25% greater in localities with gas supply compared to other localities.

Total energy consumption for cooking and heating in households of Peshawar City is estimated at 105,000 TOE, of which wood contributes 16,476 TOE or 16% of total consumption. In conventional units, wood consumption is 40,874 tonnes in households. The commercial establishments consume about 3,725 tonnes of fuelwood. Thus, total fuelwood consumption in Peshawar City works out to be 44,600 tonnes. Charcoal consumption is estimated at 3,500 tonnes, of which 3,000 tonnes is used in Government establishments, 300 tonnes in households, and 200 tonnes in the commercial sector.

The woodfuels trade in Peshawar City is worth 78 million rupees. Wood supplies come from natural forests in tribal areas (50%), imports from Punjab (16%) and local production (34%). Local production includes wood waste generated at saw mills operating in hardwoods. The entire supply of charcoal comes from Punjab.

The main wood species are *Kao* (*Olea cuspidata*) *Phulai* (*Acacia modesta*), *Oak* (*Carcass*), *Calker* (*Acacia nilotica*) and *Shisham* (*Dalbergia sissoo*). The first 3 species come from tribal areas, and the remaining two from Punjab and local areas.

Fuelwood is a highly differentiated product. It is differentiated on the basis of species, size class, and moisture content. Middlemen, i.e. local assemblers and retailers, play an important role in moving the product from the producer to the consumer. Prices of fuelwood have risen at the rate of 6.6% during 1980-90. This is in line with the rate of inflation.

Information on price trends, consumption trends and supplies trends need to be compiled on a regular basis for the benefit of traders. Woodfuels face price competition from gas and kerosene in Peshawar market. If the prices of gas and kerosene stay low, the demand for woodfuels will gradually peter out. Promotional measures are needed for retention and expansion of the market.

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3.3. Charcoal Production and Marketing in Gujarat

by

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Charcoal production and marketing has a long history in Gujarat, an agriculturally and industrially progressives state in Western India. The 130-member Association of Charcoal Traders of Ahmedabad takes pride not only in four decades of its own existence, but also in the town having been a market center for charcoal for almost a century . The market is known for its cash transactions and as a result, charcoal makers and sellers bring their produce from long distances by trucks both from within and outside the state.

The single species which is used for making charcoal in Gujarat is *Prosopis juliflora*, locally called as "*Gando Baval*" (a crazy species). Endowed with characteristics such as tolerance for saline conditions, surviving under low rainfall situations, and natural regeneration through seeds as well as coppicing, the species has made its presence felt in drought prone areas of the state scattered in districts like Banaskantha, Surendranagar, Bhavnagar, Mehsana, Ahmedabad, and Kutch (see Chand, Patel, and Verma, 1994).

Verma (1987:532-33) reports that: "*Prosopis juliflora*" was introduced in India somewhere in 1836 due to the efforts of a Forest Officer Lt. Col. R.H. Beddome who was the Conservator of Forests of Northern Circle of Madras Presidency. The species was first tried at Camalapur in Cuddapoh district of present Andhra Pradesh. This delicate and shy looking plant took to India as a fish takes to water.and slowly established its domain over arid, sterile, saline, degraded and sandy sites.throughout the length and breadth of the country".

Prosopis juliflora is regarded as (a) a good producer of biomass; (b) valuable fuelwood for domestic cooking; (c) a favourable home for honey bees; (d) a fixer of atmospheric nitrogen; (e) a good coppicer; and (f) yielding excellent charcoal (see Verma, 1987).

Unlike in Tamil Nadu, another charcoal supplying state of South India, *Prosopis* in Gujarat is not taken as a regular tree crop by the land owning agencies, whether individual, institutional, or governmental. Uncontrolled natural spread is predominant in the vacant and degraded lands mainly in geographical areas encircling the brim of the two gulfs of Gujarat, Kutch and Khambat, where semi-saline conditions prevail.

Land owners, whose lands the species has invaded gregariously, are generally interested in either (a) uprooting it altogether to bring the improved land under marginal agriculture (see Shingi and Patel, 1994) (b) pruning it once in a while to reduce its intensity, or (c) harvesting to convert it into a cash income periodically, particularly during stress conditions.

It is interesting to note the time-tested observations of charcoal traders who maintain that whenever monsoons have failed, the arrival of charcoal has improved substantially. This is partly because reduced income from drought-affected agriculture could be supplemented by making charcoal from the standing *Prosopis* on degraded patches of land. Labourers not finding enough work on agricultural fields during drought years not only are available, but are also actively seeking opportunities to make charcoal to supplement their reduced income.

Different arrangements for making and selling charcoal are possible depending on the skill and convenience of *Prosopis* owners. Two of the options for *Prosopis* owners, whether individual or institutional, include:

- selling the standing trees on an outright basis to charcoal making contractors who in turn make charcoal and sell it to traders, and

- getting charcoal made through charcoal making contractors on a contract basis and selling the charcoal directly to traders.

Since there are restrictions and/or formalities associated with making and/or transporting charcoal in Gujarat as it is treated as a forest produce, *Prosopis* owners have a tendency to go for option (a) which offers less transaction costs. Since charcoal making contractors are in a better position to manage procedural requirements, the biomass resource owners prefer to work through them to their best advantage. Ability to negotiate a deal, therefore, plays an important role.

Official procedures relate to (a) estimation and verification of private ownership of *Prosopis* (b) verification of authentic conversion and estimation of likely output, and (c) regulation and tight monitoring of transport to prevent unauthorized conversion and/or transport. Both forest and revenue department functionaries, for whom it may be a low priority, have to get involved at different stages of charcoal processing, for physical inspection as well as documented certification. Mobilization and synchronization of these functionaries and their certifications can be time consuming, if not frustrating at times.

The experience of the Behavioural Science Centre, an NGO which has promoted a network of cooperatives of landless labourers in the Bhal region of Khambat to make charcoal from *Prosopis* grown on government allocated wastelands, for improved livelihood of their members, shows that these cooperatives also preferred at times to operate through the contractor system to avoid procedural inefficiencies, in spite of its visibility and institutional standing.

A significantly large portion of the rural households in the *Prosopis* invaded regions make use of the species growing on community or road side lands as non-monetized fuelwood for domestic consumption for a major part of the year. This is generally accomplished by cutting and storing it in small quantities. In general *Prosopis* owners have not found selling the fuelwood to be as remunerative as making charcoal.

Prosopis as a fuelwood has some inherent weaknesses like (a) limited shelf life of some months resulting in high storage losses (b) unremunerative labour and transport costs as there are no local monetized markets (c) variable sizes and shapes of fuelwood, and (d) unavailability of thornless varieties.

Against this, charcoal, besides fetching higher prices was (a) not as messy, bulky, and thorny to handle as fuelwood (b) convenient to obtain official permission for a lot as a whole, while every individual truckload of fuelwood had to go through an administrative process, and (c) easier to sell in a centralized market at Ahmedabad on a cash basis than to explore decentralized, small scale markets scattered in different locations.

Charcoal making technology in Gujarat, like that in Tamil Nadu, but unlike that in Punjab, continues to remain traditional. First of all it is a small scale operation. Secondly, the skills required are not complex. Thirdly, technology is not capital intensive. Furthermore, it specializes in *Prosopis juliflora* as a raw material, thus excluding other possible alternative raw materials.

Almost all the charcoal makers have learnt their skills from their elders. They have had no systematic exposure or training offered by any agency, governmental or non-governmental. In fact, charcoal making may be described as an activity which in spite of its significant and critical contribution to the economic welfare of highly marginalized families, surviving on byproducts of equally marginalized lands, is generally discouraged by the otherwise enlightened forestry administration.

Examples from Tamil Nadu, and of some efforts made by the district rural development agency in drought affected and unproductive areas of the Banaskantha district of Gujarat, under a UNICEF-supported DWACRA (Development of Women and Children in Rural Areas) programme, have proved that small scale extension services provided to those engaged in charcoal making not only helps to generate much needed employment in the disadvantaged areas, but also helps to improve family welfare.

It is interesting to note that more than 100 women's groups have been organized in Banaskantha under DWACRA and charcoal making was the second largest preferred activity.

Selection of an economic activity under DWACRA had to meet certain considerations. These included (a) it should lead to increased income (b) beneficiaries must be acquainted with the activity (c) raw material required for the activity must be available locally and easily (d) the products and outputs coming out of the activity must have a ready market and sold easily (e) activity should be amenable to training, and production should start without any delay (f) activity must have a potentially long life (g) activity should not uproot existing workers (h) activity should be individually oriented but should involve some degree of group participation (i) activity should not have any competition from a major industry, and (j) as far as possible it should be relevant for married women. Charcoal making met all of these ten conditions.

DWACRA assessed that charcoal making (a) promised handsome returns (b) was valuable to poor families (c) was familiar to people (d) was based on local resources which had a value added potential (e) had a market which was growing (f) supported married women as the help of all members of the family was important (g) did not displace existing workers (h) involved individual efforts but needed collective support for transportation and marketing (i) did not have any competition from the established industries as it was a decentralized rural activity, and (j) *Prosopis juliflora* was sustainable as it was a renewable resource (see Shingi and Patel, 1995).

Women's groups get the *Prosopis juliflora* from four sources. These include (i) outright purchase from private land owners on whose fields it has been thriving (ii) auction purchase from village panchayats on whose grazing lands it has been spreading (iii) acquiring it on lease from the Revenue Department on whose wastelands it was standing, and (iv) auction or contract purchase of cuttings from the Forest Department from its degraded patches.

A system of 'Panchnama' (report of five witnesses) was followed which gave the names and signatures of witnesses specifying that the farmer whose name was indicated in the Panchnama wished to give *Prosopis* plants standing in his field or on the boundaries to the charcoal making party for making charcoal and had requested the Panchs to estimate the value of the plants. If the value estimated by the Panchs was agreeable to both the parties it was recommended to sell the plants to the specified charcoal making group.

Cost estimates per acre of *Prosopis* as worked out by DWACRA project authorities, in consultation with knowledgeable forest officials and local traders, are as follows:

	Costs:	Rs.
(a)	Cost of standing trees	1,500
(b)	Labour charges for cutting trees, preparing kiln, and charring by 4 labourers	3,400
(c)	Cost of gunny bags and packing expenses	400
(d)	Transport to Ahmedabad	1,000
	Total Cost	6,300
	Income:	
(a)	@ Rs. 100 per bag in Ahmedabad market	10,000
	Net Surplus	3,700

Access to ten acres of standing *Prosopis* was considered potentially remunerative for a group consisting of 10 to 15 women. The initial experience of DWACRA on charcoal making was highly encouraging. In the first year seven groups having a total membership of 94 women together manufactured 3,515 quintals of charcoal within six months of operations, and earned a net profit of Rs. 569,102 by using an initial capital of Rs 176,400 provided by the revolving fund. These achievements by poor women were considered as exemplary for other groups in the process of being formed.

One of the Group reportedly kept their members gainfully employed on the collective contract for a full seven months in 1994 and paid a total of Rs. 95,550 by way of wages and Rs. 13,800 by way of net profit after deducting all the expenses to 13 members of their group. The net carry home amount per woman member thus came to Rs. 8,411. On an annualized basis, the income came to Rs. 14,420 and carried these members above the poverty line.

More importantly, the Group provided employment to other non-member workers in substantial measure. Another 17 workers together earned Rs. 124,950 during the reference seven months and on an annualized basis earned per worker Rs 12'600 and thus crossed the poverty line. This shows that a small group of 13 women not only earned their livelihood respectfully, but also helped more than their number to stand on their own feet.

The Group together produced 209,000 kg of charcoal and transported it in 22 truckloads to Asarva market in Ahmedabad. Total amount realized by the Group was Rs. 438,900. A group of poor women doing business almost worth half a million rupees is commendable and reassuring.

They also earned wages at the rate of Rs. 35 per day which was more than most men were earning in that region. In addition to self employment, they stimulated activity by which truck operators (Rs. 57,200), gunny bag sellers (Rs. 26,400), charcoal merchants, and farmers and institutions supplying *Prosopis* (Rs. 77,000) also earned part of their living(see Shingi and Patel, 1995).

It must be mentioned that in spite of the general impression of the inflexible controls of the Forest Department with respect to charcoal making, the district development machinery was highly appreciative of the support and encouragement extended by the forest officials to the DWACRA activity.

Nonetheless, charcoal making activity remained characterized by traditional technology, small scale operations, and poor quality standards. The decentralized activity, scattered in 4 to 6 districts, particularly low rainfall or problematic soil conditions, kept the charcoal market in Ahmedabad running, in spite of the changing nature of the end utilization of their outputs.

It is worth mentioning here, however, that no technical guidance of required type was available either to potential *Prosopis* growers, or to the wastelands owners, private or community, in terms of technology that one could adopt for growing *Prosopis* on problematic soils. This was realized even by NGOs like the Behavioural Science Centre spearheading work in the Khambat region and the Padhar Mahila Cooperative Society of women interested in improving problematic soils surrounding Nal Sarovar.

Similarly, no data base was available on (a) the area under *Prosopis juliflora* (b) current yields (c) variations in wood-charcoal conversion ratios and (d) market potentials.

Let us now look at the quantity of charcoal arrivals at Ahmedabad market over years and trade practices.

Since charcoal transport was regulated, copies of the transit passes were used to reconstruct production estimates. It is not claimed that all the charcoal produced in Gujarat was subjected to documentation. But chances are very high, because of multiple checks, that a major portion of the production would miss administrative reporting. Available data on around 12,000 trucks were analyzed to compile charcoal arrival information for Ahmedabad market (for details see Shingi and Seetharaman, 1993).

Year-wise arrivals of charcoal from different districts of Gujarat are shown Table 1. While in general it shows an increasing trend, some years had a major setback in the supplies. Similarly, supplies from the various districts were not stable. The exception being Bhavnagar district which continuously maintained a high flow of charcoal to Ahmedabad market. Surendranagar, traditionally a drought prone district, was a dominant supplier for four continuous years till 1990, when it suddenly dropped from the scene. In the last two years, the supplies from Kutch district strengthened its supply position again after having seen a subdued level of activity during the early nineties. Banaskantha, a good supplier of charcoal at one time, now seems to be consolidating its position again but at a slow pace. More than weather or market conditions, administrative exigencies have probably influenced the supply patterns. A stricter functionary could possibly influence the responses of local charcoal producers for a period of time.

Not all the production of the state necessarily came to Ahmedabad market, particularly so during the last few years. Nonetheless, the arrivals at Ahmedabad do give a good picture of the volume of production. Reportedly, some procurement agents from outside the state have recently stepped up their procurement from the western parts directly.

Similarly, an analysis of month-wise arrivals indicate that charcoal making activity becomes sluggish during the monsoon months of July, August, and September. Arrivals slowly pick up from October to December. And thereafter from January to June it is a full season for the arrivals (see Table 2).

Use pattern of charcoal has been changing over a period of time. In the initial years, when the charcoal market in Ahmedabad was emerging, charcoal was mainly used as fuel for domestic cooking, largely by lower segments of the urban population, and for heating purposes by small scale enterprises. The market at Ahmedabad supplied charcoal, which in those days came from the adjoining states of Maharashtra and Madhya Pradesh, probably as a forest by-product, to local retailers and wholesalers who could serve these segments in and around Ahmedabad. Mostly railway wagons were used for incoming charcoal in those days and, therefore, the charcoal market developed around railway facilities. These days charcoal movement, however, takes place through truck transport which can carry smaller quantities to a large number of desirable destinations as the road network has kept on improving and truck transport operated by private individuals has become increasingly accessible. Besides, charcoal supplies started coming from decentralized farms located in scores of villages, and truck transport was convenient to them as trucks could go right up to their villages and/or fields.

Charcoal manufactured on decentralized farms was not weighed, due to a lack of weighing facilities, but was put into standard gunny bags for transporting up to the charcoal market. So all the arrivals were in 'number of gunny bags'. Since a normally filled gunny bag of charcoal had around 40 kg of charcoal, and a truck could carry up to 8,000 kg of goods, a norm was that a truckload of charcoal would bring in around 200 bags of charcoal. All documents including transit passes were recorded in number of bags and this is the unit of measurement used in the tables contained in this paper.

Upon arrival at Ahmedabad market, incoming charcoal was inspected by the traders, whose number over time has been on the decline, and depending on their quality assessment a price was quoted per maund, that is per 20 kg. If agreed upon, the truck was weighed on a weigh bridge close to the market and accounts settled with the charcoal supplier.

Table 1 Year-wise Arrivals of Charcoal from Districts of Gujarat (No of 40 kg bags)

District	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Ahmedabad	8,929	1,658	17,400	6,800	222	6,660	29,472	25,477
Banaskantha	20,571	6,207	72,491	327,454	66,364	30,879	62,869	92,213
Baroda	220					200		
Bharuch	27,190		360	6,995	2,285	7,365	4,744	640
Bhavnagar	201,673	318,813	162,609		102,240	185,236	132,071	102,351
Dang	3,473				200			
Gandhinagar	6,494	1,577	19,746	12,918	9,097	43,821	176	
Jamnagar	17,440	109,730	9,103	1,620	3,315			5,502
Junagadh			2,000			710		
Kheda	810	3,367				14,449	13,988	3,447
Kutch	3,900		3,173	1,191	7,757	21,065	186,646	735,361
Mehsana	3,130	8,670	3,620	2,190			1,975	960
Panchmahal		740	613	155				
Rajkot	4,975	21,110	8,905	200				
Surat	4,705	2,253	2,470					
Sabarkantha	400							
Surendranagar	117,938	118,957	336,964	222,230	42,830	23,542	1,373	16,486
Valsad	2,929							
Total Gujarat	424,777	593,082	639,454	690,532	234,310	333,927	433,314	982,437
From Outside	6,015	4,282	17,096	8,973	29,667		43,734	490
TOTAL	430,792	597,364	656,550	699,505	263,977	333,927	477,048	982,927

Table 2 Monthly Arrivals of Charcoal at Ahmedabad Market 1986-87 to 1993-94 (No of Bags)									
Month	1987	1988	1989	1990	1991	1992	1993	1994	% share
Apr	2,0132	7,0654	6,4561	6,8959	7,0230	2,6685	5,2556	94,973	10.4
May	3,2687	5,4585	9,8616	8,9294	5,5927	5,8300	5,0051	80,291	11.5
Jun	2,8548	6,9363	9,5006	9,6843	4,0394	5,0969	6,0804	103,223	12.1
Jul	1,1881	3,6495	5,6171	3,0611	1,0876	2,2239	1,6871	28,929	4.8
Aug	2,8636	2,000	1,9427	3,0430	1,5721	1,4675	1,6729	24,272	3.4
Sep	2,6650	5,8767	4,752	2,0340	1,5462	1,7386	8,520	43,810	4.3
Oct	3,0289	3,4019	1,7340	4,9567	8,668	1,8844	1,9062	8,3427	5.8
Nov	3,3604	5,6655	2,7407	3,9195	1,0438	1,9856	2,1572	87,002	6.6
Dec	6,5351	5,8319	5,3095	4,8303	1,4634	3,5463	2,7327	113,714	9.2
Jan	7,2211	5,2330	6,8728	7,3368	2,1627	4,3650	4,9266	122,961	11.2
Feb	7,5312	3,6859	6,8567	7,5710	0	3,9682	6,8450	96,154	10.2
March	7,0842	6,7318	8,2880	7,6885	0	4,6091	8,5840	104,171	11.9

(A bag approximately of 40 kg of charcoal)

The trader then dispatched this charcoal either processed or unprocessed depending on his clients. Processing meant unloading charcoal from gunny bags, screening it to remove fines and dirt, doing preparatory cleaning to sort out unburnt wood and/or small chips, filling in fresh gunny bags, and top dressing filled bags with good quality charcoal pieces to improve visual quality of the goods. He then worked out the actual expenses incurred, deducted possible revenue from the rejected material obtained from processing, added his margins, and worked out a selling price on a quintal basis and not on a maund or a bag basis.

A trader generally expected 25 per cent of his purchases to be of reject grade. But this figure varied from one supplier to another and from one season to another. Though there was a market even for rejected material, he received less than half the ruling prices for good charcoal. A net cost for a recent purchase of a truckload of charcoal is shown in table 3. It should be noted, however, that this was during an off-season and the truck came from Tamil Nadhu where they use long bags and carry more weight.

Table 3 Expense Calculations by a Charcoal Trader (Reference date: September 1995)	
Gross weight on arrival including weight of gunny bags (kg)	9,540
Deductions for weight of gunny bags (kg)	208
Preparatory losses (kg)	1,140
Net charcoal recovered (kg)	8,400
Amount paid to the supplier (Rs.)	
(9540 - 208 kg weight of gunny bags) @ Rs. 92 a maund	42,927
Cleaning expenses (Rs.)	615
Total expenses (Rs.)	43,542
Recovery from rejects (Rs.)	1,710
Net expenses (Rs.)	41,832
Net cost per maund (Rs.) (Rs. 41832/8400 kg * 20 kg)	99.6

A trader added his margin to the net cost. This margin varied from one customer to another depending on the long term business relationship, quantity lifted, and mode of payment. In the case of cash transactions, which the traders preferred to increase their turnover, he fixed the price to be charged at 2 per cent above the net cost. But for a sale involving a credit period of four months it may be 18 per cent of the net cost. For a net cost of Rs 100, for example, the prices charged respectively would be Rs. 102 and Rs. 118 per maund.

The market has some traders who finance other traders if approached. They know the credit worthiness and/or business potential of individual traders. According to this arrangement, a trader wishing to purchase charcoal on a particular day on credit would approach the financier, located in the same market premises, and ask him to receive goods for him and make payment to the supplier. The financier purchases material in his name to begin with, at a price agreed upon between the trader and the supplier, and makes payment to the supplier. He then raises a bill in the name of the trader and charges him an amount of Rs.10 per quintal per month as his charges. A trader is then free to unload, or directly dispatch, the material as he wishes. But if he desires to unload in a storage yard owned by the financier, the usual rent of Rs 150 per truckload is not charged to him. A trader doing cash transactions with his clients does not have to depend on the financier, or alternatively can have a higher turnover by combining his own money with assistance from a financier.

While a major portion of the charcoal at Ahmedabad market comes from the Gujarat state, a significant portion of the charcoal produced in the state was dispatched to a large number of destinations. Between the years 1986-87 and 1989-90, for which destination-wise data were available, a total of 182 destinations outside Ahmedabad were served from Ahmedabad Market. Of these 182 destinations, around 116 destinations were, however, within Gujarat, and the remaining 66 destinations were outside Gujarat (See Table 4).

Table 4 Total dispatches inside and outside Gujarat (no of bags)		
	In Gujarat	Outside Gujarat
1986-87	67,784	193,622
1987-88	251,691	261,111
1988-89	167,473	403,992
1989-90	152,048	427,630
Total	638,996	1,286,355
Annual average	159,749	321,589
No of towns	116	66

Estimates also show that around 20 per cent of the charcoal arriving in Ahmedabad is consumed in the city itself. Though old uses such domestic cooking and fuel for small scale industrial units are decreasing mainly because of increasing prices of charcoal, there are some end-users who have very few other options available and continue to use charcoal. Some of these end-users may not be consuming a sizable quantity, nonetheless, they continue to be an important market segment scattered in many small and big towns.

One of the traditional users of charcoal in Ahmedabad, and in other towns as well, is the laundry units. A large number of small laundry units, incapable of getting electric connections, still depend on wood-based charcoal for their iron presses. Hard coal is not used as it (a) produces smoke and smell (b) is difficult to ignite (c) prone to get extinguished by movement of the press. Poor quality of charcoal giving occasional sparks because of unburnt wood sometimes poses dangers, however, to clothes, and therefore, quality charcoal is preferred.

Charcoal briquette manufacturing, which was in operation a few years ago is probably decreasing. But it makes efficient use of the rejected fines and chips by mixing them with other agricultural wastes to make almond shaped briquettes which are purchased and used by small scale, roadside hoteliers serving poor customers, usually labourers. The main attractions of these briquettes are that they can be purchased in small quantities, are quite cheap, are easy and cost effective to use. A large number of small eating places are potential customers of charcoal briquettes, but we were told that units manufacturing charcoal briquettes are switching over to other businesses.

Discarded automobile batteries are used for extracting lead which has developed into a secondary market on an appreciable scale. Located on the outskirts of the cities, these units require a good quantity of charcoal, not necessarily a good quality, for their processing. The number of such units has been on the increase. According to current estimates, one processor needs almost 10 bags of charcoal a day, and there are more than 50 processors who together need almost 500 bags, or 2.5 truckloads of charcoal everyday. This means almost 8,000 tons consumed annually.

Some units processing metal find the use of charcoal essential for their operations. But these units are under pressure due to environmental considerations.
Dhania dal (coriander seeds) are becoming a branded product and an increasing number of small scale manufacturers are entering into this activity. Charcoal has distinct advantages both for the labourers working in these units, who prefer traditional processing technology, and the method of

processing which requires a slow heat for roasting. Now there are close to 15 units which use charcoal for Dhania dal processing.

Another specialized use of charcoal powder is in the manufacturing of incense sticks known as Agarbatti. However, not much of a market of this type is captured by Gujarat charcoal.

Another major use of charcoal is for chemical applications in the industries located in or outside Gujarat. Some of these units use charcoal to extract carbon, which can be used for further processing of industrial output. Calcium carbide, calcium carborate, and rayon industries make good use of charcoal. These units need charcoal (a) as an industrial raw material (b) on a continuous basis (c) in large quantities (d) with assurance of supplies (e) in accordance with specified quality standards like moisture content, fixed carbon content, and ash content, and (f) on a contract basis. Since they use the charcoal as a raw material for value added products, and need supplies without fail, these units are willing to pay better prices to meet their growing requirements. The market prices of charcoal have gone up precisely for this reason. Increased prices have also made some of the traditional users of charcoal look for substitutes, and units previously using charcoal as fuel for heating or energy purposes have discontinued the use of charcoal in spite of their preference for it. Use of charcoal by the carbide industry itself is estimated to be 63,000 metric tons per annum. No estimates are available for other industries so far.

Demand by the industrial sector for charcoal has many implications for the traditional market. A new group of contractors who secured tenders from these industries for (a) specified quantity (b) in specified time frame (c) at specified contract rates, and (d) at specified quality standards have made them look for commission agents who can carefully handle large orders and meet strict commitments. Traditional charcoal markets or even the charcoal producers are not changing their age old practices to respond profitably to the changing environment. The same is the case with researchers, technology suppliers, policy makers, transporters, and all those directly or indirectly concerned with (a) forestry management (b) wastelands development (d) rural development in general, and (d) renewable energy sources.

Increased production of charcoal can reduce prices causing traditional users to re-adopt this wood based energy source and can also provide remunerative opportunities for charcoal makers as a result of an increased volume of sales. However, in order to achieve its full potential, charcoal making still needs to be appreciated by government administrators, as well as policy and technology support, and a commercial orientation.

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4. SESSION 3: COMMERCIALISATION OF WOOD FUELS: POLICY AND STRATEGY ISSUES

4.1. Policy and Strategy Issues in the Trading and Marketing of Woodfuels

by

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Abstract

This paper presents an overview of the energy sector in Pakistan, with particular emphasis on woodfuel and its consumption by the household sector. It investigates the future role of woodfuel in the overall energy mix, sustainability of supplies, and the manner in which woodfuel trading takes place in the country. It traces the trading cycle from the producer, wholesaler, retailer and finally to the end-consumer through extensive field surveys and other analytical work, and evaluates the motivations and cost build-up of different participants in the cycle. Based upon the findings of this work, it is concluded that woodfuel and timber markets are working effectively and with good economic efficiency, and there is no need for government intervention. Government policy should, therefore, be directed to maintaining the private market system, and facilitating the development of the wood markets through greater information dissemination, removal of fiscal barriers and physical constraints, rationalization of energy prices and promotion of end-use efficiencies.

Overview of the Energy Sector

Introduction

Pakistan is endowed with large natural gas resources which were first discovered in the early fifties. Oil and coal reserves have also been discovered, and hydro-electric potential has been tapped to meet the country's energy needs. However, even with this natural endowment, Pakistan is dependent upon imported energy supplies, mainly in the form of crude oil and finished petroleum products from the nearby Arabian/Persian Gulf countries. While the consumption of modern fuels is growing, a large proportion of households (mainly in the rural areas) are still using traditional fuels (firewood, crop residues and animal wastes) for a variety of socio-economic reasons. Energy consumption levels are generally low (often at subsistence level) compared to other developing economies, reflecting the poor economic condition of a majority of the population. The current national energy consumption of modern fuels is estimated at over 20 million TOE (at the end-consumption level), which has been growing at 6.1% over the last five years. Of this, approximately 66% is supplied through indigenous resources at the primary-supply level, while the remainder is imported mainly in the form of crude oil and petroleum products. In recent years, the cost of imported energy (crude oil and petroleum products) has been $ 1.5 billion, which is almost 40% of the total export earnings of the country.

Traditional fuels (firewood, crop residues and animal wastes) are the primary source of energy for a majority of the rural population in Pakistan. Reliable statistics on consumption of traditional fuels are not available, since these are not widely traded in the market. However, it is estimated that traditional fuels supply an additional amount of almost 20 million TOE of energy, primarily to the household sector. The consumption of these fuels takes place very close to the supply sources.

Household sector

The household sector accounts for approximately 54% of final energy consumption in Pakistan, and is thus the largest single energy consuming sector in the country. Because of rapid population growth, it is also the most rapidly growing sector in terms of the demand on modern fuels. This growth has placed a tremendous stress on the modern fuel supply infrastructure, resulting in electricity load shedding, natural gas rationing, fuel shortages and increased requirements for fuel imports and massive capital investments in the energy sector. At the same time, and in spite of the growth of modern fuel usage, the majority of households still rely on biofuels such as firewood, dung and crop residues. Each of these biofuels alone supplies more energy (in terms of their latent value) to the household sector than all the modern fuels combined. In view of the rapidly growing population, there are fears that woodfuels are becoming scarce, causing hardship, particularly to those low-income households who rely exclusively upon the collection of those fuels as 'free' goods to meet their basic energy needs.

Field surveys

The major demand analysis survey was conducted over a period of one year with the co-operation of the Federal Bureau of Statistics, and the same type of energy and socio-economic information that was collected for the World Bank's Living Standards Measurement Study was collected. The primary objectives of this survey were to identify the country's energy consumption patterns, and their casual relationships, using the cross-sectional data base. Satellite imagery, in conjunction with extensive field surveys, was utilized to take stock of the biomass resources, using variable sampling plots in different agro-ecological zones. Finally, extensive nation-wide surveys were launched to trace the flow of woodfuel (and timber) from producers, wholesalers, transporters, retailers, and to the end-consumers. This survey enabled the project team to highlight the impediments in the woodfuel marketing system, and to propose different policy options. These surveys were undertaken and completed with the help of local professionals, staff of the counterpart agency, and specialists of ESMAP. Data bases were subsequently developed, and analytical work undertaken to formulate an integrated household energy strategy for Pakistan.

Sectoral fuel consumption

Survey results indicate that the household sector accounts for approximately 54% of total final energy consumption in Pakistan, equivalent to approximately 19.985 Million TOE in 1991. Table 1, shows the breakdown of total final energy consumption by different fuels and all the sectors, including households. It will be observed that biofuels account for 86% of total household energy consumption in Pakistan, while firewood alone accounts for 54% of the total. Biofuels are principally used by households in traditional stoves to meet the bulk of their cooking, space-heating and water-heating needs. Natural gas, used mainly for cooking in urban areas, is the most important modern fuel, accounting for 50.6% of total modern fuel consumption in the household sector. Electricity, used mainly for lighting and space cooling, accounts for a further 30.6%, followed by kerosene (15.7%), which is principally used for lighting, although also for some cooking. The remaining 3.2% is accounted for by LPG use, which so far has remained fairly small in Pakistan. No significant use of coal in the household sector of Pakistan was found during the survey.

Wood supply

Of the total energy consumed by the household sector, a predominant proportion comes from wood and other biomass resources such as dung and crop residues. Evidence suggests that such heavy reliance on these fuels has a number of undesirable consequences, including environmental damage. The Biomass Resource Assessment component of the project aimed at developing a data base which would include, inter alia, the availability and supply of traditional fuels to the household sector. For this purpose a national agro-ecological zonation scheme was created using multi-temporal Advanced Very High Resolution Radiometer (AVHRR) satellite imagery to distinguish between patterns of vegetation activity with time. The satellite imagery was obtained as monthly composites of daily images covering six annual growing seasons from 1982-87, then combined with ancillary Geographical Information System (GIS) data on rainfall, topography, climate, and the extent of irrigated farmland to produce a zonation of fourteen land cover types for the whole of Pakistan. The sampling methodology ensured that sampling units fell in areas of woody biomass vegetation in all agro-ecological zones throughout Pakistan. All woody biomass was measured, including commercial timber trees, all other tree species and woody shrubs. Mathematical models were also developed from destructive sampling of trees and shrubs to predict their biomass content by component (commercial timber, poles, large branches, small branches, twigs and leaves). Models were also developed to allow for the effects of crown damage due to lopping on tree biomass and growth. In order to estimate annual sustainable productivity, models were developed for trees and shrubs using both primary data from growth measurements in the field and secondary data from forestry field tables. Wood biomass resources, and annual productivity, was estimated for each agro-ecological zonation, and for different provinces. The salient results are as follows:

Total Standing stock	=	210.78 Million Tonnes
Total annual wood growth	=	22.70 Million Tonnes
Total woodfuel growth	=	20.13 Million Tonnes
Twigs/Leaves growth	=	10.10 Million Tonnes
Roundwoodfuel growth	=	10.03 Million Tonnes

Table 1

Pakistan: Final Energy Consumption by Sector, 1991
(Thousand TOE)

SECTOR	Elec.	Gas	LPG-1	Petr. Prod.	Modern Fuels	Coal/ Coke	Wood	Dung	Crop Residues	Trad. Fuels	Total Fuels
Households	851	1416	92	442	2801	119	10637	3613	2816	17185	19987
Commercial	190	275	31	522	1018	0	713	0	0	713	1731
Industrial-2	905	3290	0	1124	5319	2878	5	0	1353	4236	9555
Agriculture-3	458	0	0	1634	2092	0	0	0	0	0	2092
Transport-3	3	0	36	3729	3768	1	0	0	0	1	3769
Other/Govt.	148	0	0	335	483	1	0	0	0	1	484
Total	2555	4981	159	7786	15481	2999	11355	3613	4169	22136	37618
Unit Household	1238	40.2	122	41.1		115	2324	1477	1161		
Consumption/ year	Kwh	Mef	kg	Litre		kg	kg	kg	kg		

Sustainability of forest resources

The issue of biomass sustainability is complex, and cannot be addressed only from the consumer's viewpoint. It should also be seen from the viewpoint of the producer, and the relationship of supply and equilibrium prices have to be also taken into account. The real importance of biomass sustainability lies in the associated issues of higher demand resulting in higher prices which in turn could increase the woodfuel share of the household budget, stimulate interfuel substitution, reduce woodfuel consumption, or induce some combination of the above effects. A woodfuel price model was developed to combine these perspectives, and to estimate the interaction of market price, consumption level and producer supplies.

- Impact on ground water recharge, soil erosion and fertility and microclimate quality

The removal of vegetation can increase runoff, accelerate top soil loss, and destroy beneficial microclimates. These phenomena can reduce agricultural productivity and increase sediment loading, resulting in accelerated siltation of dams and waterways. This issue requires further studies on rainfall, soil types, slope angles and terrace and watershed management practices.

- Impact on fragile ecosystems

Woodlands and forests are home to several threatened plant and animal species in Pakistan, including the Mugger (a crocodile of the Indus), Hog Deer, Fishing Cat, Balochistan Bear, Straight-horned Markhor, as well as an estimated 2,000 medicinal plant species. Deforestation hastens the demise of these species. The issue requires the differentiation of biomass resources on the basis of quality, and separating, quantifying and comparing the impact of woodfuel consumption from indigenous woodlands and the planting and use of boundary trees and monocultural woodlots.

Existing Woodfuel Trading Structure

General features and patterns of trading

Firewood markets in Pakistan operate under an organized set of arrangements and structures, which are responsive to supply and demand conditions. The actual scale and efficiency of trading networks are regulated by a number of interacting factors such as local demand, transport requirements, supply locations, prices, etc. The manner in which traders cope with these factors is a function of certain basic features of their trading establishments. About 40,412 businesses operate in firewood markets throughout Pakistan. Roughly 32% are found in urban centers, 52% in villages, and the remaining 16% are located along metalled roads. In addition, about 4,800 timber traders also sell wood, though at lower levels. Retailers dominate the firewood market in numerical terms totaling over 36,000 or 91%. Sales to the household and commercial sectors comprise the bulk of their revenue. Retailers are unevenly distributed throughout the country with the highest percentages found in the Punjab and NWFP. Most traders sell retail as well as wholesale. There are few "pure" retailers or wholesalers that sell exclusively to either households

or other traders. About 65% of all traders recorded sales to each of the three types of buyers, forming the backbone of the market. Roughly 30% concentrate solely on the household sector, while only 5% target other traders exclusively.

Firewood trading businesses are generally small scale units that remain open all year-round. About 71,848 people were working on a permanent basis during the winter of FY92, roughly 87% in retail. A further 26,928 people were employed as part-time staff. Altogether 98,775 people were engaged in wood markets, about one out of every 1,185 people in Pakistan. Approximately half of all traders also stock other fuels and materials for sale. Primarily, these products include timber, its sawdust derivatives, and charcoal. Most of the traders who also sell timber are located in the NWFP and Punjab provinces, where they have easier access to public auctions of timber from government forests. Seasonal variations are in clear evidence for the firewood trade. Winter sales are roughly twice the level of summer sales. Seasonal variations are more pronounced for retailers, whose summer trading activity drops to approximately 38% of winter sales while only dropping to about half for wholesalers. Monthly expenses per trader depend on location and type of trader. Wholesalers have roughly double the monthly expenses as retailers. Urban wholesalers are paying higher rents than any other type of trader. Rural wholesalers show a disproportionately higher monthly budget for temporary staff.

Supply and critical links in the distribution chain.

Most rural-based wholesalers obtain their supplies directly from private farmers, confirming the importance of these supply sources to the firewood trade. Urban retailers have the shortest distribution chain, as most do not venture into rural areas to procure their supplies, preferring instead to buy from large wood depots located just beyond municipal borders, or from local wholesalers. According to trader perceptions, supply problems exist particularly for those located along the metalled roads. This suggests that wood markets are interdependent, and competition for limited winter wood stocks is keenest for all but the urban retailers, most of whom do not buy directly from private farms. Unlike other commercial products, firewood has no easily traceable, standard distribution route. It is supplied from either private wood producers or government forests. Upon entry into the market, it weaves its way to the final consumer after any number of intermediate levels of exchange between trader.

Private farmers in Punjab are crucial players in supplying firewood markets accounting for nearly 90% of all farmers who sell their wood to local traders. Wood producers generally tend to be large land-holders. About 75% of the farmers surveyed indicated that they planted the trees themselves, and the predominant species planted are *Shisham* and *Kikar*. There is only marginal involvement of tree producers in the inner network of the firewood trade. Their role is primarily that of resource supply preferring to leave the actual parameters of wood market entry up to the traders, which puts them at a disadvantage. Except in Balochistan, most farmers sell their wood on a standing tree basis. The sale prices of wood producers vary on the basis of tree type and quantity sold. The price for all sales ranged from Rs.125-1000/ton, with an average price of about Rs.450/ton. *Babul* prices are the lowest, fetching about Rs.350/ton, while assorted other species fetched roughly 50% higher prices (Rs.530/ton). Most of the wood sold in a province originates in the same province. This situation holds true for every province except Balochistan, where firewood is drawn mostly from the neighboring Sindh province. This pattern of cross-province transport reflects the physical scarcity of wood resources in this province.

Sales structure prices and margins

Winter monthly firewood sales were 1.822 million tonnes during FY92. This amount included 1.43 million tonnes that were sold directly to the final consumer as well as 0.392 million tonnes that were sold to other traders. On an annual basis, the wood trade in Pakistan approached 16 million tonnes during FY92, or roughly 135 kg/capita/year. The sale structure of wood markets is dominated by retail trade. Annually, about 12.4 million tonnes are sold to the final consumer compared to 3.4 million tonnes sold to other traders. For retailers, the wholesale portion of monthly winter sales was almost zero for NWFP and Balochistan retailers. For wholesalers, the retail portion of winter monthly sales is roughly a quarter of their trade. Most of the wood trade is taking place in the northern part of the country. Of particular note is the situation in rural areas of the NWFP, where retailers account for 56% of the total sale to rural consumers.

There are significant variations in purchase prices across provinces. This range extends from the lowest price paid by Sindh traders to the highest purchase price paid by traders in large urban centers. These fluctuations tend to even out when considered from the perspective of trader location. There is a general consistency for purchase prices for urban, rural and roadside dealers. Each is within 6% of the national average, and suggests a competitive market system. Selling prices also show significant variation across provinces. Except for Balochistan, price mark-ups are fairly consistent throughout the country, coming to roughly 30%. In the case of Balochistan, this mark-up can probably be explained by the higher transport costs involved and the attendant risks. Net margins show considerable variation per province and trader location. Sindh traders show the lowest profit margins at Rs.23,000, while Balochistan traders show an uncharacteristically high annual net margin at Rs.108,000.

Firewood transportation

The most common form of wood transport is by truck, of which there are about 100,000 in the country. Most of these are employed to transport a wide variety of items in addition to firewood. The trucking agencies which are heavily involved in wood transport tend to be small to medium sized, and remain busy throughout the year. The most common truck is a 6-wheeler Bedford with a 8-ton hauling capacity. Wood transporters are characterized by a relatively recent entry to wood markets. There are wide variations between agencies regarding the number of trucks contracted out for wood transport. Most carry out between one and eight wood hauling trips per month and average about 512 km/month. About 50% of the wood which is transported is generally medium diameter round logs. Most of the rest are large diameter round logs. The transport of firewood involves substantial distances and freights. Balochistan traders show the highest average distance travelled. Punjab traders, regardless of location, show the lowest average transport distance. This is due to the fact that they are in close proximity to farmlands from where they obtain the overwhelming majority of their supplies.

Transport costs figure prominently in the price structure of firewood. They account for 67% of en route and yard arrival costs. Costs are lowest for roadside traders operating closer to farm sources. The tariff structure used by transport agencies includes a fixed overhead and a distance-dependent freight cost. Average wood transport costs are estimated at Rs.0.53 per tonne-kilometer for a fully loaded 8 tonne truck. Transit taxes show wide variation per province. *Zila* and *Octroi* taxes vary from 9% in Sindh to 34% in the Punjab. The lowest percentage of taxes are paid by rural traders (12%), yet are not significantly different from the share paid by urban traders (17%), who may transport their supplies across *tehsil* and municipal boundaries. Compared to other costs, overall transit taxes take up the same share (16%) as costs involved in unloading and other yard arrival tasks. The fluctuations in transit taxes undoubtedly affect the price structure throughout the country.

Future Role of Wood Energy

Household energy projection model

An analytical demand projection model was developed based upon the HESS survey, and is structured upon the disaggregation of households into five groups representing principal energy consumption patterns. These groups correspond to rural/urban location, use of electricity and use of natural gas. Relationships between fuel consumption, and other demographic and economic data were statistically derived from the HESS database for each of these groups. Residential energy consumption patterns evolve as households move between groups, and as average household behaviour changes within groups. This evolution occurs in response to changes in the independent demographic and economic parameters. Some of these demographic and economic drivers consist of exogenous variables outside the domain of government energy policy (population growth, rural/urban migration, changes in household size, household expenditure growth, etc), and are modelled probabilistically. Other drivers represent government policies, such as fuel prices, gas and electric connection rates, appliance efficiency standards, and are modelled as user-defined choices.

Demand scenarios

Four different scenarios for estimating the long-term energy consumption for the household sector were defined as follows: (a) baseline scenario (b) accelerated natural gas and electricity connections scenario (c) economic pricing of natural gas and electricity scenario, and (d) improved electric end-use efficiency scenario. The baseline scenario assumes the continuation of current policies i.e. the number of new gas and electricity connections are according to GOP targets (adjusted according to actual achievements in the past), LPG networks in rural areas assumed at current level, kerosene and LPG prices bearing the same relationship to crude oil as in 1991, and prices of other fuel remaining unchanged in real terms. Under the accelerated connection scenario, the number of new gas and electricity connections are increased by 10% over the baseline case, up to a maximum of a 95% electrification/gas connection level. Under the economic pricing scenario, gas tariffs are doubled by 1998 (at constant 1991 prices), and this increases these to 60% of economic cost by the year 2003 (at expected crude oil prices, this value is approximately Rs.105 per Mcf), and subsequently increases these to parity with economic costs by 2008. Similarly, for electricity, the average tariff is increased to Rs.1.00/KWh in 1998, and to parity with economic costs (a levelized Rs.1.67/KWh) by 2003. Under the improved efficiency scenario, certain assumptions were made on efficiency improvements (and hence lower unit consumption) for lighting, fans and refrigerators.

Table 2

Pakistan: Household Sector Final Energy Demand

Fuel	Units	1991 Estimate	1991-93	8th Plan 1993-98	9th Plan 1998-03	10th Plan 2003-08	1991 Actual	% Error in 1991 Estimate Vs Actual
Electricity	GWh	9,923	11,552	16,527	23,987	34,440	10,455	-5.1%
Natural Gas	MMcft	55,815	64,980	95,259	139,675	203,724	60,531	-7.8%
LPG	MT	88,714	112,360	189,525	298,165	422,126	85,242	+4.1%
Kerosene	Mil Lit	565	596	621	642	682	564	+0.1%
Firewood	000 MT	29,913	32,217	38,582	44,605	51,111	29,380	+1.8%
Dung	000 MT	12,879	13,585	15,338	16,796	18,186	13,309	-3.2%
Crop Residues	000 MT	8,389	8,709	9,508	10,254	11,174	8,301	+1.1%

Source: Household Energy Policy Analysis in Pakistan, Final Report, May 1993.

Demand projections for baseline scenario

Table 2, presents the energy demand projections up to the year 2008 for the baseline scenario, based upon a number of macro-economic exogenous and policy variables, transition among different consumption groups and consumption patterns of these groups.

Trends and transitions

Significant trends in household energy consumption, and inter- fuel transitions are as follows:

- Electricity consumption increases nearly 350% between 1991 and 2008. Increasing incomes account for only about 15% of the increase i.e. if no more connections were added, total household electricity consumption would be expected to grow by about 50% over the same period. Connection rate is the principal driver of this increase.

- Natural gas consumption follows a similar trend. Per household consumption among users increases only by 20%, but the increase in connection facilitates the bulk of the 365% increase in total consumption.

- Alternatively, the increase in LPG consumption is driven primarily by the increase in household incomes. Increasing incomes allow households to move quickly from kerosene to LPG, or skip kerosene altogether as a cooking fuel and move directly from woodfuel to LPG.

- Although there is some increase in woodfuel use per household (of the order of 15-25% depending upon the group), the 71% increase in total woodfuel consumption is primarily attributable to population growth. The remaining growth in total consumption appears to be a result of inter-fuel substitution away from crop residues and dung, facilitated by income growth.

- Dung and crop residue use remains constant (or falls depending on the group) on a per household basis. However, population increases cause 41% and 33% growth in total consumption, respectively.

- Approximately 65% of households will continue to cook with biomass (though not exclusively), compared to 80% today. Biomass will remain an important component of the household fuel mix in Pakistan.

Wood resource management systems

With careful management and planning, woodfuel can offer a sustainable energy future for Pakistan's households. However, there is a transition to be made away from reliance on old-growth trees. Farm trees, deliberately planted and managed on private farmlands, must supply Pakistan's wood energy future. Woodfuel management is a challenging task. Policy efforts in the future should focus on supporting people's tree planting initiatives, inter-fuel substitution, and woodfuel conservation. The market is an important ally in this regard, and should not be undermined through subsidies or give-away policies. Tree planting is an essential component of a sustainable woodfuel system. The demand for timber, not woodfuel, drives farmers to plant trees, but woodfuel is a useful by-product of the timber market. Although resource markets are subject to periodic fluctuations, stimulating the demand for timber can help avoid a tree glut. The government should focus its attention on making commercial fuels more available in a cost-effective manner. No subsidies should be given to achieve this, but rather fuel supplies can be increased through reliance upon market forces, and public investments justified by benefit-cost analysis.

Employment opportunities and incomes

The traded woodfuel amounts to about 12.4 million tons in FY92, which represents 41% of the total woodfuel consumed in Pakistan. Woodfuel trading activity plays an important role in the economy by generating considerable employment opportunities. According to the HESS survey, there is a woodfuel business for every 2,500 inhabitants, and about 80,000 to 100,000 people are directly involved in this trade. The business generates about Rs.11.3 billion annually, which is equivalent to about 10% of the country's exports. Most of the traded woodfuel comes from private farms constituting a substantial earning for the farmers. It also constitutes a significant activity for the transport sector, as the effort is estimated to exceed 100 million tonnes-km annually.

Sustainable development and environmental protection

Discussion of forests and their benefits normally include an assessment of the environmental benefits to be derived from forests. These include such factors as reduced soil erosion, increased soil-water infiltration, reduced local temperatures, enhanced watershed protection, and aesthetic amenities. While these benefits normally accrue in the case of closed forests, they are normally outside of normal market forces. As a result, they justify a certain level of government intervention to protect and maintain forests. These benefits can be partially attributed to trees growing on private agricultural land. There is small reduction in soil erosion which can be attributed to linear and hedgerow plantations, and trees on private land certainly provide environmental amenities, such as shade. However, trees on private land do not provide the same level of public amenities as do closed forests. They behave, and should be treated in a manner similar to perennial cash-crops. Therefore, their harvesting and management should not be subjected to special government regulation, but rather left to the discretion of the private land manager.

The important lesson on sustainable development and environmental protection is two-fold. First, trees grown on private agricultural land should not be subjected to government regulation and interference. The land manager should be free to make decisions, and take actions relevant to their management as seen fit. Second, if the environmental benefits from forestry are really considered worthwhile, then they can only be achieved through forest management, protection and preservation. From this perspective, the Forest Department needs to redouble its efforts to manage the few remaining natural forests in the country. Only through the protection of these remaining forests can be environmental benefits from forestry be gained.

Woodfuel Trading and marketing issues

Tree planting and felling issues

According to the HESS survey, 125 million trees were planted by the private sector in 1990 and 10.8 million were felled: a ratio of 11.6 to one. This is close to the 10:1 ratio obtained by the Forestry Sector Master Plan (FSMP) farm tree survey during the winter of FY1991. This means that most farm trees are young and in their fastest growing stage, so that if present planting and felling practices are maintained, the farmlands will produce large amounts of wood in a few years time. This potential can be roughly quantified, in that according to HESS, a typical mix of farm trees on irrigated lands grows by about 13 kilograms of air-dried woody biomass per tree (including roots, etc.) per year over the first five years, increasing steadily to 19/kg/year at age eight years. If we assume a 70% survival rate, and the midpoint of these growth rates (16/kg/year), 125 million planted trees will grow by about 1.4 million tons each year. This is 4.3% of current total timber plus firewood consumption.

The growth rates and harvest ages (rotation periods) of tree crops are critical factors, but are extremely variable because of differences in site quality, management practices and species. Most measurements of tree growth are based on government plantations and may not be appropriate for farmland trees, as the latter may be better watered, fertilized and generally cared for, and more intensively managed. They are particularly inappropriate for the ubiquitous linear and scattered farmland trees. However, using the standard 'yield' tables, yields of major tree species in compact and linear plantations at different ages (5, 10 and 15 years) have been estimated at 12-17 m3/ha/year. There is also widespread agreement that the majority of the farmers harvest trees when they are quite young, long before these reach a size suitable for sawn timber, and before they achieve maximum annual increment. Reasons for this harvesting practice are: (a) farmers discount their investments, and when their trees are growing (adding value) at less than the discount rate employed, the economic logic is to fell and sell them (b) early harvesting of field boundary trees (plus wide spacing) reduces crop losses due to shading and water competition (c) high demand for woodfuel and for construction poles, as compared to timber, contributes to short rotation periods (d) lack of equipment to fell, cut up and transport large trees, and (e) large trees fetching a lower, price per unit volume compared to young and small trees, even though they have an intrinsically higher timber value.

Transportation issues

Wood trading involves large volumes of freight traffic, and the total transport effort in bringing wood to the traders' yards is estimated at 27 million tonnes-km. Retailers accounted for almost 96% of this effort. Based upon geographic considerations, very long haulage distances are involved in the case of Balochistan, and averages 138 km for roadside traders and 546 for rural retailers. For the same reason, the unit cost of transportation of wood is by far the highest at Rs.284-353/ton, as is the share of this cost in the total landed cost (27-35%). Other notable findings are the short haulage distances in rural Punjab and Sindh, and for the roadside traders in Punjab. This almost certainly reflects the relative abundance of farm trees and riverine forests. In Punjab, the short distances mean that transport is not a big factor in the retailers' costs for obtaining wood. In many instances, non-mechanized means are used for transporting wood to the traders' yards at short distances. The lowest transport costs--using mechanized transport--are for Karachi, largely because of the volumes and haulage distances, and because the truckers are able to return up-country with loads from the port. The unit transportation costs tend to be higher when the trip distances are short: this is because there is a fixed overhead for undertaking a trip, and a distance-dependent price. As the distance increases, the average cost per tonne-km falls. Another aspect is the availability of forward load from Karachi port; it has been observed that during times of arrival of ships with food grains or other bulk cargo, the availability of trucks for movement of woodfuel decreases.

Downstream cost and transit taxes issues

Based upon the HESS survey, transit taxes are found to have an important bearing upon the landed price of wood in the traders' yards. For the Punjab traders, these are estimated to be about 50% of the transport cost (less taxes), and overall they are nearly 100% on the same basis. The initial wood price (i.e. the price from the previous traders, or wood producers) ranges from 57% to 74% of the landed cost: very much the same proportion as with the retailers. A recent (1990) study gives data on transit taxes in NWFP which indicate that they typically amount to Rs.150 per ton (Rs.6 per maund) for air-dried wood, or approximately 30-35% of typical tree producer prices for firewood and small timber. The figures cited are the District Council export tax (z*ila* tax) of Rs.88 per m3, and the *octroi* tax of Rs.18 per m3. Assuming an air-dry wood density of 0.7 tons/m3, these total Rs.150 per ton. On top of this, there is the 12.5% sales tax levied on most retail goods. This is a large tax burden, especially for a primary commodity with a fairly low value added content, as opposed to finished manufactured goods. Furthermore, this burden is likely to be passed on to those with the weakest bargaining power, namely wood consumers or producers, since the traders and transporters are in a stronger position to maintain their margins and profitability. Also, the tax system is so complex and poorly understood that it is open to widespread abuse. Over-charging is made easier by the fact that tax rates often differ for woodfuel and timber even though these may be hard to define. There is a strong case for the government to review the transit taxes system with a view to reforming and simplifying it.

Infrastructure systems growth

In a general sense, lack of adequate infrastructure development in the country effects the woodfuel business in the same manner as it hampers other economic activity. Since the production centers are in far flung areas, a metalled road network and means of transport are necessary to bring the produce to the trading centers. The transport of woodfuel by mechanized means is a very low-priority item. Truckers agree to transport wood during their lean business periods, or on the backhauls to Karachi. The trucking industry itself is not organized on scientific lines, and general-purpose trucks are mostly used in the country. Woodfuel traders also rely upon primitive methods for loading and unloading the trucks, and mechanized/semi-mechanized equipment is not available.

Strategies for Wood Energy Development

Salient features

Because of the very nature of wood energy development, a comprehensive strategy transcending organizational boundaries has to be evolved. Such a strategy should facilitate the private-market mechanisms, rely upon community participation, promote efficiencies, and be based on the principles of social equity. The following are the salient features of a wood energy development strategy:

- Continue to offer households a broad choice of fuels for different end uses. There should be no forced government intervention for inter-fuel substitution; instead, irritants (government controls, levies) must be removed, so that the energy market can operate on a more competitive basis.

- The largest possible participation on the part of the private sector and the community must be obtained in implementing the strategy, and the government must restrict its role to that of facilitator.

- Seek alternative household energy systems and fuels that are of lowest economic cost to the country, and also ideally result in economic advantage to the household in the short and long-term, and promote these in the country through the most cost-effective mechanisms.

- Priority must be accorded to actions to replace firewood as a household fuel, partially, so that regional imbalances and the threat of deforestation can be averted.

- Maintain prices of petroleum products, natural gas and electricity for the household sector at their true economic values, but taking into account the welfare considerations of the poorer sections of the society.

- Rational use and energy efficiencies in the household sector must be promoted through a system of incentives.

- The household energy strategy should be institutionalized in the overall planning system, and progress should be monitored on a periodic basis.

Strategy components

The household energy strategy consists broadly of the mechanisms for managing and orienting energy supplies, the mechanisms for managing and orienting energy demand, and the institutional and community elements and/or agents participating in the promotion and implementation of the strategy. These mechanisms and institutional and community elements act in an integrated and complementary manner to achieve the overall objectives of the strategy. Within this broad framework, four specific programmes encompassing these components are as follows: (a) setting institutional responsibility and development (b) overall demand management (c) sustainable supplies and woodfuel production, and (d) commercial fuels infrastructure and inter-fuel substitution.

Setting Institutional Responsibility and Development

Setting institutional responsibility

It is important to recognize the importance of woodfuel consumption by the household sector in the overall energy mix of the country. This dominant position of biomass fuels also calls for designating an institution for the long-term development planning of the household sector. It is felt that the Planning Division (Energy Wing) should fill this role, and a specialized Cell should be created for this purpose. This Cell should have a multi-disciplinary team of planners. However, due to its very nature, it will have to develop formal links with a number of other institutions in the country like the utilities and energy organizations, the Forestry Wing of the Ministry of Environment, Federal Bureau of Statistics (FBS), Ministry of Food & Agriculture (MINFA), Pakistan Forest Institute (PFI), and others. In view of the inter-relationships between different ministries and government institutions, and to co-ordinate activities among various social and economic groups, it will be necessary to establish a Strategy Co-ordination Committee for overall co-ordination and supervision, and a Technical Executive_Committee/Household and Biomass Energy Units for actual implementation of the Strategy.

Strategy Co-ordination Committee

The principal responsibilities of this Committee would be: (a) defining and or ruling on all policy related matters of the strategy (b) supervising the implementation of the strategy and ensuring the implementation and completion of all proposed studies, tasks, pilot programmes, projects etc. (c) co-ordinating inter-ministerial activities and relationships, ensuring the maintenance of a collaborative environment, and (d) reviewing and approving the annual budget (prepared by the Technical Executive Committee/ Household and Biomass Energy Units) for the implementation of the strategy.

Technical Executive Committee/Household & Biomass Energy Units

The Technical Executive Committee for implementing the strategy would essentially be formed with the establishment of two units as follows: (a) a Household Energy Unit within the Energy Wing, Ministry of Planning and Development (leader unit) and (b) a Biomass Energy Unit in the Office of the Inspector General of Forests, Ministry of Environment and Urban Affairs. The two units, taken together, would constitute the Technical Executive Committee, and would perform the following functions: (a) technical preparation, implementation and monitoring of all the components of the strategy (b) preparation and submission of all the policy recommendations, operating guidelines, annual budgets and execution plans to the Co-ordination Committee for consideration and approval, and (c) to resolve any other technical or logistical problems.

Development and updating of data bases and analytical work

HESS and the Forestry Section Master Plan (FSMP) have provided an excellent starting point for creating a comprehensive data base on household consumption, biomass resources, and annual sustainable productivity. However, all these surveys were snapshots for a single year, and can say little about the changes which may be occurring over time. For example, consumption patterns are likely to be affected by changes in real incomes, technological innovations and efficiency improvements, and other socio-economic conditions. Similarly, woodfuel supplies from farmlands can be affected by crucial factors such as planting and felling trees, establishment of boundary trees versus block plantations, or farmers' attitudes to trees versus other agricultural activities. It is, therefore, important to establish regular surveys to collect key data on household consumption and biomass supplies (tree plantation, management, production, costs, revenues, prices etc.), using a consistent format for comparability of results. It is felt that the Federal Bureau of Statistics (FBS) and the Pakistan Forest Institute (PFI) should be involved, along with the Ministry of Food, Agriculture and Co-operatives (MINFA), in this exercise, so that the specialized strengths of these institutions could be utilized and data bases shared. Based upon these data bases, analytical work and technical studies would become possible.

Overall Demand Management

Energy conservation and demand-side management

Since the National Energy Conservation Center (ENERCON) is mandated to implement energy conservation and DSM measures, it is proposed that they are recognized as the focal point for the implementation of this component of the strategy under the overall supervision of the Strategy Co-ordination Committee. The following activities should be performed: (a) demonstration programmes on energy conservation should be implemented in selected residential buildings (b) information should be disseminated and advisory services made available to households (c) advisory services should be set up for architects, developers and construction contractors and they should receive appropriate training in this field (d) advisory services and training should be provided to households to better enable them to adopt fuel-efficient practices (e) technical studies on DSM measures for the household sector should be carried out, and (f) an extensive information dissemination and outreach programme for promoting energy conservation should be implemented. Since this function is already being performed by ENERCON, no extra costs are envisaged; however, close co-ordination should be maintained.

Efficient woodfuel stoves

Since woodfuel consumption represents a large proportion of the household energy mix, efficient wood stoves offer a great potential for rationalizing consumption and bringing it in line with supply. However, this option has not made a great deal of progress primarily due to the following reasons: (a) efficiency programmes have generally under-estimated the efficiency of the open-hearth or traditional 'chula', with the result that fuel-efficient stoves do not demonstrate the promised savings, (b) designs of the fuel-efficient stoves (dies of the high-mass smokeless stoves absorb too large a share of the heat to be as efficient as the simpler metal bucket design), and (c) inconvenience involved in using the fuel-efficient stoves. A designated agency (the National Energy Conservation Center), in close collaboration with the Energy Wing, should formulate a fuel-efficient stove programme for the household sector. The programme should start with a review of work done by many national and international agencies, in the country, notably ATDO, GTZ, etc. It should carry out a testing programme, and adopt stoves demonstrated to be efficient and convenient in other contexts. Information dissemination, practical demonstration, and diffusion in selected communities in target areas should also be carried out.

Equipment testing, standardization and technical assistance programme

An extensive programme on equipment testing, standardization and technical assistance is proposed to be undertaken through the Pakistan Standards Institute (PSI), the Hydrocarbon Development Institute of Pakistan (HDIP) and the National Institute of Power (NIP). This would be a continuous programme throughout the proposed length of strategy implementation, and should consist of the following major components: (a) development of equipment/appliance standards, especially with respect to equipment/appliances used by the households (b) development of test procedures and facilities for determining the conformity of the equipment/appliance to the approved standards (c) enforcement of standards (legislative and administrative cover, collection of samples and testing, approval or rejection of equipment/appliance, etc), and (d) providing technical assistance to trade associations, cottage industries, etc. in meeting standards. While PSI, HDIP and NIP are already performing this function to a certain extent, their facilities and infrastructure, however, need to be strengthened. A separate exercise would be needed to determine the investments required. This should not be included as part of the strategy implementation cost. It is, however, envisaged that one local consultant would need to be hired for one year to co-ordinate the activities between these institutions and the Household Energy Unit, and provide technical support, to set up this programme.

Sustainable Supplies and Woodfuel Production

With careful management and planning, woodfuel can offer a sustainable energy future for Pakistan's households. However, in order to have such a situation, a number of steps have to be undertaken as follows: (a) successfully make a transition from reliance on old-growth trees to farm trees, deliberately planted and managed on private farmlands, to supply major woodfuel requirements (b) proper woodfuel management has to be carried out, and policy efforts should focus on supporting people's initiatives at tree planting, inter-fuel substitution, and woodfuel conservation, without undermining it through subsidies or give-away policies, (c) stimulate the demand for timber in the country (75% of any tree ends as waste product which can be used for firewood) can help ensure sustainable woodfuel supplies (d) ensure consistent government pricing policies for household sector fuels (natural gas, kerosene, LPG), and increase the availability of household fuel, remove subsidies, promote efficient woodfuel stoves, etc. All of these steps would rationalize woodfuel consumption and bring it into balance with the sustainable supplies.

Conscious policy of no intervention by government

Governments can normally achieve little, if anything, by trying to intervene in the workings of privately-run woodfuel and timber markets. In Pakistan there is anyway little need to intervene, because the system of wood trading and transport appears to be working effectively and with good economic efficiency. The large number of traders and the diversity of transport and trading channels ensures a high degree of competition. Most traders are making reasonable but not excessive incomes from their businesses. Government policy should be to maintain this private market system with the minimum of intervention.

Promotion of farm tree plantation and social forestry

Land use alternatives are too important to be dictated by relatively narrow policy objectives such as increased wood production. Farmers should be free to make educated choices on using their land in the most productive and sustainable ways, which would often include a significant emphasis on tree growing. The approach of the government in promoting farmland trees should, therefore, follow a hierarchical structure leading from broad objectives to more specific tree oriented levels i.e. first, to devise policies aimed at promoting sustainable land use generally, second, to provide farmers with good and locally relevant information on tree growing as a business enterprise, and third, to provide incentives for social forestry so long as these do not conflict seriously with other land use objectives.

Improvement of information/advice to farmers on tree-growing and marketing

The quality and extent of information/advice to farmers on growing and marketing of trees has an important implication for sustainable woodfuel supplies and production. Some of the major deficiencies are related to inefficiencies in (a) the management of farm trees (b) the harvesting of trees, and (c) the manner in which the wood markets are operated. Advice through extension services, literature and broadcasts, etc, on these issues should be given a high priority in the development of strategies to promote farm forestry. Information may need to include species choice, management practices such as pruning, thinning and rotation periods for various products, estimation of tree volumes and weights at the time of sale, and decisions on whether to sell standing trees to a trader or felled trees delivered to buyers. As part of this approach, provincial forestry departments need to monitor the development of expected wood demand from new wood-based industries, including pulp and paper, to ensure that future supply and demand will be at least approximately in balance.

Replacement of subsidies, and improvement of credit facilities/financial incentives

Provincial forest departments have been promoting farm forestry by subsidies of various kinds. HESS and other surveys point out that farmers plant trees without the aid of subsidies, in the expectation of making good profits from sales to new wood-based industries. Furthermore, the economic analysis on block plantations versus major agricultural crops shows that subsidies in the first years of plantation establishment make little difference to economic competitiveness, which is dominated by the price of wood, tree growth rates and the discount rate employed. Policy-makers should, therefore, consider the replacement of subsidies by improved credit facilities for tree growing. Farmers can generally raise loans for agricultural crops, but find it difficult or impossible to raise them for tree crops. Central and provincial government forest departments should consider raising this issue with the Agricultural Development Bank and other lending institutions. Improved credit would have a similar incentive effect, as with subsidies, on tree growing without any charge on public funds.

Establishment of rural and semi-urban associations for firewood extraction

The HESS survey clearly indicates that almost the entire rural population using firewood is 'collecting' it rather than purchasing it. Woodfuel trading is confined primarily to large cities and towns. It is estimated that the uncontrolled collection of firewood from dead branches and discharged cuttings takes place throughout the rural areas. However, the country's forest resources and farm trees do not have the capability to generate the dead branches and/or cuttings in the required quantities, and illegal cutting is resorted to meet the firewood needs. The establishment among rural and semi-urban communities of associations for firewood extraction is a critical condition for reducing uncontrolled firewood exploitation. This step requires very careful consideration, as communities should be involved fully in the formation and running of these associations, and the government should only act as a facilitator. These associations should take into account the firewood supply conditions in their particular areas, develop organized extraction programmes, encourage monthly payments (stumpage fee), organize collection and use of this fee for creating economic opportunities in their community for women and children, who traditionally collect firewood.

Removal of restrictions/taxes on firewood movements

Federal and provincial governments should facilitate woodfuel trading by undertaking a country-wide review of taxes on wood transport across divisional/district boundaries, permits and payments for wood harvesting. The purpose of this review should be to remove restrictions on movements (if any), and to simplify and standardize the procedures. The revised tax and permit system should be widely publicized, for example, at all transport check points. The present tax system is onerous and reduces incentives for tree growing and effective marketing. it is grossly inconsistent and poorly understood, increasing opportunities for abuse and damaging exploitation of wood producers and traders.

Firewood transportation

The transport of wood in Pakistan typically involves high tonnages over large distances by 6 wheel Bedford trucks. Not surprisingly, transport costs are the largest component of the wood purchase prices, accounting for 67% of en route and yard arrival costs. A variety of animal-driven or tractor trolleys are also used for hauling farm wood to the traders. Costs are the lowest for roadside traders in Punjab and the NWFP, who operate close to farm supplies. Any government intervention in pricing diesel oil is bound to have a major (and undesirable) impact on woodfuel prices. The government may facilitate the utilization of large-tonnage fuel efficient trucks and simplify procedures for woodfuel movements, so that traders are able to do their business according to the market conditions.

Assessment and Planning exercises

Electricity and natural gas networks

Given current gas and electricity pricing for the household sector which is lower than the true economic cost, accelerating the rate of gas and electric connections will have high net economic costs, but will provide households with a higher level of welfare in non-monetary terms. The only way to determine whether this welfare gain is worth the economic cost is to set prices to the economic cost of the fuel, and let households decide for themselves. Therefore, connection rates should be accelerated only if households are paying the full economic cost. However, even with this qualification, steps should be undertaken to enable the expansion of electricity and natural gas networks to meet long-term demands. One approach to manage electricity demand is to combine policies for economic pricing and improved efficiency. This would reduce electricity consumption to 22.7 TWh in the year 2008, instead of the 34.5 TWh, estimated under the baseline scenario. Although this is still a 229% increase over the estimated 1991 consumption of 9.9 TWh, it is far less than the 348% increase of the baseline scenario. This approach may in fact be a matter of necessity if Pakistan's chronic power shortage persists. Similar policies should be adopted for natural gas supplies. However, whatever policies are adopted, the magnitude of infrastructure development work should not be lost sight of, and concerted efforts and budgetary allocations must be made to realize the targets.

LPG supply facilities

By the year 2008, total LPG consumption increases nearly five-fold under the baseline scenario. The importance of planning for LPG supply infrastructure, therefore, should not be overlooked. In the light of GOP's commitment to privatization, the private sector should be given a major role in the expansion of the LPG supply network. Investments will be required for: (a) port facilities to handle unloading/storage of large shipments by sea, to take advantage of economies of scale (b) trucks for transporting LPG from port storage to bottling plants (c) bottling plant, and (d) bottles. In addition, GOP should ensure that safety regulations are in place and strictly enforced.

Substitution of woodfuel with LPG

The main objective of this programme is to reduce the amount of woodfuel used for cooking by inducing a switch to LPG in certain target areas threatened by deforestation. Such a programme has to include two major components: (a) realizing technical improvements in the 'LPG cycle' that make the supply of LPG more reliable, and (b) organizing and executing a promotional campaign which is based upon a marketing strategy focussing on the lower-middle income class consumers. It is important that such a marketing strategy concentrates on women and their involvement in household energy supply.

Policy studies and formulation

Taxes on wood movements

As part of the household energy strategy implementation, it is proposed to undertake a detailed study to review country-wide taxes on wood transport, and requirements for permits and other payments. The study should propose simplified, consistent and transparent mechanisms, and levies so that firewood trade is promoted. Based upon the results of this study, policy changes should be brought about and provincial governments/local bodies should be advised to implement the revised procedures. The study is proposed to be undertaken by a team of local consultants during the first year of strategy implementation.

Credit facilities and financial incentives

A detailed study needs to be undertaken to evaluate the replacement of farm subsidies with credit facilities and other financial incentives to reduce the start-up costs and the effects of delayed returns from tree growing. Results of this study should form the basis for a policy on credit facilities for growing farm trees from the Agricultural Development Bank/Kissan Bank. This study should be undertaken in the first year of the implementation of the Household Energy Strategy by expatriate and local consultants. Based upon the results of this study, a pilot programme should be launched in a designated area of the country.

Cost of wood transport to Balochistan and Karachi

The wood transport survey has indicated an abnormally high transport cost for movements to Balochistan, and movements from NWFP to large southern cities of Hyderabad and Karachi. These costs could be severely affected with further increases in diesel prices or other factors. As part of the pilot programme, a study on this issue would result in a better understanding of the causes, and in the development of a policy response for the same.

Pilot programme

Farm forestry information dissemination and field research programme

Pilot programmes on improved information dissemination and a field research programme is proposed to be undertaken through the provincial forest departments in Punjab, Sindh and Azad Kashmir. These programmes should first evaluate the status of farm forestry, carry out farm income surveys (data on trees and crops, tree growth rates, wood and crop prices, land rents, etc), and analyse net returns per hectare for trees and major crops. Based upon the results of these surveys, policy guidelines and an information programme should be developed. This programme should be executed through extension services, literature and leaflets, and radio and television broadcasts. Information should be tailored to the specific area of the country, and should include choice of tree species, management practices such as pruning and thinning, estimation of tree volumes and weights, and on criteria for deciding whether to sell standing trees to a trader, or felled trees delivered to buyers. Since this programme is expected to be undertaken and implemented through the existing GOP infrastructure, no major costs are envisaged. However, it is anticipated that a consultant would need to be hired for designing the initial surveys, kicking-off the field work, and reviewing the information dissemination campaign during its first year of implementation.

<u>Establishment of associations for firewood extraction</u>

GOP, in collaboration with the Aga Khan Rural Support Programme (AKRSP) and the National Rural Support Programme (NRSP), should promote the establishment of associations for firewood extraction in a few target areas of relative firewood scarcity. Communities should be actively involved, and encouraged to organize woodfuel harvesting/collection, institute stumpage fee, and create economic opportunities, especially for women and children. Even though GOP's role should be limited to the facilitator, it should create conditions so that the economic activities in the rural areas become sustainable in the long-run. It is envisaged that GOP would target two projects per year (one in the Northern Areas, and the other in Punjab/Sindh) for the next five years. In order to launch this programme, it is envisaged that the services of a consultant are to be hired for one year.

Conclusions

Woodfuels occupy a very significant proportion of the overall energy mix, especially for the rural population of Pakistan. Even with large-scale extension of electricity and gas networks, woodfuels will continue to have this dominant role over the next 20-25 years. The household energy strategy proposed, therefore, has the major objectives of:

- continuing to offer households a broad choice of fuels for different end uses, and no forced government intervention for inter-fuel substitution,

- seeking alternative household energy systems and fuels that are of lowest economic cost to the country, and also ideally result in economic advantage to the household in the short and long-term, and to promote these in the country through the most cost-effective mechanisms,

- according priority to short and medium-term actions to replace firewood as a household fuel, partially, so that regional imbalances and threat of deforestation can be averted,

- obtaining the largest possible participation on the part of the private sector and the community in implementing the strategy, with the government acting only as the facilitator,

- maintaining prices of petroleum products, natural gas and electricity for the household sector at their true economic values, but taking into account the welfare considerations of the poorer sections of the society,

- promoting rational use and energy efficiencies in the household sector through incentives,

- removing irritants (government control/levies) from the woodfuel market, so that it can operate on a more competitive basis and

- institutionalizing the household energy strategy in the overall planning system, and monitoring progress on a periodic basis. The woodfuel market is considered a major ally in the implementation of this strategy, and since it is working effectively and in a cost-effective manner, the government is strongly advised against any intervention. However, it could act as a facilitator of the private-market mechanisms through the information dissemination and promotional programmes, and removal of fiscal barriers and physical constraints.

Appendix

Excerpt from: Boom and Crash: Farm Forestry in North West India

N.C. Saxena
Farm Forestry in North-West India: lessons from the 1980s. Ford Foundation, New Delhi

In response to soaring timber, pole and fuelwood prices during the 1960s and 1970s , farmers in north-west India responded with an explosion of tree-growing, mostly of eucalypts. Millions of farmers planted trees on field borders and marginal lands; medium and large-scale farmers also replaced field crops with woodlots, hoping to cash in as well as reduce rising labour costs and problems of labour management. The boom was supported by government forest departments and hundreds of millions of dollars from donor agencies for decentralized nurseries and other promotion strategies.

According to government figures, farmers across India planted over 8.5 billion trees during 1981-88. In one year (1983-84) 195 million farm trees were planted in Gujurat, increasing the stock of all farm trees by a factor of four. In Gujurat, Punjab, Haryana, western Uttar Pradesh and Karnataka the enthusiasm for tree planting during 1980-85 passed all expectations and took everyone by surprise; in many areas farm plantings increased 5- to 10-fold between 1982 and 1983 alone. The main reason was the hope of good profits from the sale of timber, poles and pulpwood but not from lower-priced firewood.

By 1986 problems began to emerge, leading to a crash in planting rates during the late 1980s as dramatic as the earlier boom. By the end of 1986 many farmers began prematurely harvesting or uprooting their trees and returning the land to field crops. A main problem was that, hoping to maximize output, they had planted their woodlots with very close spacings, typically with only 0.5 to 1 meter between each tree. The trees could not achieve the girth required for timber markets and had to be sold as construction poles. The pole market became saturated and prices fell steeply. For example, farmers who had initially hoped to earn Rs.100 per tree after 6 years could not get even Rs.10 per tree after 1986. Demand for pulpwood was limited as the mills were getting cheap wood from the forests at subsidized prices. Fuelwood prices were rarely sufficient to cover production costs. Furthermore, farm forestry programmes had no components to inform farmers on the marketing of trees while foresters without any market training often gave farmers inflated ideas about the prices they could expect.

A complex system of taxes and permits to harvest trees and transport wood exacerbated the price problem. In some areas, chains of as many as five agents had to be persuaded to sign chits of paper before trees could be cut or moved to market. Apart from reducing the margins to be made from wood trading, and hence producer prices, the permits and taxes helped the traders dominate the market to such an extent that they could often pay "distress" prices for trees. The majority of farmers could do little to correct this as they lacked the knowledge, contacts and time needed to "oil the wheels" of the bureaucracy which controlled the system. For the traders, on the other hand, getting through or round the hurdles imposed by the bureaucracy was just a part of their professional expertise.

PART 3 : ANNEXURES

1. ANNEXURE 1: COURSE PROGRAMME

1 October - Sunday

0900 - 1000 **Opening Ceremonies**

1000 - 1030 Inauguration Tea

1030 - 1300 **Introductory Session**

Objective: To present the rationale, objectives and activities of the course, particularly those pertaining to the workshop to be conducted at its end.

Topics to be discussed:

- Background, purpose and programme of activities of the course
- Instructions in the conduct of the country workshops:

  . criteria for country grouping (i.e. available data and information, policies and strategies, institutional infrastructure, and programme activities)
  . recommendations for national and regional level activities.

This part of the session was presented by Mr. Conrado S. Heruela, RWEDP

Paper Presentation:

Trade in Woodfuel and Related Products in Asia: An Overview by Mr.T.N. Bhattarai, Wood Energy Resources Specialist, RWEDP

Open Forum

1300 - 1400 Lunch Break

1400 - 1600 **Session I: Patterns of Supply and Use of Traded Woodfuels**

Objective: To discuss the patterns of uses of traded wood fuels, their sources and the systems for supplying them to various end users.

Topics to be discussed:

- Uses of Traded wood fuels

  . patterns of consumption (in households, industries, and enterprises)
  . impacts on energy consumption
  . other socio-economic impacts (e.g., foreign exchange, production costs of industries/enterprises, household expenditures, etc.).

- Supply of traded wood fuels

- sources of wood fuels (forests, agricultural lands, etc.); types of species; parts of tree used (e.g., branches and twigs, trunks, roots).
- types of production systems (forests, plantations, agroforestry, farmlands, etc.).

- Factors constraining wood fuel supply

Paper Presentations:

1. **Study of Wood Fuel Flows in Six Urban Areas of the Philippines** by Ms. Felicisima Ariola - Head, Policy and Program Development Section, Non-conventional Energy Division, Department of Energy, Philippines

2. **Wood Fuels Trade and Marketing in Pakistan** by Mr. Zamir Ahmed Deputy Chief, Energy Wing, Planning and Development Division, Ministry of Planning and Development, Pakistan

3. **Wood Fuel Flows in the Dry Zone of Myanmar** by U Saw Thun Khiang - Watershed Management for Three Critical Areas Project, Myanmar

Open Forum

1900 - 2000 Welcome Dinner: Pearl Continental Hotel - Peshawar.

2 October - Monday

0900 - 1300 **Session II: Issues in the Trading and Marketing of Woodfuels**

Objective: To discuss the factors that promote commercialization of wood fuels, how subsequently trading and marketing systems for wood fuels evolve and the consequent socio-economic and environmental impacts of these activities.

Topics to be discussed:

- Factors that promote commercialization(i.e., trading & marketing as a commodity) of wood fuels - e.g. unavailability and high cost of "modern fuels", household incomes, urbanization, source of rural income, fuel preferences, etc.

- Characterization of wood fuel flows - description of wood fuel trading and marketing systems (i.e. wood fuel gathering/harvesting, charcoal production, briquetting, and other conversion processes; transportation and distribution mechanisms; trading and retailing practices, and pricing schemes)

- Socio-economic Impacts (e.g. employment and rural income, gender aspects)

- Impacts on wood resources and other environmental affects.

Paper Presentations:

1. **Commercial Wood Fuel Supply in Cebu City, Philippines** by Ms. Elizabeth Remedio - Project Manager, Affiliated Non-con Energy Center, University of San Carlos in Cebu, Philippines.

2. **Marketing of Wood Fuels in Peshawar City, Pakistan** by Dr. K.M.Siddiqui, Director General, Pakistan Forest Institute, Peshawar, Pakistan.

3. **Charcoal Production and Marketing in Gujarat, India** by Mr.Prakash M. Shingi, Indian Institute of Management, Ahmedabad, India.

Open Forum

1300 - 1400 Lunch Break

1400 -1600 **Session III: Commercialization of Wood Fuels: Policy and Strategy Issues**

Objective: To discuss policy and strategy options to make the trading and marketing of wood fuels more efficient so that their potential as a "modern and commercial" energy option can be better exploited.

Topics to discussed:

- What are the future prospects of wood energy as a commercial fuel option?

  . as a “modern" energy source for households, industries and enterprises
  . as a strategy in enhancing wood production and resource management
  . as a source of income and employment particularly for rural areas
  . as a strategy for sustainable development and environmental protection

- How can the efficiency of wood fuel flows be ensured?

  . harvesting techniques
  . charcoal production and other fuel conversion processes
  . transportation mechanisms
  . distribution systems
  . role of government and private sector groups (community)

- What is to be done to ensure that the trading and marketing aspects are adequately covered in the assessment and planning for wood energy and in the policies and strategies for wood energy development?

Paper Presentation:

- **Policy and Strategy Issues in the Trading and Marketing of Wood Fuels -** by Syed Waqar Haider - Energy Consultant, World Bank, Pakistan Energy Option Study, Pakistan.

Open Forum

3 October Tuesday

0900 - 1600 Field Trip: Observation Tour of Wood Markets in Charsadda and Mardan districts.

- Interaction with woodfuel producers traders and consumers.

4 October - Wednesday

0900 - 1300 **Workshop: Improving National Capabilities to Assist Processors and Traders of Wood Fuels**

Objective: To identify regional activities and design a draft framework for national follow-up actions as well as to formulate recommendations to help improve national capabilities in assisting processors and traders of wood fuels maximize both their benefits from and their contributions towards making wood fuels an efficient, economic and sustainable energy option.

Group-1: South East Asian Countries: The countries which are already implementing projects and activities and other interventions to enhance the marketing and trading of wood fuels (and should have therefore conducted information collection/assessment and planning/policy studies on these aspects). The countries also share similar trends in wood fuels use as a source of domestic energy. They also possess, more or less, common cultural and socio-economic conditions.

Group-2: South Asian Countries: The countries which have at least conducted some information collection/ assessment activities and/or are now conducting planning and policy studies. These countries also face some common regional issues such as tremendous pressure on their vegetation resources which are a source of fuelwood for domestic energy, and they share, to a large extent, common socio-economic and cultural characteristics.

1300 - 1400 Lunch Break

1400 - 1530 **Plenary Session: Adoption of Recommendations**

1530 - 1600 **Closing Ceremonies**

1900 - 2000 Farewell Dinner: Pearl Continental Hotel - Peshawar.

2. ANNEXURE 2: OPENING ADDRESSES

2.1. Welcome address by Dr. Raza-ul-Haq, Central Silviculturist, Pakistan Forest Institute, Peshawar, Pakistan

Mr. Ismet Hakim, FAO Representative in Pakistan, Dr. Hulscher, Chief Technical Adviser, Regional Wood Energy Development Programme, distinguished delegates, ladies and gentlemen.

It is my profound privilege and pleasure to welcome you all, on my behalf and on behalf of the Director General, Pakistan Forest Institute, to this four-day course on Trade in Woodfuel Related Products. I am especially grateful to the Chief Guest for being with us at such short notice, in spite of an extremely busy schedule, to inaugurate this function. Most of you have travelled quite long distances: from Bangladesh in the east, down to Indonesia in the south east. I greatly appreciate your interest and am very happy that you could make it to the course.

I am particularly grateful to Dr. Hulscher, Chief Technical Adviser of RWEDP, who has come all the way from Bangkok to Peshawar despite the many other demands on his time and energy. This is sufficient evidence of his keen interest in the course. We are grateful to him for choosing the Pakistan Forest Institute as the venue for the course.

We feel privileged to host a gathering of such distinguished scientists and experts on trade in woodfuel related products from almost the entire Asia-Pacific Region: Bangladesh, China, Indonesia, Myanmar, Nepal, the Philippines, Sri Lanka, Thailand and Vietnam.

Ladies and gentlemen, a brief introduction as to the necessity of holding this four-day course will not be out of place. At present, 30-80% of the energy requirements of the Asia-Pacific Region are met by wood fuels. Due to the progressive increase in the share of non-wood fuels, the per capita consumption of wood fuels is decreasing but its aggregate consumption is increasing because of the increase in the over-all population of the region.

Improved databases, strategies to integrate wood energy into the national development programmes, training, case studies and pilot projects are some of the major activities of the Regional Wood Energy Development Programme. These are also high priority areas of interest of the Government of Pakistan. Pakistan has now a National Conservation Strategy and Forestry Sector Master Plan in place. It has also recently completed a Household Energy Strategy Study (HESS), which has clearly shown that wood is a major household fuel. The federal and provincial governments have recently launched massive programmes of afforestation and reforestation with the assistance of the World Bank and Asian Development Bank to meet wood energy and timber needs of rural and urban populations, to arrest degradation of the environment and watersheds and to improve human living conditions in the country. The FAO/UNDP in general and the Regional Wood Energy Development Programme in particular can assist Pakistan in a number of ways to realize these objectives of forestry development. We benefited from Phases I and II of the Regional Wood Energy Development Programme and hope to continue to do so during Phase III.

We welcome the holding of this regional course to disseminate the information already acquired from past studies to government and non-government organizations, and to identify follow-up activities that can help the member countries to maximize the benefits from trade and marketing of wood fuels, which are some of the major objectives of this course.

The weather is fine at present and I hope that your stay at Peshawar will be comfortable and beneficial. I also hope that a lot of useful information will flow among the participants during the deliberations of this training course.

I once again thank you all for being here with us and warmly welcome you.

2.2. Welcome address by Dr. W.S. Hulscher, CTA, Regional Wood Energy Development Programme, FAO, Bangkok, Thailand

Dr. K.M. Siddiqui, Director General of the Pakistan Forest Institute, Mr. Ismet Hakim, FAO Representative in Pakistan, distinguished delegates and guests, ladies and gentlemen.

It is my pleasure to welcome you on behalf of FAO-Regional Wood Energy Development Programme in Asia, on the occasion of the opening of this Regional Course on Trade in Woodfuel Related Products. I would like to express that I am delighted to be here, and honoured to address this audience.

It was in early May of this year that I had the pleasure of meeting with the IGF, Mr.Abeedullah Jan, who is one of the Focal Points of RWEDP in Pakistan, and Mr. Rafiq Ahmad, in Islamabad, together with Mr. Heruela, Wood Energy Planning Specialist of RWEDP. At that time we discussed many issues of wood energy development and Mr.Jan expressed his strong support for conducting this Regional Course in Pakistan. Further consultations with Mr. Siddiqui at Peshawar by Mr. Heruela were very fruitful, resulting in the establishment of an excellent co-operative relation between PFI and RWEDP. RWEDP has the highest regard for PFI and acknowledges its wide experience and its highly successful long-standing strategies and activities.

Five months of preparations have preceded this opening day, with important contributions from several experts and resource persons. I think the organization of this course is a fine example of co-operation between RWEDP, and the host country, Pakistan, as well as the FAO-Representative in Islamabad. But its success depends ultimately on the participants and experts in the meetings.

I would also like to acknowledge the contacts and consultations with Mr. Sheryar Khan of the Pakistan Council of Appropriate Technology, and representatives of the Energy Wing of the Planning and Development Division. It is not by accident that the present Regional Course takes place here in this country. Pakistan has always been, and continues to be, an active member-country of RWEDP. Several activities in wood energy development have taken place in Pakistan, or have been executed by Pakistani experts. Two years ago RWEDP published an important study by Dr. K.M.Siddiqui and Mr. Mohammad Amjad on "Marketing of Woodfuels in Peshawar City", the very location of the present course. We have benefited a lot from these activities. Also, the major household energy strategy study, which is closely related to wood energy issues, and which was conducted a few years ago in Pakistan, has greatly increased our understanding of the intricacies of wood energy supply and demand and wood energy flows. Therefore, it has been an obvious choice for RWEDP to bring delegates of its member countries to Pakistan, and particularly to Peshawar.

Further relevant studies, initiated by RWEDP, on supplies, flows and marketing of woodfuels have been undertaken by experts in Asia. A number of these studies will be summarized and presented to the audience in the coming days, as specified in the course programme. Bringing all these results and experts together in one programme will, no doubt, assist the RWEDP member countries to acquire an overview of the various aspects of trade in woodfuel and related products in the region.

The subject of woodfuel flows and related products, including markets and trade, is a most important subject in wood energy development. However, fully understanding and appreciating its complexities is not at all easy. Still it is necessary that we continue to study these issues, as an improved understanding is the basis for appropriate national and local policies which can effectively address the needs and constraints of both woodfuel users and woodfuel producers. We know that more than half of the population in South and South-East Asia depend on wood energy, and up to some 10% of the rural population derive their main income from the woodfuel business.

Altogether some 20 names are on my list for this course for the coming days, and the list does not yet include the additional names from Pakistan itself. The programme seems very interesting, including as it does important presentations from the distinguished resource persons and other specialists. As you will have seen, the programme also allows for discussions, as should be the case when an international group of experienced people are gathered together. Furthermore, field observations and some social activities have been scheduled. Thus, we have what amounts to, I think, a varied and attractive programme.

Ladies and gentlemen, allow me a few words about the FAO-Regional Wood Energy Development Programme in Asia.

Some of you may know that the RWEDP has been operational for many years, in fact since 1983. RWEDP is located in Bangkok, and is generously funded by the Netherlands Government. Last year, the third phase of the programme was started. This phase is a substantial programme of 5 years, in which 15 countries in Asia are participating. Altogether these countries are home to more than half of the world population, and most of them are in the same situation of being major woodfuel users. The thrust of the present phase is two-fold:

The first one is consolidating the achievements of the past by disseminating the results and findings to many more people. Many valuable results from previous studies are still not familiar to many people who can benefit from them. That means training, workshops, expert consultations etc., both regionally and nationally. It is our aim to have trained more than 2,000 people in various aspects of wood energy development, namely staff from governments and NGOs as well as private sector organizations, by the end of the third phase.

The second thrust of RWEDP is to initiate and support strategies to engage more systematically in wood energy policies and planning. In most countries, efforts have been made by governments and NGOs to relieve pressures on wood energy. However, often these efforts have consisted only of small and scattered projects and a larger framework of policy and planning has been lacking. The present phase of RWEDP aims to assist the member-countries to firmly incorporate wood energy into national and sub-national energy planning. This can, of course, only be achieved by the co-operation between energy planners and experts from the forestry departments who have the requisite expertise and background in wood resources. Co-operation should also be established with departments for agriculture, rural development, gender issues, and others.

When I refer to RWEDP, I refer basically to three specialisms. These are wood energy resources, wood energy conservation, and wood energy planning. They are all represented in the Regional Wood Energy Programme and they are all essential. You will appreciate that the specialisms are not only of a technical character, as many socio-economic aspects are closely intertwined with wood energy development. I mentioned already the many people who earn a living in the wood energy business. There are also the numerous people who depend on cheap woodfuels to meet their basic needs, but who are finding these resources scarcer and scarcer these days.

In wood energy development, we must aim to strike a delicate balance between policies for basic needs satisfaction, environmental concerns, employment and income generation, and balanced rural-urban growth, as well as other related policy areas. Altogether it makes wood energy development a complex and challenging subject.

The present Regional Workshop is fully funded by RWEDP. Ten more national workshops or demonstrations in related subjects are to follow in due course with partial support from RWEDP. Plans are being made by RWEDP, in co-operation with the member countries, to implement a number of national workshops. It is relevant to mention that a National Workshop on Trade in Woodfuel Related Products is planned for Pakistan, with support from RWEDP, sometime during the first half of 1996. This will be a follow-up to the present regional activity. Therefore, I am delighted to see so many delegates from Pakistan here. Another National Workshop in Pakistan is being planned by the Pakistan Council for Appropriate Technology, with support from RWEDP, for March next year, on the subject of rural wood using industries.

Furthermore, apart from these aforementioned workshops, RWEDP is also preparing for a number of regional and national courses in wood energy planning and wood energy conservation, and related activities.

I would like to thank the Government of Pakistan and the Pakistan Forest Institute for their hospitality, and wish all of you a very interesting and pleasant stay.

2.3. Inaugural address by Mr. Ismet Hakim, FAO Representative, Islamabad, Pakistan

Dr. K.M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar and his colleagues, Mr. Hulscher, Chief Technical Adviser of the RWEDP, and his colleagues who have come from Bangkok, distinguished resource persons, participants, ladies and gentlemen.

It is my pleasure to welcome all of you to Peshawar on behalf of the FAO representation in Pakistan. It is indeed a rare opportunity for us to receive such a large number of distinguished professionals and experts from the Asia region. For this I extend our sincere appreciation to the Government of Pakistan through the Pakistan Forest Institute, which has generously accepted the proposal to host this training workshop in Peshawar.

FAO recognizes the important role played by wood energy in Asia and gives a high priority to its integration into the policies and plans of all its member countries. In this endeavour the Government of the Netherlands has been very generous to FAO. It has supported FAO in the implementation of the Regional Wood Energy Development Programme in Asia since 1983 by providing uninterrupted financial assistance. The two earlier phases of RWEDP have unveiled many important facts and figures, which were either unknown or ignored in the past. In its current phase (1994-1999), the RWEDP intends to assist its 15 member countries (3 new member countries have joined the programme during its current phase) in the field of wood energy development by providing technical assistance, training and education in related areas such as policies and strategy, data assessment and planning, wood energy conservation and efficient utilization, woodfuel distribution and trade and woodfuel production.

As wood energy is intricately linked to the lives of many people, more particularly in the rural areas where its role is not expected to change very soon, this particular workshop aims to improve the capabilities of the government agencies and NGOs to assist woodfuel producers and traders in order to enable them to earn additional income from involvement in the wood energy sector. Recent studies show that the use of woodfuel in Asia is still increasing in absolute terms, and is expected to do so for many years to come. Considering the growing shortage of woodfuel in many different areas, and visualizing the adverse impact of woodfuel shortages on the economy and environment of many developing countries, FAO has already incorporated wood energy among the five priority concerns of the Tropical Forestry Action Plan (TFAP) in 1985. The earlier two phases of RWEDP contributed significantly to raising awareness about wood energy among senior policy makers and planners. Although wood energy is commonly cited as one of the "non-wood forest products", or the "minor forest products", it is the only and the most reliable source of energy for a majority of the population in most developing countries in Asia. For that matter it can be considered as the most important "forest product" for the majority of the people in rural areas. Even with the present energy use scenario, most countries in Asia already spend a substantial amount of their foreign exchange earnings to import commercial energy sources (i.e. petroleum fuel, mineral coal, etc.), mostly for use in the industrial, commercial and transportation sectors. The bulk of the energy used in the domestic sector, which is primarily used for cooking and heating purposes by the households, is being supplied from traditional sources. The rural households, village level processing and manufacturing activities and small scale cottage industries are predominantly dependent on traditional sources for their energy supply.

The wood energy sub-sector, besides making an important contribution to the national energy balance, is also an important source of income and employment for a large number of rural people, particularly the illiterate, the landless and the poor for whom there is virtually no other opportunity for employment and income generation. In developing countries with subsistence economies, where a large number of small and marginal farmers are below the absolute poverty line, the income and employment opportunity provided by the wood energy sub-sector must not be undermined. It should be noted that it also performs an important function by acting as a shock absorber during times of natural calamities and their associated distresses.

Therefore, the topics covered by the present training workshop are most relevant. The context in which the course is being organized and the country selected for hosting it, both seem most appropriate. As energy shortages have been increasingly felt by most RWEDP member countries, the pace of economic development in some countries has already been restricted or hampered due to insufficient energy to accelerate the rate of industrial development.

Ladies and gentlemen, the host country on the other hand, presents a unique example in the region. It is still heavily dependent on wood energy for the domestic sector (75% of household use traditional sources). Traditional sources contributed over 22% of total energy consumption in 1991, over 73% of woodfuels produced came from non-forest sources, mostly from privately owned land, and about 41% of total fuelwood consumed was traded. The woodfuel market is dominated by the private sector, where a large number of producers, wholesalers and retailers (between 80,000 to 100,000 people) are directly involved in this trade.

So you see we can learn a great deal from Pakistan. But this a forum for the exchange of information, exchange of knowledge, exchange of experience, within the member countries of the Asian Region and it is very important that in your deliberations you give the forum the benefit of your own knowledge and experience. You see we are promoting FAO’s policy, the so-called technical co-operation among the developing countries. We have to learn from one another. We know a lot about our own situations. So it is time to exchange not only relevant information but also the technical know-how, and to exchange experts from one country to another, for example from Bangladesh to Pakistan, from the Philippines, from Indonesia, from Nepal to Thailand to China, Vietnam and vice versa. This should be promoted vigorously and FAO is ready to support you in this endeavour. There is lot to learn from this region and you know that Asia is the fastest growing region in the world. It is developing very fast, so we should be pleased; and I call on you as the younger generation of experts in these countries to promote this technical co-operation among each other.

Mr. Chairman, Dr. Siddiqui, Mr. Hulscher, before I conclude I would like to extend my wishes for the success of the training workshop and wish a happy and memorable time for the participants in Peshawar. I stay here in Pakistan. I must say it is potentially a great country. So I wish to congratulate the leaders of this country for their efforts towards creating a stable and prosperous society.

Thank you very much.

2.4. Vote of Thanks by Dr. K.M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar, Pakistan

Mr. Ismet Hakim, FAO Representative, Dr. Hulscher, Chief Technical Adviser, Regional Wood Energy Development Programme, Mr. Heruela, Energy Planning Specialist, distinguished delegates, ladies and gentlemen.

Assalam-u-Alaikum

First, I would like to express my deep gratitude, on my own behalf and on behalf of the officers of this Institute, to the Chief Guest for kindly agreeing to inaugurate the Regional Course on Trade in Wood Fuel Related Products organized by the Pakistan Forest Institute in collaboration with the Regional Wood Energy Development Programme of the FAO Regional Office, Bangkok, Thailand. In spite of his many engagements in the Federal Capital, his presence at this function reflects the commitment of the Government and his keen personal interest in the promotion of forestry and forest-related activities in the country. We are also thankful to you Sir, for your inspiring Inaugural Address at this function.

We are also grateful to Dr. Hulscher, CTA, RWEDP and his team of experts for being with us at this four-day Regional Course. In spite of his very tight official schedule at the headquarters in Bangkok, his presence with us reflects his commitment towards the fulfilment of the objectives of the RWEDP. He has shown great dynamism and vigour as CTA in pursuance of the objectives of this regional programme of wood energy development which in highly important for almost all the countries in Asia. We are grateful to him for choosing PFI as the venue for the present course.

I extend my heartiest welcome to all the distinguished guests and participants of the course. It is a matter of great satisfaction for me and my colleagues to welcome the course participants hailing from the ten countries of Asia who have travelled from all over South-east Asia and the Pacific with great enthusiasm to actively participate in the deliberations of this Training Course. They will confer great benefits on the people of the region by exchanging their experiences regarding trade in wood fuel related products in the countries of Asia and they will help to promote knowledge and expertise in this field.

I fervently hope that all the course participants will enjoy a highly productive and comfortable stay at the Institute. I wish you every success in your deliberations.

Thanks.

3. ANNEXURE 3: CLOSING ADDRESSES

3.1. Remarks on behalf of the participants by Ms. F. N. Ariola, the Philippines

On behalf of the chairman and participants of the course, I would like to express our sincere thanks to the staff of the Pakistan Forest Institute, especially to Dr. Siddiqui, for so ably providing us with every facility during the course. I would also like to extend our expression of thanks to the Regional Wood Energy Programme for offering this four days workshop.

It has been a great pleasure to come to Pakistan and I would like to thank the organizers for making all the necessary arrangements for the conduct of the course, and not forgetting the transportation arrangements which were greatly appreciated. I would personally like to express my appreciation to all my fellow participants for so freely exchanging information and facts during the course and for offering me the benefit of their experience.

Thank you.

After this the Chairman of the session, Dr. K. M. Siddiqui, Director General of the Pakistan Forest Institute, Peshawar distributed certificates among the participants. This was followed by the closing address from the Chairman and closing remarks by Mr. T. N. Bhattarai, Wood Energy Resource Specialist, FAO/RAPA, Bangkok-Thailand.

3.2. Closing address by Dr. K.M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar

Ladies and gentlemen,

It is my real pleasure and honour to speak to you at this concluding session of the 4 days regional course on woodfuel. A few months ago when the Chief Technical Adviser of the Regional Wood Energy Development Programme (RWEDP) asked us if we would like to host this course we were over -joyed at the offer and accepted it readily. But we did not realise at that time that there would be such strong participation from a very large number of regional countries and were really pleasantly surprised when we received the list of participants from all the different countries. So it was a great pleasure for us to have all of you with us in this Institute for four days. We have tried our best to make your stay here comfortable and productive. I hope we have achieved this objective and if there was some mishap or some misunderstanding I hope you will forgive us for that. We are really grateful to the Regional Wood Energy Development Programme for providing us this opportunity to be host to you. Dr. Hulscher and his team Mr. Heruela and Mr.Bhattarai were very helpful to us during the organization of the course.

We have touched upon some very important topics during the sessions although they do not appear to be so when you move in the corridors of power in Islamabad, Khatmandu, Delhi or any where else. But it is very important to meet with the people who are living in the rural areas of all the countries of the region. It is very important to study woodfuel as a commodity. It is time that our planners and policy makers paid attention to this subject and did something to reduce the hardships and the miseries the people have to suffer, especially the weaker segments of the society, the women and children who have to bear the brunt of collecting fuelwood. As I told you before, it is really a pathetic sight which confronts me when I come out of my house in the morning, that is, small children and women collecting twigs and leaves from our research plots. We really need to begin to seriously address the needs of these people. It is this type of course which we have just completed which draws the attention of planners to these needs and which informs them about the issues related to this commodity, a commodity which helps to meet the basic needs of the poor segment of urban society and the people living in the rural areas. I hope all of you will take this message home with you and persuade your planners and policy makers to do something about this. I hope the Regional Wood Energy Development Programme with its team of experts will continue to assist, motivate and facilitate the development of wood energy programmes in the countries of the region through holding many more similar courses and workshops, and through the establishment of data bases and other things that we have mentioned during our meeting. So with these remarks I would like to thank the Regional Wood Energy Development Programme and its staff for holding this course in the Institute. I would like to thank our foreign participants for being with us. I hope your return journey will be pleasant and safe. I would also like to thank my colleagues from Pakistan who so diligently attended all the sessions and who actively participated in the deliberations of the course. I would, finally, like to thank my colleagues, my officers and the staff of the Institute for ensuring that all of the arrangements for this course were satisfactory.

I wish you all good luck and thank you once again for being with us.

3.3. Closing remarks by Mr. T. N. Bhattarai, Wood Energy Resources Specialist, FAO/RWEDP, Bangkok, Thailand

As Dr. Siddiqui pointed out, this course was arranged within a very short period of a few months. Nevertheless it has provided us all with a very good opportunity to exchange our ideas and experiences and to get to know each other. I am very grateful to our Pakistani colleagues for making such excellent arrangements for this course. First of all, on behalf of my colleagues at the Regional Wood Energy Development Programme, I would like to express our sincere appreciation to the Government of Pakistan and to the host institution, the Pakistan Forest Institute, who have put in their best to make this course a success. I am particularly thankful to Dr. Siddiqui, Dr. Haq, Mr. Asif Kamal, Mr.Iqbal and many more who helped us, as invisible hands, to make this course the success that it was. The deliberations were very useful for enhancing the awareness of professionals and administrators of the need to develop and support energy wood fuel programmes. With regard to extending co-operation I would like you to note that we certainly are trying to build-up institutions in the region which are playing a vital role in forestry as well as wood energy related issues. Indeed we are looking forward to having many more meetings and various kinds of fora to discuss the task of wood energy development in the region.

Thank you very much.

4. ANNEXURE 4: TYPES OF ORGANIZATIONS REPRESENTED AND COUNTRY OF ORIGIN AND PROFESSIONAL PROFILE OF PARTICIPANTS

4.1. Organizations

The majority of institutions which sent representatives to attend the course/present papers were government organizations concerned, in one way or another, with addressing issues related to the production, regulation, supply, trade and use of wood fuels. Except for the sponsoring body (Regional Wood Energy Development Programme, FAO/UN, Thailand), the remainder of the organizations were either forest departments, government bodies/ministries concerned with energy planning, supply/demand of fuelwood, and environmental issues, and research organizations and universities.

4.2. Country of Origin of Participants

In all, 32 participants from 10 countries of the region were registered and attended the course. Out of this number, 14 were Pakistani nationals. Of the 18 other participants, 3 represented the sponsoring organization (Regional Wood Energy Development Programme, FAO/UN, Bangkok) and 15 were from various South East Asian (including China) and South Asian countries with the following breakdown:

	Country	No. of Participants
-	Bangladesh	2
-	Philippines	2
-	Thailand	1
-	China	2
-	Myanmar	2
-	Indonesia	2
-	Vietnam	2
-	Nepal	1
-	Srilanka	1

4.3. Professional Profile of the Participants

The local and international participants attending the technical sessions had professional backgrounds concerned with planning, production, research and educational aspects of woodfuel supply, demand and trade.

4.4. Participants Attending the Inaugural Ceremony

The inaugural ceremony was also attended by Mr. Ismet Hakim, FAO, Representative, Islamabad (as Chief Guest) and senior research and teaching staff of the Pakistan Forest Institute, Peshawar. The officers of the Pakistan Forest Institute attending the inaugural session were directly or indirectly involved in teaching and research on various issues related to wood fuel production, supply and demand in Pakistan.

5. Annexure 5: List of Participants

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6. ANNEXURE 6: COURSE EVALUATION FORM

6.1. Pre-Course Information

a) Was the information sufficient for you to prepare yourself for this course?
Yes
No
If no, why not?

b) When did you receive the pre-course information(i.e. how many days before you departed for the course)?

c) Do you have any suggestions to improve the pre-course information and logistical arrangements?

6.2. Training Course Structure

a) Have the sessions contributed to achieving the objectives of the course?

Session I: Patterns of Supply and Use of Traded Wood Fuels
Yes
No
Other comments/suggestions:

Session II: Issues in the Trading and Marketing of Wood Fuels
Yes
No
Other comments/suggestions:

Session III: Commercialization of Wood Fuels: Policy & Strategy Issues
Yes
No
Other comments/suggestions:

Field Trip
Yes
No
Other comments/suggestions:

Workshop: Improving National Capabilities to Assist Processors and Traders of Wood Fuels
Yes
No
Other comments/suggestions:

6.3. Training Course Structure - Presentations/Discussions

a) Did the presentations/discussions contribute to achieving the objectives of the session?

Regional Overview: "Trade in Woodfuel and Related Product in Asia"
Yes
No
Other comments/suggestions

Session I: Patterns of Supply and Use of Traded Wood Fuels
Yes
No
Other comments/suggestions

"Study of Wood Fuel Flows in Six Urban Areas of the Philippines"
Yes
No
Other comments/suggestions

"Wood Fuels Trade and Marketing in Pakistan"
Yes
No
Other comments/suggestions

"Wood Fuel Flows in the Dry Zone of Myanmar"
Yes
No
Other comments/suggestions

Open Forum/Panel Reactions
Yes
No
Other comments/suggestions

Session II: Issues in the Trading and Marketing of Wood Fuels

"Commercial Wood Fuel Supply in Cebu City, Philippines"
Yes
No
Other comments/suggestions

"Marketing of Wood Fuels in Peshawar, Pakistan"
Yes
No
Other comments/suggestions

"Charcoal Production and Marketing in Gujrat, India"
Yes
No
Other comments/suggestions

Panel Reaction/Open Forum
Yes
No
Other comments/suggestions

<u>Session III: Commercialization of Wood Fuels: Policy & Strategy Issues</u>

"Policy and Strategy Issues in the Trading and Marketing of Wood Fuels"
Yes
No
Other comments/suggestions

"Panel Reactions/Open Forum
Yes
No
Other comments/suggestions

6.4. Training Course Objectives

a) Has the workshop achieved the following objectives it has set for itself?

- To network participants from governmental, non-governmental and/or private organizations who have been and will be further involved in the production and distribution (flow) systems of wood energy resources in RWEDP member countries.

  Yes
  No
  Other comments/suggestions

- To enhance their knowledge and understanding about the complexity, intricacy and linkages of various elements of these systems so that the specific role of every actor or element is duly recognized and incorporated into the planning process of different sectoral agencies affecting the national energy balance.

  Yes
  No
  Other comments/suggestions

- To develop country capacity to design and implement national workshops/training courses that recognize the role and contribution of the private tree owners, wood fuel processors and traders with the aim of integrating their needs and required assistance in sectoral development policy and plans so that a sustainable income, if not an increasing level of income, is assured from involvement in the wood energy sector.

  Yes
  No
  Other coments/suggestions

- To identify and plan a follow-up training activity at the national level, within the scope of RWEDP.

  Yes
  No
  Other comments/suggestions:

- Logistics, Infrastructure and Organization

  Please comment on your satisfaction or dissatisfaction with the following:

  - meeting rooms
  - secretarial services
  - payment of allowances
  - international travel arrangements
  - transportation within host country
  - accommodation

  Other comments/suggestions:

- Interaction of Participants

  Please comment on your satisfaction or dissatisfaction with the following:

  - Interaction among participants
  - Interaction between participants and resource persons
  - Interaction between participants and course organizers

  Other comments/suggestions

- Overall Course Evaluation

  Considering all of the above, what would you say are the STRONG and GOOD points of this training activity?
  Considering the same, what would say are the WEAKER points or AREAS FOR IMPROVEMENT of this training activity?

- Additional comments/suggestions

6.5. Participants Evaluation Sheet

Instruction: Before and after the course, please assess your present level of knowledge on the different aspects of the trade of wood fuels and other related products using a scale of 0 to 5, as follows: 0 = none to 5 = very much

Before the Course:

Knowledge of the Following :	0	1	2	3	4	5
overall regional situation on trade in wood fuels and related products						
general patterns of uses of traded wood fuels						
general patterns of sources of traded wood fuels						
usual supply and distribution systems for traded wood fuels						
factors contributing to commercialization of wood fuels supply and use						
olicy and strategy options for the efficient trading and marketing of wood fuels in order to exploit its potential as a "modern and commercial" and sustainable fuels						
the specific situation in your country on the trading of wood fuels and related products						

After the course:

Knowledge of the Following:	0	1	2	3	4	5
overall regional situation on trade in wood fuels and related products						
general patterns of uses of traded wood fuels						
general patterns of sources of traded wood fuels						
usual supply and distribution systems for traded wood fuels						
factors contributing to commercialization of wood fuels supply and use						
policy and strategy options for the efficient trading and marketing of wood fuels in order to exploit its potential as a "modern and commercial" and sustainable fuel						
the specific situation in your country on the grading of wood fuels and related products						

7. Annexure 7: Framework for Organising Field Observations

	Group 1 Wood production	Group 2 Woodfuel Distribution % Trade	Group 3 Woodfuel Market: Consumers & Users
Current Situation:			
Constrains:			
Possible Solutions:			