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**GENDER ASPECTS OF WOODFUEL FLOWS IN SRI LANKA:
A CASE STUDY IN KANDY DISTRICT**

Kandy, Sri Lanka



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FOREWORD

Wood energy sources and users are typically scattered over a wide geographical area. This situation is very different from coal or oil products, which come from one or a few sources only, such as a harbour, refinery, etc. Like other fuels, woodfuel is a commodity serving the users, but it is much more than that. Numerous different sources, actors, routes and markets are involved in the woodfuel flow system, and under a variety of local conditions they provide for the production, harvesting, processing, trading, transporting and retailing of the fuel. Thus woodfuel is a far more complex commodity than any conventional fuel. Indeed, the woodfuel business is somewhat unique in that it has many intricate linkages with the rural society and economy.

Studying the flow of woodfuels helps us to understand the socio-economic linkages and appreciate the real problems of this most important energy source. In Sri Lanka as in many other countries in Asia, woodfuel provides more than half of the country's energy. As such it is worth the attention of policy makers in various sectors, which include forestry, energy, agriculture and several other sectors.

Although the findings of Prof. Anoja Wickramasinghe refer to Kandy District in central Sri Lanka, her main conclusions are not unique to that area, and indeed point to many problems that are shared by other countries in the region. These include impediments to woodfuel harvesting and trade, the lack of encouragement to farmers to produce woodfuel for the market, the restricted but important role of women in the harvesting and processing of woodfuels, the male dominance in the commercial flow, and the adverse impacts on state revenues. The best way to improve the current situation would be to promote woodfuel as an easily tradable commodity. Similar conclusions have been reached in other woodfuel flow studies.

Prof. Wickramasinghe's report is one in a series of RWEDP woodfuel reports on woodfuel flows. Others include 'Woodfuel Flows: An overview of four studies' (RM No.30); 'Woodfuel in the Philippines - Production and Marketing, Baguio City' (RM No.41); and 'Woodfuel Flow Study of Phnom Penh, Cambodia' (FD No.50). There are also various RWEDP workshop reports on the subject. However, the Sri Lanka study is the first one to focus on the gender aspects of woodfuel flows. The results suggest that such a focus can provide a more comprehensive understanding of the issues at stake, including the health risks to which women are subjected.

It is a pleasure to thank Prof. Anoja Wickramasinghe and her colleagues, Mr. Tara Bhattarai and Mr. Conrado Heruela of RWEDP, and the numerous people who cooperated in the local interviews. Their efforts have resulted in a document that is highly relevant to policy makers and scholars alike.

Dr. Willem S. Hulscher,
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The field research presented in this report was made possible by the co-operation of many people, including those involved in the woodfuel trade, and the women who are engaged in gathering and headloading fuelwood for self-consumption. The people with whom this research was conducted spent a large amount of time answering our questions, broadening our understanding of on-the-ground situations and discussing their problems.

The members of the households, carters, traders, saw mill owners, woodfuel depot owners, representatives of industries, contractors, transporters and the commercial woodfuel suppliers that we visited and interviewed during the course of this research, entertained us graciously. This study would not have been possible were it not for their interest and participation. In addition to these numerous role players involved in the woodfuel flow process, I would like to express my gratitude to the field researchers for their consistent, dedicated and excellent work. My special thanks are due to Mr. P.B.S. Dissanayake, Ms. Rheka Niyanthi, Mr. Thilak Bandara, Mr. A.G.S.S. Nandana and Mr. Keerthi Rajapakse for their excellent collaboration and sustained interest.

I wish to thank Mr. S.M.B. Amunugama of the Department of Geology, the University of Peradeniya for the cartography work. I also greatly appreciate the cooperation of my husband, Mr. Ranjith Wickramasinghe, who made important contributions throughout the research - from the organization of the field investigations to the preparation of the report.

Finally, I wish to acknowledge the financial and technical support provided by the Regional Wood Energy Development Programme of the FAO. I am extremely grateful for the collaboration of Dr. W. Hulscher, the Chief Technical Adviser, and Mr. Tara N. Bhattarai, the Wood Energy Resources Specialist - their numerous comments and suggestions on the field methodologies and on the draft of this report were invaluable.

Although many people were involved in conducting the field research and in gathering information from various sources, I am solely responsible for the analysis presented herein and for any errors, omissions or inconsistencies in the report.

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FUELWOOD - CUT AND READY FOR SALE (A.W.)



SPLITTING FUELWOOD TO THE DESIRED SIZE BRINGS IN AN INCOME (A.W.)

EXECUTIVE SUMMARY

INTRODUCTION

Woodfuel is the primary source of energy in rural Sri Lanka but in the industrial sector consumption of woodfuel is limited to 18.2% of the total energy consumption. The ways in which woodfuel is distributed from production sources to the end users are little understood. Indeed the national wood energy picture currently available reveals little about woodfuel flows, particularly about gender related patterns of engagement in woodfuel related activities and other gender issues, or about the flow mechanisms that have a direct bearing on the commercial trade in woodfuel. Our limited understanding impedes our ability to plan and formulate strategies of local significance, to promote cash returns from woodfuel to both men and women equitably and efficiently, and to contribute to improving the living standards of those who are engaged in the woodfuel distribution process without remuneration or with only marginal benefits. Investigations covering the local situation are essential to identify local priorities of national and regional significance.

This manuscript presents the findings of a study conducted in Kandy district, Sri Lanka. Kandy district, according to previous studies, is a woodfuel deficit area. The national scenario constructed during the preparation of the Forestry Sector Master Plan (FSMP) in 1995 shows that the national demand for biofuel is about 9.1 million tonnes whereas the supply is about 9.8 million tonnes. In fact, Kandy district, like many others, reflects the crucial imbalances prevailing locally. Kandy is noted with its 57,990 hectares of land under homegardens, 58,490 hectares under tea, 6,020 under coconut, 3,860 under rubber, all of which contribute significantly to woodfuel production.

From the perspective of studying the gender aspects of woodfuel flows a wide range of situations has been taken into consideration. The first is the widespread phenomenon pertaining to free gathering for self-consumption. The second is the multiple production systems that cater for the local commercial woodfuel demand, particularly in the rural areas. The third is the flow of commercial woodfuel mainly from the producing areas outside the district to Kandy urban area.

The research was conducted by selecting Kundasale area, one of the administrative divisions of Kandy district, and the Kandy urban area where urban woodfuel depots are located and the commercial woodfuel business is concentrated. The study conducted in Kundasale area has enabled an examination of the activities pertaining to free gathering and the commercial flow of woodfuel mainly from local resources for local industries from the perspective of gender. The urban study has enabled an examination of the gender relations and the flow mechanism linking external suppliers and urban woodfuel depots, and urban depots and end users. The major findings of the study are presented in the following sections.

- **GENDER ASPECTS OF WOODFUEL GATHERING FOR SELF-CONSUMPTION**

The total number of households covered in this study is 105. Fifteen households each were selected from 7 villages. All 105 households depend on fuelwood for domestic cooking, all depend on free gathering and a few partly use commercial fuelwood and substitutes. The flow mechanism includes a number of activities such as harvesting, trimming and cross-cutting, bundling and carrying, splitting, and gathering deadwood. All households reported using multiple harvesting sources, but not all households use all sources. While all

households use homegardens, only 89 use fences/hedges, only 14 use other household lands and only 14 use non-household lands. This gave a total of 222 household records of use of the various sources. The involvement of men and women (not differentiating between joint or separate involvement) in the activities comprising the flow mechanism was investigated taking into account all four production sources. About 95% of the 222 records showed women to be involved in harvesting, while for men the figure was about 44%. For trimming and cross-cutting the figures are 31% for men and 100% for women. For bundling and carrying the figures are 26% for men and 100% for women. For splitting wood the figures are 43% for men and 97% for women. For gathering and carrying dead wood the figures are 8% and 100% for men and women, respectively.

This general overview reflects that among all activities, men's involvement is fairly high only in harvesting and splitting. In contrast, women's involvement is consistently high in all activities. The domination of women in the procuring of woodfuel for self-consumption points to the fact that the non-commercial flow is heavily associated with women's reproductive responsibilities and the conventional ideology which regards women as responsible for providing fuel for the home.

- **THE COMMERCIAL FLOW AND TRADE IN RURAL AREAS**

The commercial woodfuel in rural areas is for rural industries such as bakeries, the pottery industry, lime and brick kilning. The commercial flow of woodfuel is mainly from saw mills and household production systems, primarily homegardens. Trading and transporting are the two activities in the mechanism that take place between sawmills and industries. These are completely dominated by men. Delivery is by hand carters, tractors and lorries, which are considered beyond the domain of women's work. Although the number of households providing woodfuel for commercial channels was limited to 15 (nearly 14%), another 28 (26%) mentioned that they also contribute when trees are felled for timber and tree pruning is done at a stretch in homegardens. The commercial flow is dominated by men. Right from the level of trimming, cross-cutting and stacking, in the activities done at the sites where wood is harvested, men select the wood of market potential, women provide free labour as 'helpers'. Trade and transportation are attended to by men. None of these activities are free from the conventional ideology about the masculine and feminine nature of work. Men, with their greater mobility, are engaged in the work dealing with trade, transportation and cash transfer.

- **FLOW MECHANISM IN RURAL AREAS**

The rural trading system is rather complex. The system consists of producers, contractors, tree buyers, traders and transporters who undertake trading as well. The involvement of intermediaries depends heavily on the location of supply sources, woodfuel types and personal contacts with the buyers. An important role is played by hand carters who provide the cheapest mode of transport for the consumers. The earnings of various intermediaries vary widely. A generalized picture is that of the total amount paid by industries in rural areas, nearly 18-27% goes to hand carters while the producers' share is in the range of 73-82%. As earnings from woodfuel are low, it is not considered a profitable income venture. When whole trees are sold directly to the traders no extra payments are made to the producers for the parts traded as woodfuel. Trees are valued in terms of timber so there are no additional payments for the woodfuel. This implies that in the system of tree trade, fuelwood is a by-product only, so no value is added for the standing fuelwood segments. The general practice

of free gathering of branchwood, twigs etc. as fuelwood affirms that fuelwood is often seen as a by-product of trees.

The rural woodfuel trading system is informal and influenced by the demand for specific woodfuel types like round wood, split wood, logs, wood sticks etc. and their availability. None of the flow mechanisms add to the price given to the producer. It has been noted that it is slightly cheaper for industrial users to purchase woodfuel stocks from the suppliers and pay for the transportation rather than wait for doorstep delivery. The intermediaries engaged in trading and transportation do not make an exceptionally high profit. As hand-carts are owned by carters, they make a living out of it. As most of the tasks like harvesting, trimming and cross-cutting are attended to by household members the involvement of hired labour is minimal. Paid labour is often engaged when activities like high level branch pruning, and tree felling take place. Fuelwood from sawmills comes as a by-product, so no extra labour is employed. This implies that income from fuelwood sales earned by mills is quite similar to the returns for the homegarden fuelwood, and it is an additional income. It is difficult to simplify the local flow mechanisms and rural trading system because these are situation specific.

- **URBAN WOODFUEL FLOW**

Urban woodfuel flow mechanisms fully cover the trading system. This system is completely different from the trading system in the rural sector because it is interregional, it involves large scale trading and a delivery system from urban fuelwood depots to end users is also well marked. It was found that of all the woodfuel which comes to Kandy urban area nearly 76-88% goes to the consumers through fuelwood depots. All 11 fuelwood depot owners interviewed in this study are major intermediaries between supply sources and consumers. The woodfuel flow process can be characterized as consisting of two main divisions, the first involving the flow between the producers and urban wood depots where processing/splitting takes place, and the second involving the flow between the urban wood depots and the end users, and where another set of intermediaries is engaged.

Fuelwood is transported from the dry zone areas and rubber growing areas. In both cases forest wood and rubber wood is transported in large volumes and is mainly conveyed by lorries. Split wood from wood depots is delivered by bullock carts. Coconut husk is transported from rural areas to urban areas on a small scale by bullock carts.

The price paid for doorstep delivery per 1 kg of split wood is about Rs 2.40. The price at a production site varies tremendously according to size of logs, type and straightness etc. At the production sites the price received by the producer is about 0.31-0.43 cents. This implies that only about 13-18% of the price paid by the consumer goes to the producer, and the remaining 87% gets fragmented in the process. For good quality cross-cut wood nearly 0.90 cents is paid per kilogram at wood depots. Between contractors and urban fuelwood depots nearly 27% of the end price remains. At the wood depots where splitting takes place 56% of the price remains. Nearly 17% remains in the last segment related to retail deliverers, i.e. the carters. Among all intermediaries urban wood depots receive the highest returns for their involvement and 30-37% of the end price goes directly to the depots.

The outstanding feature here is the male-dominated mechanism. No women are involved in the trade, in processing and in the delivery system. Fuelwood trade is not conventionally accepted as women's work. The flows of fuelwood for self-consumption and commercial use reflect two contrasting situations. Although the domestic sector is the largest consumer, the

large-scale flow patterns with profit making intermediaries are in the commercial woodfuel trade in the urban setting.

- **POLICY ISSUES**

The commercial woodfuel flow, or the woodfuel trade, has to pass through a number of impediments. The most crucial ones are associated with state regulations on harvesting trees and transporting the fuelwood of some species like jak and forest wood. The adverse affect of these regulations is that transportation is controlled by permit holders, so neither the producers nor the end users can play a key role in making decisions. As harvesting permits are not valid for transportation, another cumbersome process has to be followed to get transport permits. Rather than going through such difficulties fuelwood is sold to illegal transporters who pay a relatively low price. In such situations the transportation cost is relatively high because the transporters secretly charge for the risk factor too. As a result of these conditions women are rarely engaged in the woodfuel trade, and they rarely consider the fuelwood trade a potential means of improving their income and earning opportunities. To help improve women's livelihood from the woodfuel business well-targeted policies need to be introduced to promote woodfuel as an easily tradable commodity. These would also motivate women to adopt woodfuel conservation measures and woodfuel saving devices.

On the one hand state policies, mainly woodfuel-related legislation, do not encourage farmers to produce fuelwood for the market. But on the other hand, such policies do not generate more revenues for the government. The income earning potential of fuelwood is not considered seriously by producers, mainly because it cannot be traded openly. For many, fuelwood is only a by-product and not a prime income source. The problems of inefficient, informal and irregular transportation are connected partly with the state regulations.

In the process of commercial woodfuel flow, women's roles are marginal, so the benefits of the trade are directly reaped by men. At local, national and regional levels, the goals of empowering women and improving their socio-economic status must be integrated into the policies and programmes related to wood energy development. 'Woodfuel trade' needs to be considered as a means to provide women with income earning opportunities. To achieve the broader goals of gender equity, a Regional Advocacy Network, 'RAN' is proposed under the umbrella of the RWEDP. The 'RAN' will take the initiative to help organise national networks. Further research is recommended to plan for the creation of the necessary institutional arrangements.

1. INTRODUCTION

1.1 PRESENT SITUATION

The importance of woodfuel as a primary source of energy is often associated with its widespread use in the domestic sector as the sole source of cooking energy, as well as in home-based and village-based industries. The renewability of woodfuel makes it economically attractive and its production has been widely promoted in order to save the expenditure on the import of alternative commercial energy types like petroleum, electricity etc. and to support local sustainability. International agencies like the RWEDP of the FAO have influenced Sri Lanka to address, particularly since the 1980's, the issues pertaining to woodfuel production, transportation, marketing and the efficient management of consumption at the national level.

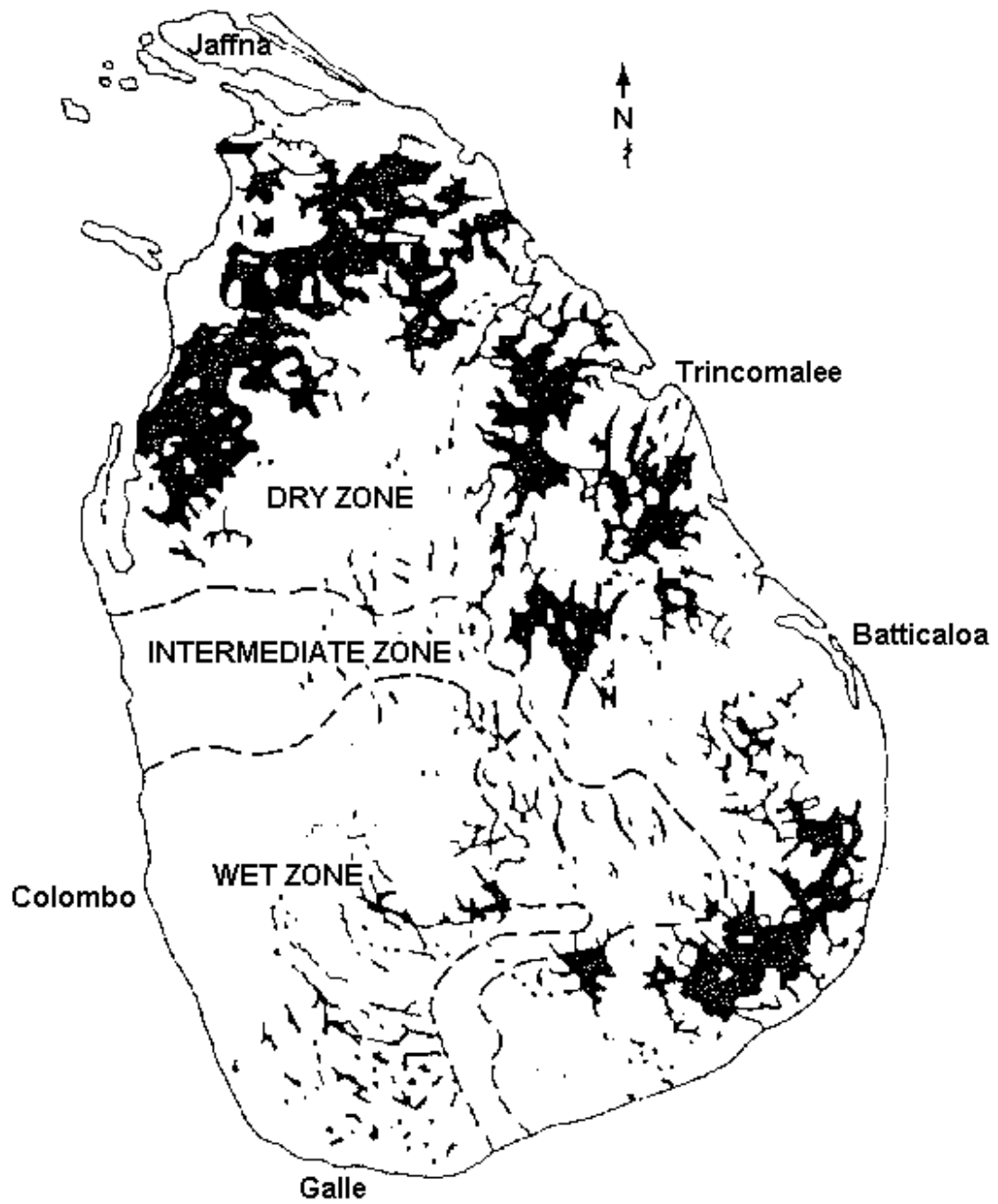
A significant attempt has been made to integrate the national concerns over fuelwood production into national forestry policies and improving non-forest production systems has been identified as a means to relieve the pressure on forests and to meet the people's woodfuel needs (Nanayakkara, 1990; and FSMP, 1995).

Biomass energy has remained a popular source of energy in Sri Lanka. The practice of using 'fuelwood', the non-converted raw wood, rather than converted woodfuel types like charcoal, has remained unchanged for generations. The most influential factor here is not the reluctance of the people to adopt converted types of woodfuel, but the practice of gathering fuelwood freely from whichever sources are available within an accessible distance. The advantage of using fuelwood, even in the situations where procuring and portaging are cumbersome, is that users do not have to bear the cost of raw materials, conversion, and transport.

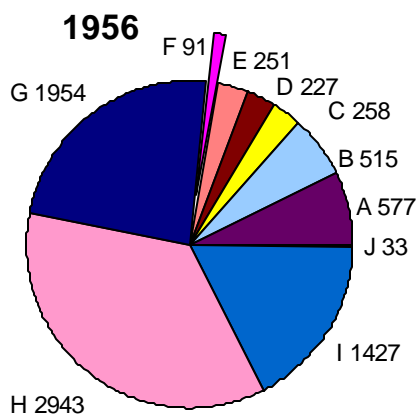
The consumption of a whole cluster of biomass including wood sticks, split wood, husks, crop residues etc. seems to be much cheaper than using one solid type of woodfuel, so, 'fuelwood' remains a common type of energy. The household sector consumes the bulk of the fuelwood in Sri Lanka because of its comparative advantages. It either incurs no financial costs or is cheaper to use. The end users, primarily the majority in the household sector, do not depend on external resources or delivery systems. The locally available sources and resources enable local people to satisfy their needs locally by allocating family labour for gathering and portaging. Under these circumstances, women's greater involvement in gathering fuelwood as part of their household responsibilities has tended to continue in rural areas.

However, there is a wide spatial disparity in the distribution of woodfuel sources like forests, tree crop plantations, homegardens, common lands etc. Further disparities exist in regard to fuelwood types, which include species as well as the type of biomass used. While more than three fourths of the country's forest cover is located in the dry zone (See Figure 1), the trends in landuse point to the fact that more and more forests and other land is being converted to non-forest uses including settlements (see Figure 2).

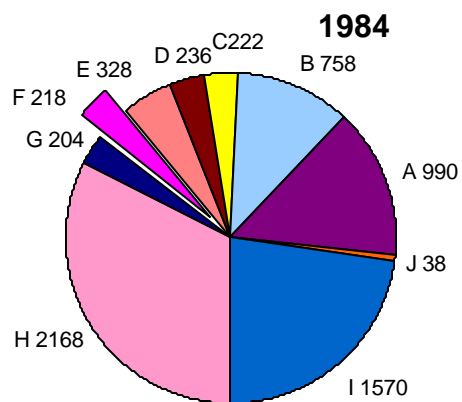
FIGURE 1 : SPATIAL DISTRIBUTION OF FOREST COVER IN SRI LANKA IN 1992



**FIGURE 2 : LAND USE IN SRI LANKA IN 1956, 1984 AND 1995
(IN THOUSANDS OF HECTARES)**



- A. Settlements
- B. Paddy
- C. Tea
- D. Rubber
- E. Coconut
- F. Other crops
- G. Unmeasured
- H. Forest
- I. Grass, Chena, Scrub
- J. Wetland



- A. Paddy & other annuals
- B. Sparsely used cropland
- C. Sugar cane
- D. Tea plantations
- E. Rubber plantations
- F. Coconut plantations
- G. Homegardens
- H. Other perennials
- I. Wetland & barrenland
- J. Urban land
- K. Natural forests & mangroves
- L. Forest plantations
- M. Other openland

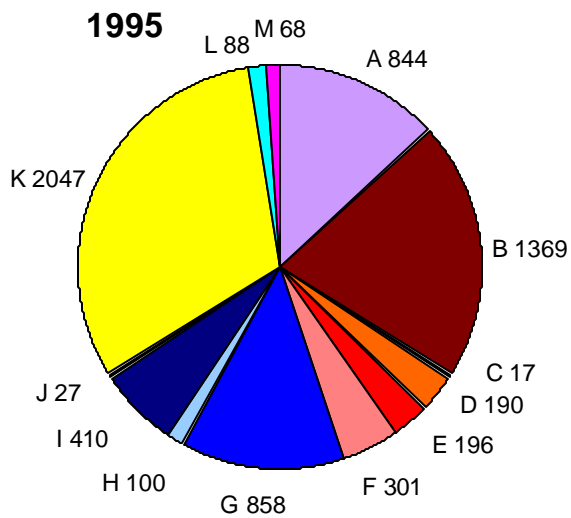


TABLE 1: LAND USE PROJECTIONS ('000 HA.)

Land use category	1995	2000
Paddy and other annuals	844.4	844.4
Sugarcane	16.8	16.8
Sparsely use cropland	1393.8	1436.1
Tea plantations	189.8	189.8
Rubber plantations	193.6	188.8
Coconut plantations	300.7	300.7
Homegardens	918.3	949.4
Other perennials	101.6	104.1
Wetland and barren land	410.3	410.3
Urban land	27.6	29.2
Natural forests and mangroves	1961.2	1834.8
Forest plantations	92.3	100.0
Other open land	65.3	111.3
Total	6515.7	6515.7

Source: FSMP, 1995.

According to FSMP (1995), if current trends continue a number of changes will take place (Table 1) regarding land use. Between 1995 and 2000 a clear expansion of sparsely used croplands, homegardens, urban land, forest plantations, and other perennials and croplands will tend to occur.

Similarly, a further reduction in the natural forest cover of the country and the conversion of some areas currently under rubber plantations to other uses have been predicted. How impacts of these losses/trends on the fuelwood situation should be addressed by introducing coping strategies into energy consumption behavior is an important issue pertaining to the country's regional development.

Although the forest cover has been continuously decreasing, Sri Lanka is fortunate when compared with other countries in the region as it has diverse sources of fuelwood supply. Of the total of 6.5 million hectares of land, the area under forests has been reduced to isolated islands. The total area under closed-canopy forest cover has been reduced from 80% in 1881 to about 24% in 1992. Based on the trends in the forest cover it has been projected that the natural forest cover of the country (exclusive of riverine, sparse forest and mangroves) will be about 22.8% in 1995, and it will be further reduced to about 21.3% by the year 2000. When compared with the proportion of the population depending on fuelwood, which is about 93.8%, the decreasing forest cover points to two crucial consequences: high pressure on the available sources of supply and fuelwood scarcities.

As a result of the depletion of forest resources, their contribution to the fuelwood supply has been reduced. The supply as a whole is dominated by non-forest production systems (see Table 2). The country must be well-equipped not only to match the demand and supply but also to ensure that the systems of fuelwood flow are maintained to satisfy the consumers and producers and to address the issue of spatial disparities.

TABLE 2: ESTIMATED SOURCES OF BIO-ENERGY SUPPLY

Source	Percentage share
Homegardens	26
Cropland	19
Coconut	19
Rubber	7
Processing residues	3
Natural forests	7
Forest plantations	4
Others	14

Source: FSMP, 1995

1.2 CONSUMPTION PATTERNS

Despite the well-marked spatial disparities in the distribution of production sources, the share of bio-energy in total energy consumption has been exclusively high when compared with other types like petroleum and electricity. In 1992, for instance, bio-energy accounted for about 66% of the total energy consumption in Sri Lanka (see Figure 3). Bio-energy comprises fuelwood (67%), and crop residues (33%). According to the surveys carried out in 1993 for the preparation of the Forestry Sector Master Plan (FSMP), fuelwood alone contributes nearly 44% of the country's total energy consumption, while crop residues, mainly from coconut, contribute nearly 22%. The important changes in the energy consumption patterns are connected with the increased demand for energy since the 1970s. Its consumption has increased an average of 2.33 percent per year between 1982-1992. The increase in consumption in the household sector has been faster than that in the commercial sectors. The household sector consumed 81% of the bio-energy in 1992, while the industry sector used nearly 16%. The implications of these figures for fuelwood production, flow and commercial use are crucial, because in spite of the depletion of forest cover and the expansion of settlements etc., national fuelwood requirements are on the increase. The total fuelwood consumption by households was nearly 8 million tonnes in 1993. However, the forestry sector shows that its contribution to the energy sector has not been fully recognized.

While a number of commercial energy types are used in Sri Lanka, woodfuel has remained critically important in the domestic sector (See Table 3). According to the Forestry Sector Master Plan, the total consumption of bio-energy by households in 1993 was estimated at about 8.15 million tonnes, and this is to be increased to 8.82 million tonnes in 2020 (FSMP, 1995). The estimated consumption by the industrial sector is to be 1 million tonnes. The same estimates have shown that between 1993 and 2020 the tendency in the household sector is for consumption to increase from 8.15 million tonnes to 8.82 million tonnes;

whereas in the industrial and commercial sectors the tendency is to decrease consumption from 1.02 million tons to 0.82 million tonnes between 1993-2020, due to the adoption of improved technology and efficiency. Although the expected increase primarily in the household sector does not point to a dramatic increase in demand, with the depletion of forests and the conversion of lands to settlements etc. the share derived from homegardens, coconut, rubber and croplands comes to about 71% of the total supply. Under the present conditions the non-forest production systems are the major supply sources.

This situation suggests a few defining features. The first is that production is heavily dependent on the private sector, both on small-scale units of production and tree crop plantations. The second is that while a spatial imbalance in production is determined by the land use, the consumption patterns are associated with the distribution of population, and industrial and commercial activities. Improving the flow of fuelwood is a way to smoothen out the acute scarcities faced by the end users and excess production, and also the spatial imbalances.

TABLE 3: THE SECTORAL ENERGY SUPPLY AND CONSUMPTION

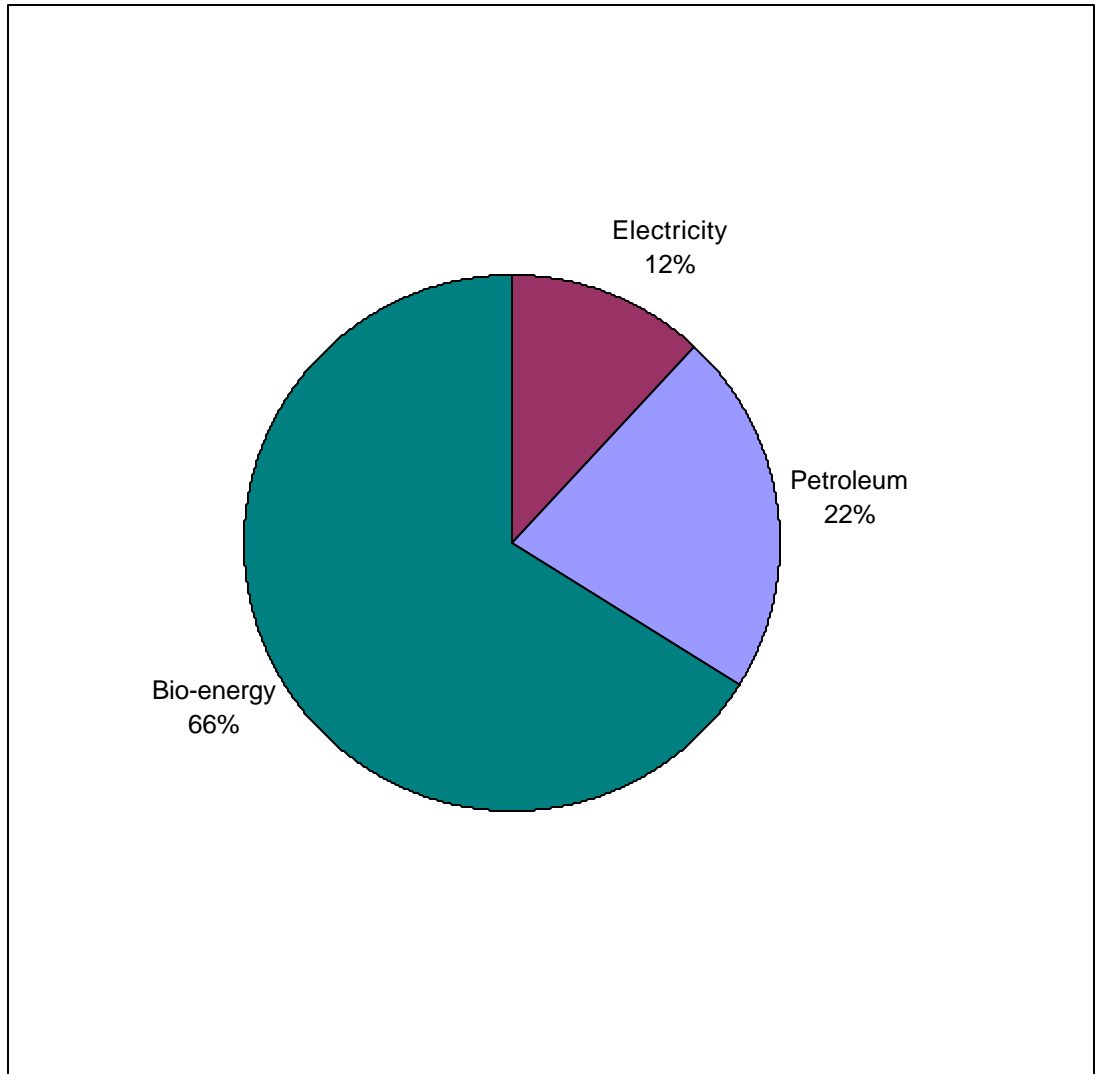
	Household sector %	Industry sector %
Fuelwood and other bio-energy	87.5	59 (includes agro-residues)
Hydro-electricity	6.6	25
Oil	--	16
Kerosene	4.8	--
LPG	1.1	--
TOTAL	100	100

Source: Sri Lanka Energy Balance, 1992.

According to the results of the survey conducted in 1993 for the preparation of the FSMP, other types of energy are slowly being substituted for bio-energy due to the increasing cost of fuelwood. The consumption of fuelwood by the industrial and commercial sub sectors in 1993, shows that the tea industry is the main consumer (see Table 4). The spatial distribution of these industries and commercial sectors tends to decide the patterns of commercial woodfuel flows and the concentration of trade and processing activities.

The analysis of the present scenarios and trends in the woodfuel sector and of the projections made for the preparation of the FSMP in Sri Lanka indicates that 8 administrative districts experience woodfuel shortages. Sixteen districts are noted to produce surpluses, while in one district, the Kandy district, demand and consumption are almost equal. The overall country situation in 1995, according to the FSMP projections, was favourable, because while total demand was projected at 9.2 million tonnes of biomass energy the country's supply was projected at about 9.8 million tonnes. Projections for the year 2020 indicate that the country will continue to produce a surplus. While the demand is expected to be about 9.7 million tonnes per annum, the biomass supply will be about 10.1 million tonnes. In such a scenario biomass accessibility and biomass trade mechanisms will have important implications for woodfuel consumption.

FIGURE 3: ENERGY CONSUMPTION SHARES IN 1992 BY TYPE



1.3 SPATIAL PATTERNS IN THE FUELWOOD FLOW

The flow of fuelwood from production areas/systems to the consumers is controlled by intermediaries. Fuelwood availability as well as its scarcity are complex issues. Both depend on what types of fuelwood are needed and on the level of consumption. Biomass fuel as a whole comprises dense wood, small branchwood, twigs, wood shavings, crop residues etc. The users' selection tends to vary according to the use, while the traders' choice depends on the transportability, profitability of sales, and the market. The type of fuelwood available for transportation or random gathering cannot be generalized because in most cases the flow patterns are determined by what is available, preferred and demanded by the end users.

TABLE 4: ESTIMATED CONSUMPTION OF FUELWOOD BY THE INDUSTRIAL AND COMMERCIAL SUB-SECTOR IN 1993

Sub-sector	Consumption ('000 tonnes)	% share
Tea curing	455	43.2
Hotels & eating houses	164	15.6
Brick & tile manufacturing	150	14.2
Coconut	51	4.8
Bakery	99	9
Rubber	72	6.8
Tobacco	13	1.2
Others	49	4.7
Total	1,053	100

Source: FSMP, 1995.

Howes and Endagama (1995), based on an extensive study conducted in Sri Lanka, divided the fuel used by domestic and industrial consumers into 3 categories. These include 'exportable fuelwood', 'other fuelwood' and 'other fuel'. The 'exportable wood' comprises rubber wood, and coconut and forest wood and accounts for nearly 57.8% of the total, which is equivalent to about 9,556.5 thousand tonnes. In fact this category accounts for almost all the industrial biomass fuel and the greatest portion of transacted fuels.

The 'other fuelwood' category which comprises many types of fuelwood coming from homegardens, croplands etc., accounts for nearly 12.8% of the total, which is equivalent to 2,128.3 thousand tonnes. The category referred to as 'other fuel' comprises crop wastes and is made up of coconut by-products from plantations and homegardens and accounts for nearly 28.8% of the total, which is equivalent to 4,759.1 thousand tonnes.

As 'exportable fuelwood' comes from large-scale production systems which are primarily located in the wet zone and from the dry zone forests (see Figure 4), industrial and commercial consumers heavily depend on the systems of trade and market flows. The availability of 'other fuelwood' and 'other fuel' depends on the locality, resource distribution etc. The flow patterns are connected with the location of producing areas relative to consumers and the type of fuelwood available and needed. The flow patterns are interregional and intra-regional as well as local. The four districts in the hill country,

according to the analysis of Howes and Endagama(1995), are among the fuelwood deficit areas. The national scenario constructed by these authors divides the country into 5 zones on the basis of the fuelwood balances - which refers to the total production less the total consumption (see Table 5). In preparing the national scenario the following features have been taken into account :

- i Overall biomass deficit areas - where consumption exceeds production and a large amount of fuelwood has to be imported;
- ii Fuelwood deficit areas - the gap between production and consumption is not so wide, some quantities are imported;
- iii Self sufficient areas - an overall balance is noted and no exportable surplus is available;
- iv Rubber wood exporting areas are noted with a significant surplus of rubber wood so export is significant;
- v Fuelwood exporting areas - sufficient surplus of other forms of fuelwood is available to export;
- vi Potential exporting areas - at present an unutilized large surplus of exportable fuelwood is available.

Data presented according to the above categorization reveals that the issue is not the deficit at national level but the spatial imbalances among production and consumption areas that have to be smoothed out through appropriate transport mechanisms. Moreover, the balance between production and consumption depends on the distribution of forests, the non-forest production systems with fuelwood producing potential, and the consumption. The exportable commercial woodfuel supply is dominated by natural forests, rubber and coconut. The bulk of commercial fuelwood comes from natural forests, so in the flow patterns, fuelwood transportation from dry zone forests to the wet zone can be noted. Rubber wood is exported mostly for industrial and commercial uses, so, among non-forest fuelwood, it dominates the commercial flow.

The present situation points to a number of important features. The first is that even where fuelwood is not scarce at the national level, the intra-regional spatial differences in the distribution of resources, resource ownership patterns and demand can lead to fuelwood scarcities among users and to excess production. The second feature is that where conventional practices like free gathering of multiple products are continuing, a greater transition from free gathering to commercialisation cannot be expected, although flow patterns can be traced. The third feature is that there is no complete picture regarding the locally prevailing patterns in the fuelwood flow due to its wider use to meet the needs of daily life and of the village-based industries which do not operate under formal systems. The fourth feature is connected with the informal and irregular nature of the fuelwood flow from the production areas to the market areas. The final and most crucial feature is the dependence of the market flow on intermediaries while free flow systems are dominated by women. A proper coverage of these cannot be provided without a broad field investigation over a long period of time which takes into account diverse spatial situations.

1.4 PURPOSE AND SCOPE OF THE STUDY

The purpose of the field investigation, conducted in Sri Lanka between October 1996 - July 1997, was to examine men's and women's roles in the woodfuel flow mechanism as well as their patterns of engagement in woodfuel related activities. These activities include harvesting, trimming, wholesaling, transporting, processing and marketing etc. and are (or at least some of them are) subjected to gender specific divisions of labour. The flow mechanism includes the flow of woodfuel through market channels for household consumption, industries and other commercial uses as well as the free gathering and portaging from supply sources to consumption areas/units.

FIGURE 4: THE SPATIAL FEATURES RELEVANT TO WOODFUEL PRODUCTION BY DISTRICTS



TABLE 5: AREAS WITH WOODFUEL SURPLUS AND DEFICIT BY DISTRICTS

Category	District	Zone	Overall balance '000 tonnes ¹	Fuelwood balance '000 tonnes ²	Price rank
Overall deficit	Colombo	Wet Low	-373	-399	5
	Kandy	Up-country	-333	-436	7
	Gampaha	Wet Low	-228	-210	4
	Nuwara Eliya	Up-country	-176	-292	1
	Badulla	Up-country	-90	-172	2
Fuelwood deficit	Matale	Up-country	4	-34	12
	Matara	Wet Low	71	-85	8
	Galle	Wet Low	77	-52	18
	Jaffna	Dry	81	-172	9
	Hambantota	dry	111	-9	10
Self-sufficient	Batticaloa	Dry	123	86	5
	Ratnapura	Wet Low	270	56	11
	Kurunegala	Wet Low	774	72	14
Rubber wood exporting	Kalutara	Wet low	178	177	16
	Kegalle	wet low	403	240	13
Fuelwood exporting	Amparai	Dry	591	584	19
	Mullaitivu	Dry	853	808	22
	Polonnaruwa	Dry	808	789	23
	Anuradhapura	Dry	809	792	24
	Monaragala	Dry	1110	1064	17
Potential exporting	Trincomalee	Dry	513	517	20
	Mannar	Dry	570	477	15
	Vavuniya	Dry	578	568	21
	Puttalam	Dry	640	405	3

Source: Howes et. al., 1995.

¹Includes both fuelwood (e.g. rubber wood, coconut wood) and crop residues (e.g. tea clippings, coconut leaves); ² Includes only fuelwood

The scope of the study covers the identification of the multiple activities undertaken by men and women in the woodfuel flow and the determination of the levels of their involvement in these activities and the roles they perform to sustain flow mechanisms. But it should be noted that the presence or absence of specific gender patterns in the collection of fuelwood for self-consumption and in trade are of equal importance for the development of wood energy.

Two geographical areas were selected for the study. These include:

- I. Kandy urban area - where interregional trade takes place. The administrative centre of the district is the location of woodfuel depots, transporters, centres dealing with processing, wholesaling, delivering and retailing. The involvement of intermediaries is clear in the transportation in the commercial flow systems. These reasons made Kandy an ideal choice for detailed investigation to construct an urban woodfuel flow scenario. Another specific factor influencing this selection is that the Kandy district scenarios constructed for the FSMP, and by Howes and Endagama (1995), reveal some contradictions regarding the fuelwood balance.

- II. Kundasale - located in the outskirts of Kandy urban area. After a reconnaissance visit Kundasale was selected for 3 reasons. The first is that a range of woodfuel based industries is located in the area so the system is marked by specific consumption patterns, especially in terms of fuelwood types. The second reason is that its rural setting offered opportunities to investigate a range of activities related to harvesting and processing which could not be fully covered in an urban area. The third reason is that the preliminary visits to the area revealed that it was suitable for investigating intra-regional flow mechanism which could broaden our understanding of the local woodfuel trade. To understand the links between gender specific patterns in the division of activities and woodfuel flow mechanisms it was necessary to observe the situations where men and women were directly involved in woodfuel related activities.

The selection of Kandy urban area and Kundasale Administrative Division was complementary in that they helped the researchers construct a comprehensive picture which included both internal and regional flow mechanisms. The investigation in Kandy urban area helped the researchers construct a picture of the interregional flow mechanisms. This area is characterised by a large-scale flow from remote production areas to the wholesalers, and then to an internal delivery system. The management of the flow is in the hands of the intermediaries.

The investigation in Kundasale helped to develop an understanding of how the woodfuel flow is linked with local mechanisms which operate informally and are controlled by a number of small-scale woodfuel suppliers or directly by the producers. The two systems are, to some extent, contrasting. The first operates under external governance and the second is local resource-based and community-based.

In terms of gender, the investigation was to determine whether, and to what extent, equal or equitable opportunities for participation are available for both genders in both rural and urban areas, particularly when the woodfuel flow is controlled by external agents such as traders.

1.5 WHY STUDY GENDER ASPECTS?

Gender is one of the predominant features in society which influences the behavioral patterns of the two social groups, men and women, particularly those related to the allocation of intra household resources or extra household resource management tasks. Within the context of woodfuel flows gender plays an important and wide ranging role - from managing fuelwood supply sources to consumption. Gender is the least explored aspect of the commercial woodfuel flow, especially in the case of timber. Some aspects pertaining to the gathering of fuelwood for self-consumption have been randomly investigated. In almost all institutions in the production hierarchy, which include households as well as industrial production units and services, most activities are divided between men and women and certain patterns have evolved in the division of their labour, allocation of time, occupation of space/locations and control over resources etc. In association with gender ideology and the division of tasks and responsibilities certain constraints on the equal distribution of benefits have also been established. Under such circumstances the social construct of men's and women's roles, or gender, is a crucial socio-economic variable in the analysis of the commercial woodfuel flow.

Our understanding of who does what, why one gender specifically attends to certain tasks but not to others, why one gender benefits more from the production and sale of fuelwood than the other has direct development implications. A study of the gender aspects of the commercial woodfuel flow will point to the issues which are outside the household maintenance and survival domain and focus on income generation through woodfuel related activities. Clearly, the woodfuel trade can provide income earning opportunities and thus help to uplift living standards, and is thus of vital importance to any strategies aimed at improving women's lives.

In this study an attempt has been made to understand how, conventional ideology related to gender is re-enforced in the commercial and non-commercial fuelwood flow mechanisms. Women, due to their biological status, are recognized as the reproducers; so household maintenance, including the provision of fuelwood, has been combined with their reproductive roles and domestic chores. Men are more recognised as producers of goods and earners of cash. Men's greater ownership of resources and their mobility are conventionally accepted as essential for their productive work. Such socially constructed features of gender are seen throughout woodfuel systems and are related to producers, traders and end users.

As the primary focus of this study is 'woodfuel flows', gender aspects of the production and consumption of woodfuel have not been fully covered owing to constraints on time and resources. But this lesser emphasis is not an acknowledgement that they are less important to woodfuel flows.

The benefits that men and women derive from their involvement in the woodfuel sector, other than fulfilling conventional basic needs, are of immense importance in energy development. A vast amount of literature pertaining to women and fuelwood has contributed to broadening our understanding and has drawn attention to the crucial issues that women face as gatherers and consumers of biomass fuel. Gender aspects of non-commercial woodfuel flows have been covered with the focus being on exploring how women are engaged in the energy sector and how their time is allocated. (i.e. Tinker, 1990; Keenmar et al, 1988; Wickramasinghe, 1991; 1997; Agarwal, 1986). Women and energy issues have been discussed by many authors (Agarwal, 1986) and such discussions have influenced energy development policies. However, according to Cecelski (1995) some policy issues relevant to gender research, namely the promotion of energy transitions, energy efficiency, renewable energy and sustainable transport have been neglected.

2. RESEARCH METHODOLOGY

2.1 RESEARCH PLAN

The study presented in this report was started in October 1996 and completed in July 1997. Two geographical areas, namely the Kandy urban area, and Kundasale area, were covered. The study was conducted in 4 phases.

1. Phase 1. October - November 1996 (2 months)

Preparatory phase - Preparation for the field survey and collection of secondary materials were the main tasks. The activities accomplished during phase 1 include research team selection and training; literature survey and collection of secondary data; reconnaissance survey of the Kundasale area to select villages, likely key informants and groups, and to identify industrial uses; selection of households for the follow-up survey (15 households each were randomly selected from the 7 villages). In addition, out of the 4 types of major wood energy based industries located in the area, small-scale pottery industries, lime kilns, brick kilns, and bakery industries were selected for the detailed investigation.

The next main task accomplished in phase 1 was the designing of the research methodology, primarily preparing questionnaires for the households, industrial sector, saw mills, urban wood depots and transporters. These were pre-tested and modified where necessary prior to their adoption. Once the tools and techniques for the survey were prepared the field research was conducted.

2. Phase 2. (December - April - 6 months)

Field investigations - The activities accomplished during this phase include:

- i. Household questionnaire survey;
- ii. Participatory Rapid Appraisal;
- iii Key informant discussions and group discussions (men's and women's groups);
- iv. Participatory observation/investigation

Weekly meetings were held with the research team to examine progress and suggest further improvements.

The details of the tools and techniques are given in Table 6.

3. Phase 3. (May - Mid-June - 1 and 1/2 months)

Data tabulation and information consolidation - The relevant information/data gathered using various tools and techniques were tabulated and summarised to present in the report.

4. Phase 4. (Mid-June - July 1 and 1/2 months)

Report writing and submission to RWEDP for comments.

2.2 FIELD METHODOLOGY

As a result of broadening this study to cover flow patterns/mechanisms in 3 spheres, namely the household or self-consumption sphere; the rural woodfuel based industrial sphere, and the urban commercial sphere, a complex research process had to be followed. Different questionnaires had to be prepared to guide researchers when dealing with various intermediaries. The questionnaire used in the household survey and pre-formatted guidelines are given in Annex 1-6. Annex 7 presents a list of the specific tasks performed by members of the research team.

TABLE 6: SUMMARY OF TOOLS AND TECHNIQUES USED IN THE SURVEY

Tool / technique	Respondents / interviewees	Location
i. Questionnaire (pre-formatted)	Household (male and female)	Households (15 in each of 7 villages)
ii. Key informant discussions	Grama Niladari, forest officer and agriculture extension officers of the area. Woodfuel based industrialists, saw mills, transporters (large scale), woodfuel depots, contractors, dealers, retail deliverers, Plantation/large-scale producers, women and men.	Location of the activity
iii. Group discussions	Women's and men's groups, industrialists (lime kiln owners, brick makers) carters, a group consisting of plantation owners, contractor, dealer and a transporter - in Mawathagama.	Location of the activity
iv. Participatory observation/investigation	Researchers with the intermediaries and at each juncture (during felling, harvesting, cross-cutting, trimming, portaging etc.)	Location of the activity
v. Rapid appraisal	Team /individual visits to construct a broad picture	Homegardens, depots, plantations, industries etc.

2.3 HOUSEHOLD SURVEY

The types of information gathered by the questionnaires are related to:

- i. Household demography;
- ii. Household/living structure, including kitchen unit;
- iii. Household owned fuelwood producing sources, income sources;
- iv. Household energy use patterns and patterns in gender engagement;
- v. Composition of cooking energy;
- vi. Woodfuel flow for self-consumption and gender patterns involved;
- vii. Features related to fuelwood sale by households;
- viii. Species used and priority types;
- ix. Gender in wood energy related activities by sources.

2.4 GUIDED SURVEY OF SAW MILLS

Type of information gathered:

- i. Involvement in supplying woodfuel;
- ii. Price;
- iii. Trade pattern by users;
- iv. Sources of supply;
- v. Type of woodfuel supplied;
- vi. Benefits.

2.5 GUIDED SURVEY OF INDUSTRIES

Information was gathered on the nature of operations/industries, woodfuel use, type of woodfuel use, price paid for a unit, engagement in the supply sources by gender, and preferred or specific types of fuelwood needed for the industry.

2.6 GUIDED SURVEY OF FUELWOOD DEPOTS

A series of open ended questionnaires were used to get information on 3 aspects of the wood depots operations namely, receiving mechanisms, fuelwood depot centred activities and delivery mechanisms. The engagement patterns/and activities by gender, pricing systems and the intermediaries involved in the process were examined.

2.7 GUIDED SURVEY OF SUPPLY SYSTEMS AND OPERATIONS

The urban woodfuel flow mechanism is interregional and supply sources are scattered. As a result, unlike in the rural situation where a series of activities takes place in a narrow space and geographical area, it was difficult to construct a comprehensive picture without visiting the producers/contractors during the operations.

Questionnaires were prepared to guide the collection of information on the intermediaries on harvesting operations, on site activities and on gender engagement and the type of transport arrangement with the pricing system.

2.8 GUIDED SURVEY OF THE DELIVERY MECHANISM

The delivery mechanism can be divided into two segments. The first is the delivery of billeted fuelwood from supply sources to the depots where large-scale operations take place. The second is the delivery of processed fuelwood from depots to the users.

This part of the survey was designed to collect information about the wholesale mechanisms and the retail trade mechanisms. The information was gathered regarding gender and price changes in the flow and to identify the returns received by intermediaries.

2.9 KEY INFORMANT AND GROUP DISCUSSIONS

A large number of key informants were consulted to identify the location of industries and flow mechanisms. The individual intermediaries who have been engaged in the process, and the experienced local people in the rural area were consulted to broaden our understanding and to strengthen the information gathered from the survey. Gender specific patterns in all the activities carried out at production sites were determined and compared with the information gathered by the survey.

Group discussions were also conducted with individuals who had knowledge and experience in specific areas of the woodfuel flow. Gender engagement, pricing system and also the reasons for women's insignificant involvement in the commercial or trade were opened up for discussion. These discussions enabled the researchers to triangulate the data gathered.

2.10 PARTICIPATORY RAPID APPRAISAL/OBSERVATIONS

This was the process adopted to gather general information related to the physical features of the area, livelihood patterns, location of fuelwood supply sources, large scale consumers, land use and types of fuelwood production system, species composition, coping strategies of the people regarding wood energy security, infrastructural services, mainly regarding the woodfuel selling points, processing, woodfuel use patterns, level of women's and men's engagement etc.

2.11 DATA PROCESSING

Some of the data were tabulated manually because it was decided that information from all 7 villages should be tabulated in the field by the team members to avoid delays. To ensure consistency, formats for entering data were prepared in advance using the questionnaires as a guideline. Summaries and cross tabulations were also done manually for each village for inclusion in the report.

Information on species composition of the homegardens belonging to the households covered in the survey was tabulated by computer using the Lotus database management program. Prices were calculated in the field together with the intermediaries using hand calculators and price data were taken back to the respective intermediaries for confirmation.

3. THE GEOGRAPHICAL SETTING OF THE STUDY AREA

3.1 INTRODUCTION

The study presented in this report was primarily conducted in the area under the administration of Kundasale Divisional Secretariat, with a sample from the Kandy urban area, which is the capital of Kandy district. The purpose of the urban study was to cover the commercial woodfuel flow or the trading carried out in the urban area, while the Kundasale area was investigated to examine the flow mechanism for domestic use and for rural industries and the gender specific patterns in the activities related to the woodfuel flow.

In the woodfuel flow systems three phenomena are noteworthy. The first is the local flow or the flow for self-consumption, primarily for home consumption. The second is the internal flow or the commercial flow of fuelwood to rural industries. The third is the inter-regional commercial woodfuel flow from outside areas to the urban area where redistribution also commences.

3.2 THE GEOGRAPHICAL CONTEXT

The area under Kundasale Divisional Secretariat extends approximately over 83.2 square kilometres. It is one of the secretariats of Kandy district (Figure 5). Biophysically it is located in the central highlands of the country. According to previous investigations (i.e. Howes, 1995) the overall fuelwood production of the Kandy district is much lower than the consumption, so it has been marked as a biomass deficit area. However, according to the projections given in the FSMP for 1995 and 2020 bio energy will not be scarce in the Kandy district. The flow of fuelwood to Kandy urban area takes place from other areas, particularly from rubber-wood producing areas of the southwest wet zone, and includes forest-wood from the north central and eastern dry zone areas.

Although there are some small towns associated with service centres within Kundasale, the area is predominantly rural. Kundasale has one main draw back: its annual rainfall is comparatively low, and is often in the range of 1015 mm and 1800 mm. As a result, the area is characterised by Intermediate Zone climatic conditions, low and irregular rainfall, and is often marked with water scarcities. It is primarily composed of an undulating terrain within which the elevation varies between 420-780 metres and goes up to about 780 metres towards the north-east.

3.3 SOCIO-ECONOMIC CONDITIONS

The area comprises about 203 traditional villages and is divided into 80 Grama Niladari Divisions which, according to the administrative structure of the country, are the lower level administrative units. Its total population in 1992 was about 86,420. The area is located on the outskirts of Kandy urban area, within a distance of about 12 kilometres (See Figure 6). This location has resulted in it having efficient communication and infrastructure.

According to published statistics of 1981, poverty is a prominent feature of the socio-economic life of the area and nearly 68% of the population received free food subsidies and about 58% of the working age population (between 15-55 years) were unemployed. Another noteworthy feature is the relatively low proportion (only 25%) of employed persons in the agriculture sector. Meanwhile, the proportion in non-agricultural production related activities

was about 39%. No stretches of forests are located in the area other than narrow stretches of riverine vegetation.

FIGURE 5: LOCATION OF KANDY DISTRICT AND KUNDASALE DIVISION

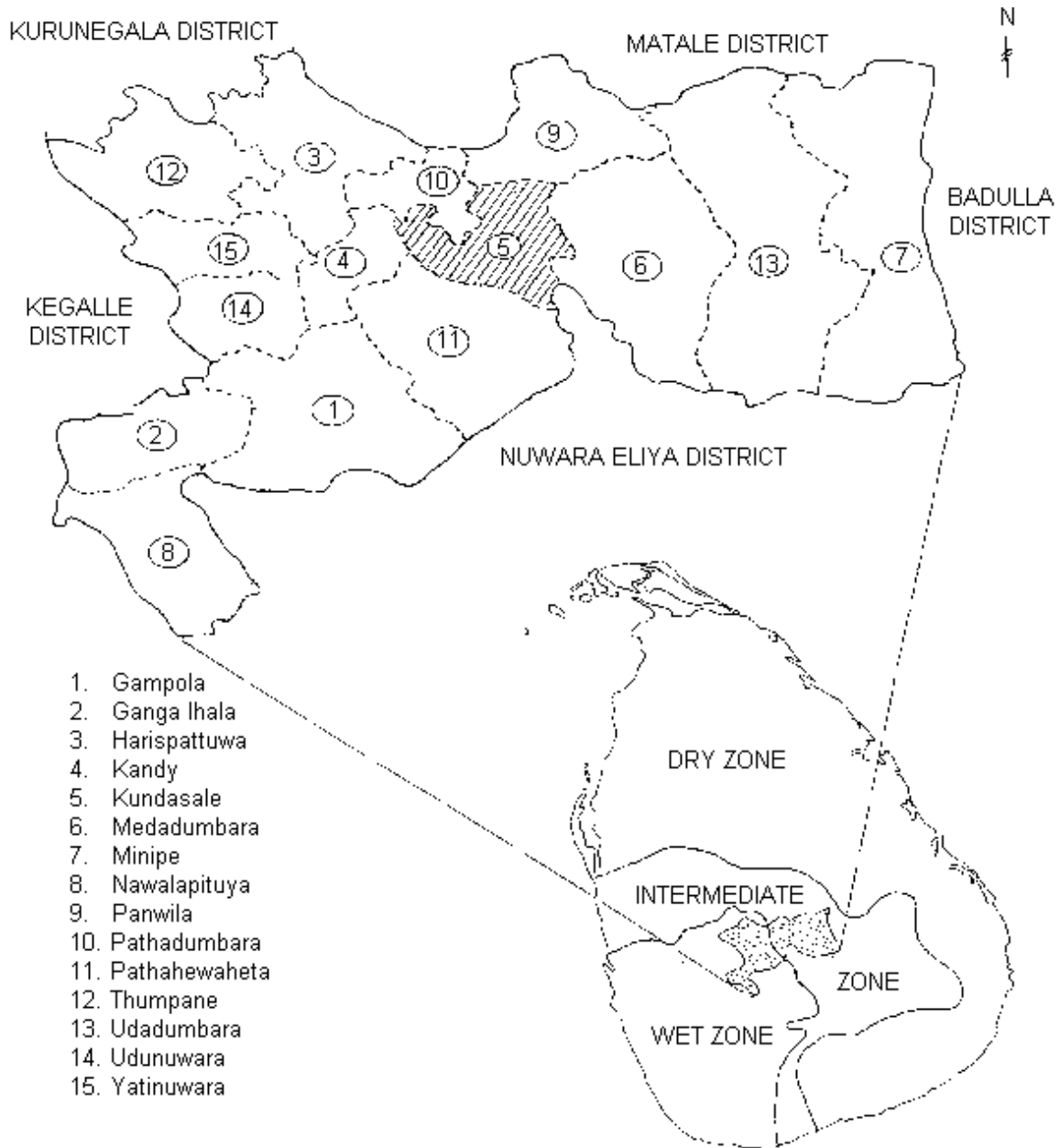
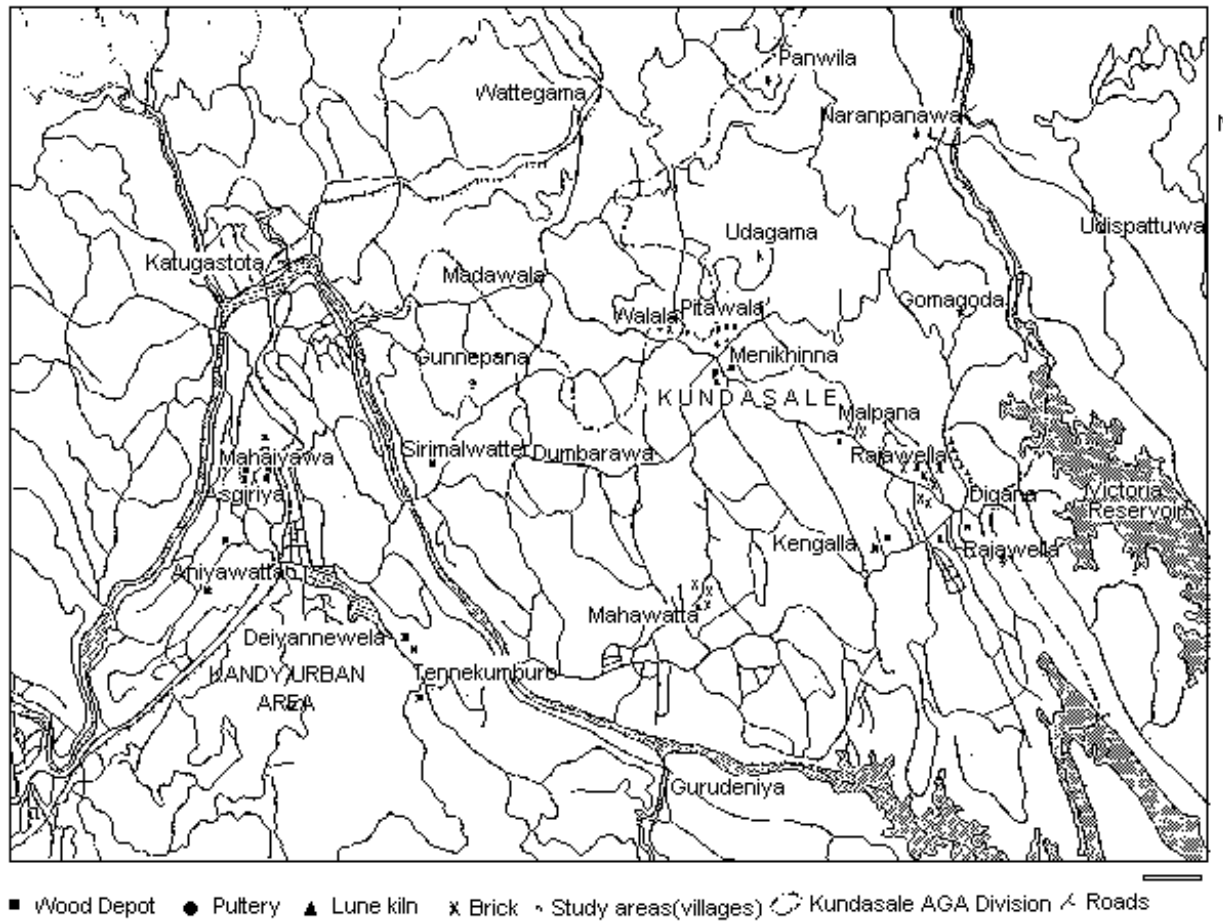


FIGURE 6: GEOGRAPHICAL LOCATION OF KANDY AND KUNDASALE AREA



3.4 LAND USE

Land use in the area is complex due to the predominance of species-mixed production systems. Of the total land area of 8,320 hectares the most widespread land use type is homegardens which account for approximately 41% of the area. (see Figure 7). Mixed trees and other crops, paddy, and perennials are also noteworthy (see Table 7). The mixed stands of trees consist of coconut (*Cocos nucifera*), jak (*Artocarpus heterophyllus*), mango (*Mangifera indica*), avocado (*Persea gratissima*), cocoa (*Theobroma cacao*), coffee (*Coffea arabica*), nutmeg (*Myristica fragrans*), pepper (*Piper nigrum*), cloves (*Syzygium aromaticum*) etc. These stands are rich in terms of their standing timber stocks and have a high potential to produce fuelwood as a by-product. This overall picture suggests there is no problem related to the local availability of woodfuel even though ownership and access to production systems are important parameters deciding the availability for end users and their use. In such circumstances, whether or not the commercial flow mechanisms are operating locally between Kundasale area and the Kandy urban area, the flow of woodfuel from local production systems to the heavy consumers like industries and commercial users is of considerable research importance.

TABLE 7: LAND USE IN KUNDASALE AREA

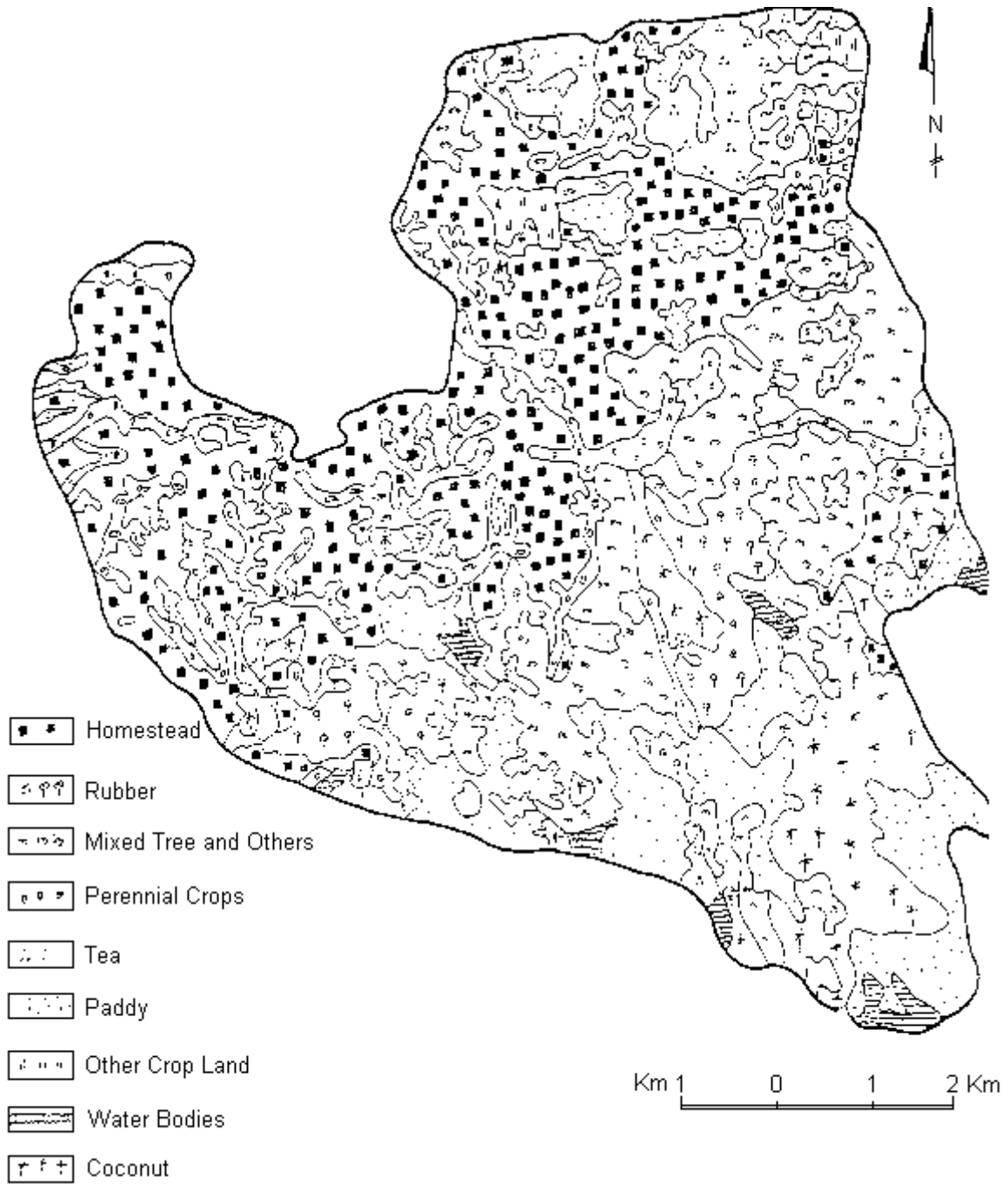
Land use type	% of area
Perennial	11
Homegardens	41
Other crops	4
Paddy	14
Mixed (tree and other)	15
Tea	5
Coconut	9
Built up land	1
TOTAL	100

Source: Wickramasinghe, 1989

One striking feature noted in the reconnaissance survey, which influenced the selection of Kundasale as the site to study woodfuel flow is that woodfuel-based industries are widespread. The area around Menikhinna, which is the divisional administrative centre of Kundasale, and Digana area are marked with numerous wood-energy based industries as well as saw mills. Industries include the lime industry, brick industry, pottery, bakeries, and treacle and jaggery making at household level. The hotels and bakeries located in the junctions, villages and other road corners depend on commercial woodfuel for energy.

The widespread location of saw mills in the Kundasale area (there are about 12) is a striking feature. Saw mills act as a source of woodfuel supply for local industries and some domestic consumers. Although no formal mechanisms exist the commercial woodfuel flow in this rural setting is dominated by the woodfuel supply from sawmills and by the supplies from local producers like households with relatively large homegarden plots.

FIGURE 7: THE LAND USE TYPES IN KUNDASALE AREA



3.5 THE SOCIO-ECONOMIC CONDITIONS OF THE SAMPLED HOUSEHOLDS

In order to collect primary data pertaining to the activities in the woodfuel flow system and how these are allocated by gender, 7 villages located in the Kundasale Divisional Secretariat were selected (see Figure 8). These villages are:

- i. Pitawala;
- ii. Udagama;
- iii. Rajawella;
- iv. Gomagoda;
- v. Narampanawa;
- vi. Panwila;
- vii. Gunnepana.

These 7 villages were selected subjectively. The special features taken into consideration include:

- i) representativeness of the types of local land use; location of non-household sectoral fuelwood consumers such as industries and commercial users which tend to influence the flow patterns and market mechanisms;
- iii) location in proximity to Kandy urban area and the Menikhinna local service centre (see Table 8 for comparative information).

The approximate distance from Menikhinna (divisional centre) to Kandy is in the range of 6-14 kilometres. However, it was decided to concentrate on these 7 villages to avoid any practical difficulties pertaining to completing the research project within the scheduled period and financial and other resource limits. The selected villages were able to represent situations related to industries and the household sector primarily depending on homegarden and local supplies.

Fifteen households were selected randomly from each village and the total number of household units covered in the survey was 105. The average size of a unit is about 4.8 persons. One striking feature here is that the female population outnumbers the male population with 117 females to 100 males. The second striking feature is that in spite of the high female population, the proportion of women in employment is extremely low. The employment ratio is 32 women to 100 men; 18 women to 100 men in agriculture, and 34 to 100 in non-agriculture sectoral employment. The third feature is that, only a few households have agricultural production units other than homegardens (see Table 9 for details).

One of the key features noted in the household survey is that the houses are composed of 3 or more units. These include, living section, bedroom/s, and a kitchen. This suggests that no households covered in this survey live in houses having extremely poor conditions. The data given in Table 10 reveals that of the total of 105 households surveyed, nearly 85% of houses are solid constructions, while 15 percent are of wattle and daub walls and mud spread floors. 37% of the kitchens are poor structures and 17% are separated from the main house. When compared with the conditions of the main house unit with kitchen, relatively poor conditions have been noted.

In terms of hearth type and facilities for relieving kitchen smoke further variations have been noted. Only 53% of the households have a kitchen chimney to relieve smoke. Kitchen smoke can be taken as an indication of the problems faced by women during food preparation. Enumerations revealed that the per capita consumption of fuelwood for domestic cooking in the range of 1.3 - 1.8 kilograms per day, and, if available, crop residues are also added.

Although this seems to be high a substantial amount of fuelwood is needed for the preparation of 3 cooked meals, and to boil water about 6 times a day. A comparison was not done regarding the impact of hearth type on wood consumption, due to the use of 3 stone hearths when needed by all households. The most widely used hearth type is the 3 stone hearth, and mud spread hearths which have one open area to feed wood are also popular. Only 12% of the households use improved wood stoves, but together with a 3 stone hearth.

Gathering fuelwood to meet household needs has been reported as heavy work, because women at least gather fuelwood 2-3 times per week. When they carry fuelwood from outside sources they tend to carry excessively heavy headloads. Measurements show that the weight of a bundle of fuelwood is in the range of 24-30 kilograms. As fuelwood is used by all the surveyed households no women are exempted from this task.

While the average monthly income of households is in the range of Rs. 1,500.00 - 25,000.00, there are a couple of very wealthy households whose monthly incomes are about Rs. 25,000.00. Among the 7 villages, Pitawala, Rajawella and Gomagoda reported a high average monthly income of more than 6,000 rupees; the figure for Udagama, Narampanawa and Gunnepana was more than Rs. 5,000, while for Panwila the figure was the lowest at about Rs. 3,600 per month.

3.6 WOODFUEL USE PATTERNS

All 105 households reported that they depend heavily on fuelwood as a source of cooking energy. Nearly 22 households purchase a part of the amount needed for cooking. Of the total, 83 are completely dependent on free gathering. Free gathering is a complex phenomenon. It points to the practice of gathering biomass from whatever production sources are available within an accessible distance, including homegardens, fences and hedges where the end users do not pay cash for fuelwood. They pay neither for labour, nor any fee to the producer/supply source. The faulty assumption behind this is that no labour costs and production costs are involved. The collection of branchwood for fuelwood without any cost tends to exclude the production cost. The non-engagement of paid labour avoids the labour cost. This suggests that fuelwood is only a by-product of trees grown for other purposes, including timber. In reality, even though fuelwood is reported as a freely gathered commodity, the converted labour time cost is in the range of Rs. 1.50 - 2.50 per 1 kg of fuelwood carried in headloads. When compared with the price paid for commercial wood, which is about Rs. 2.20 - 2.40 per kilogram in the Kandy urban area, free gathering implies a substantial saving of family expenditure. The price in the urban market includes payments for production, transportation and processing. Thus the hidden costs of freely gathered wood and the extent to which these are incurred by women are significant.

The average amounts spent on fuelwood in the household sector vary tremendously. The variations are due to local availability and seasonality, time and labour availability to gather etc. The average sum paid by the households during the period of the field investigation was in the range of Rs. 225.00 - 75.00 per month except in one village, Gomagoda, where all the

requirements are met by freely procured fuelwood (see Table 11).

The field data reveal that :

- i. Even in the rural areas some households rely on the commercial flow of fuelwood;
- ii. Although rural consumers depend solely on woodfuel, it is not composed of one single type. More than 75% is composed of real wood and the remainder is composed of residues (see Table 11);
- iii. Most of the supplementary types/substitutes for real wood in the rural domestic sector come from coconut palms. It includes mainly coconut leaves, fronds, and husks. The total number of households partly dependent on coconut palm output is 44, of which the majority reported that they regularly use coconut husk (44), while 33 mentioned their use of fronds and leaves.

In terms of biomass energy security, rural households are in a better position to withstand acute problems because they locally produce the biomass. But the 22% of the households which purchase part of their requirements revealed that informal trade operates at a low profile in the domestic sector, even in rural areas where homegardens are widespread, although the trade is occasional and irregular.

This suggests that the woodfuel flow mechanism includes two spheres. The first comprises the flow for self-consumption, mainly for domestic cooking. This is dominated by non-commercial flow patterns involving multiple supply sources. The non-commercial woodfuel flow takes place within a narrow geographical area and all the related activities tend to take place over relatively short periods of time. In the commercial flow most of the activities prior to the market flow take place elsewhere or are under the control of different intermediaries.

TABLE 8. SPECIAL FACTORS TAKEN INTO CONSIDERATION WHEN SELECTING THE VILLAGES

Village	Distance to Kandy (km)	Distance to local centre (Menikhinna)	Concentration of dense homegardens	Other relevant land use	Wood energy based industries located in the area
Pitawala	12	1	moderate	--	lime brick pottery
Udagama	14	2	moderate	--	--
Rajawella	10	4	low	coconut	lime
Gomagoda	14	5	high	--	treacle & jaggery
Narampanawa	16	7	high	--	treacle & jaggery
Gunnepana	6	6	moderate	--	brick
Panwila	10	6 - 6.5	low	tea	brick

SOURCE: FEILD SURVEY, 1996-1999

FIGURE 8: LOCATION OF FUELWOOD DEPOTS IN KANDY URBAN AREA AND THE ROADS FROM THE OUTSKIRTS

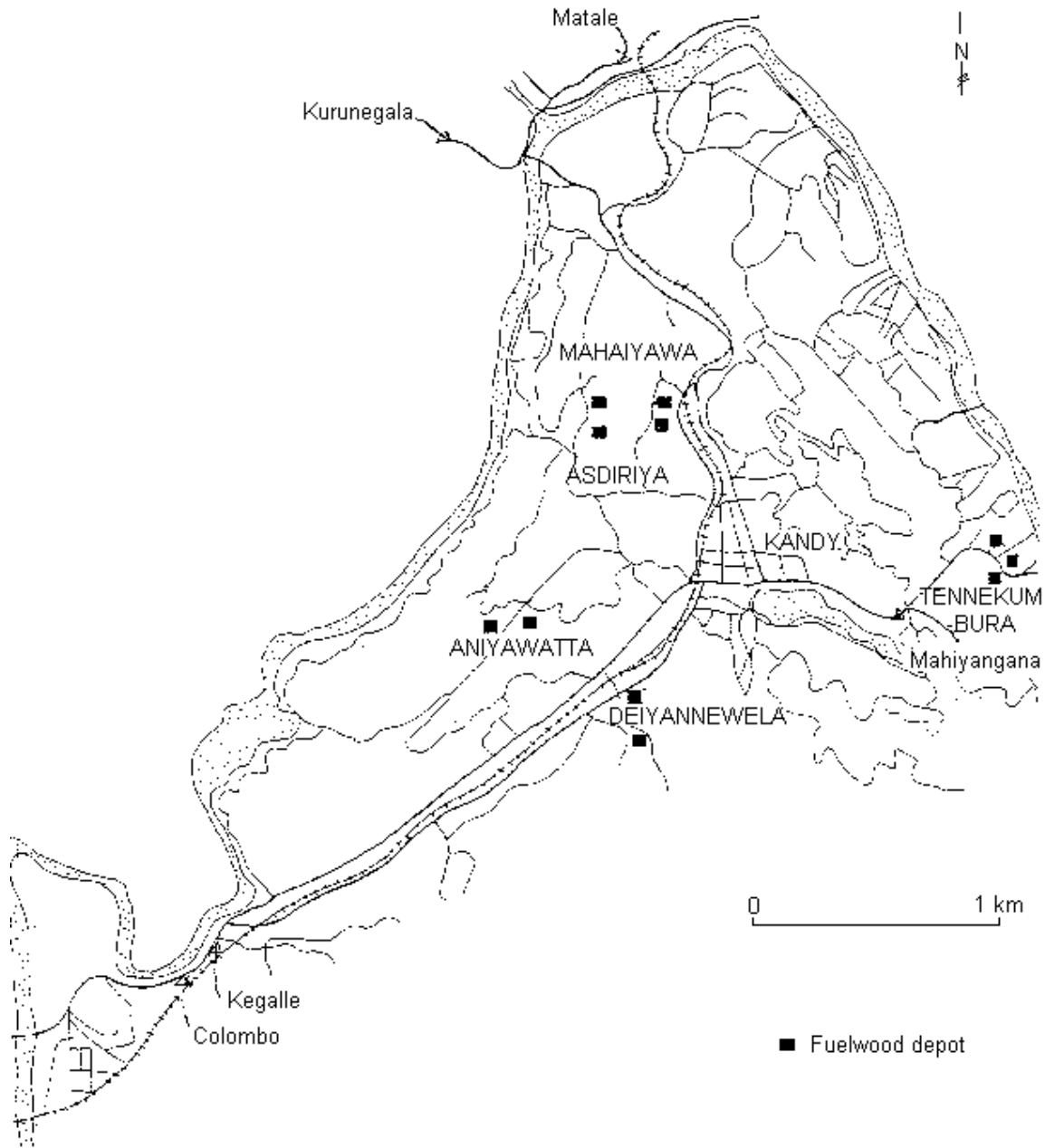


TABLE 9: SOCIO-ECONOMIC CONDITIONS OF THE SAMPLED HOUSEHOLDS OF 7 VILLAGES IN KUNDASALE AREA

Study area (village)	Sample size	Total Population		Employment		Agriculture		Non-agriculture		No. with home-garden	Other family prod. system	Average monthly income (Rs.)
		Men	Women	Men	Women	Men	Women	Men	Women			
Pitawala	15	37	45	16	7	2		17	7	15		7066
Udagama	15	31	37	21	6	5		16	6	15		5000
Rajawella	15	37	41	22	8	2	2	20	6	15		6400
Gomagoda	15	33	34	20	4	1		19	4	15	6	6100
Narampanawa	15	35	44	18	3	4		15	3	15	3	5475
Panwila	15	32	39	16	9	3	1	13	8	15	3	3600
Gunnepana	15	27	31	18	6			16	6	15	2	5600
TOTAL	105	232	271	133	43	17	3	116	40	105	14	

TABLE 10: KEY FEATURES RELATED TO HOUSING AND KITCHEN CONDITIONS OF THE SURVEYED HOUSEHOLDS IN 7 VILLAGES

Village	STRUCTURE				Location		Without chimney	HEARTH TYPE		
	main house		kitchen					3-stone	mud spread	stove
	S	P	S	P	A	C				
Pitawala	13	2	7	8	13	2	3	8	7	0
Udagama	11	4	7	8	11	4	7	7	8	0
Rajawella	13	2	11	4	11	4	11	6	6	3
Gomagoda	14	1	11	4	11	4	7	8	4	3
Narampanawa	13	2	10	5	14	1	9	8	7	0
Panwila	11	4	8	7	13	2	10	5	6	4
Gunnepana	14	1	12	3	14	1	6	4	8	3
Total	89	1	66	39	87	18	53	46	46	13

S = Solid - Walls, roof, floor solid construction
P = Poor - Walls and floor not solidly constructed
A = Attached
C = Separate

TABLE 11: THE COMPOSITION AND USE OF WOODFUEL IN THE DOMESTIC SECTOR

Study area/ village	Sample size	Cooking woodfuel			Average monthly cost (Rs.)	Composition of woodfuel						
		# Using	Free gathering	Purchasing (part)		Real wood			Fron & leaves		Coconut husk	
						75-100%	50-74%	49%>	<10	10-25	<10	10-25
Pitawala	15	15	5	10	133	15	--	--	7	--	11	2
Udagama	15	15	14	1	150	15	--	--	5	--	5	2
Rajawella	15	15	8	7	160	15	--	--	6	--	9	3
Gomagoda	15	15	15	0		15	--	--	7	--	6	2
Narampanawa	15	15	14	1	75	15	--	--	0		--	1
Panwila	15	15	14	1	225	15	--	--	0		3	0
Gunnepana	15	15	13	2	175	15	--	--	8	--	10	3
TOTAL	105	105	83	22	--	105	--	--	33	--	44	13



Women gather free woodfuel for self-consumption (A.W.)



Splitting wood for fuel is a man's responsibility (A.W.)

4. GENDER ASPECTS OF THE WOODFUEL FLOW PROCESS IN RURAL AREAS

4.1 ACTIVITIES

Woodfuel flow mechanisms vary in association with woodfuel consumption patterns, whether the woodfuel is for self-consumption or is to be marketed, and with the nature of supply sources and their location. The flow mechanism can be broken down into 6 categories. These include:

- i. harvesting of woody parts for fuelwood and, in a very few cases, the felling of trees;
- ii. trimming and cross cutting;
- iii. bundling and carrying/transportation;
- iv. splitting;
- v. gathering of dead wood and carrying; and
- vi. maintaining stocks at the backyard in wood sheds.

In most cases these activities do not always follow the same sequence but rather depend on where the work is performed etc.

4.2 THE WORK PLACE/SOURCE

Neither all woodfuel requirements, nor the wood of all species, come from a single supply source. The sources of supply or the production systems that are used by the households covered in this study include:

- i. Homegardens;
- ii. Fences and hedges;
- iii. Household lands located away from home;
- iv. Non-household lands owned by the State and private individuals.

The use of these multiple sources by the gatherers depends on their locations. One of the important features is the changing patterns in the behaviour of both genders among these supply sources. All the records show that in the non-commercial sector homegardens are the predominant source of supply, followed by fences/hedges (see Table 12).

The data gathered from 105 households, 15 each from 7 villages were tabulated for 3 types of analysis. The first was to examine the level of engagement of men and women in the activities which take place at the supply sources. The second was to identify the behavioural patterns of the two gender groups, and to determine the extent to which men and women attend to the tasks alone and jointly. The third was to see whether similar patterns could be noted across the villages studied.

4.3 MEN AND WOMEN AS TWO GENDER CATEGORIES

The engagement of men and women tends to vary among sources because all 105 households do not depend on all 4 sources of supply, or only on one source. Among all sources, homegardens are the main source of supply for all 105 households; the next most

important source is fences and hedges which are used by about 89 households. The non-household lands and other household lands are used by 14 households each (see Table 12).

TABLE 12: MEN'S AND WOMEN'S ENGAGEMENT IN THE WOODFUEL FLOW PROCESS

# of records	Homegardens (%)	Fences/hedges (%)	Household lands	Non-household land	Activity
Total	105	89	14	14	Harvesting
Men	58 (55%)	35 (39%)	4 (28%)	1 (7%)	
Women	98 (93%)	87 (98%)	14 (100%)	13 (93%)	
Total	105	89	14	14	Trimming & Cross-cutting
Men	36 (34%)	28 (31%)	5 (36%)	0 (00%)	
Women	104 (100%)	89 (100%)	14 (100%)	14 (100%)	
Total	105	89	14	14	Bundling & carrying
Men	33 (31%)	21 (23%)	3 (21%)	0 (00%)	
Women	105 (100%)	89 (100%)	14 (100%)	14 (100%)	
Total	105	89	14	14	Splitting
Men	54 (51%)	37 (41%)	5 (36%)	0 (00%)	
Women	98 (93%)	89 (100%)	14 (100%)	14 (100%)	
Total	105	89	14	14	Gathering deadwood
Men	09 (8%)	9 (10%)	1 (7%)	0 (00%)	
Women	105 (100%)	89 (100%)	14 (100%)	14 (100%)	

An overwhelming feature is that in terms of involvement in the series of activities and use of multiple sources women outnumber men. Of the total of 105 households men reported their involvement in harvesting fuelwood from homegardens in 58 households, while the figure was 98 households for women. In the same source, out of 105 households, men reported their involvement in trimming and cross-cutting in only 36 households, while the figure was 104 households for women. Thirty-three households reported the involvement of men in bundling and carrying the fuelwood from homegardens while all 105 households reported women's involvement. All 105 households reported women's involvement in the gathering of dead wood, whereas men's involvement in this work was reported only in 9 households.

When compared, women's involvement in harvesting, trimming, carrying, splitting and gathering the homegarden products is much higher than men's. This is so for all supply sources. Men's involvement in using non-household supply sources is nil except in one case where men are involved in harvesting. At the household level, woodfuel stocks are managed by women in all the 105 households, while men are also involved in this task in only 32. In 21 households men carry the purchased wood, while women do so in only 1 household. Where excess is produced women are rarely involved in selling it. Men's exceptionally low involvement in gathering fallen wood and headloading can be related to gender ideology. Their involvement in this work which is conventionally done by women is considered disgraceful. The household sphere is dominated by women, but the extent of men's involvement in household related work depends on the nature of the work itself.

4.4 PATTERNS OF INVOLVEMENT IN WORK ACTIVITIES

The analysis was extended to underscore the behavioural patterns, particularly to disclose the patterns of involvement in work activity. Three categories identified in the analysis include: 'women alone'; 'men alone'; and 'men and women jointly' (from the same household). When one examines the two major source of supply, namely homegardens and fences and hedges, which are used by 105 households and 89 households respectively, it is clear that the involvement of 'women alone' in each type of activity stands out (see Table 13). The overall patterns of involvement in woodfuel related activities are presented in Table 14 and lead to the conclusion that among the 3 categories referred to 'women alone' dominates. Their joint involvement implies that men and women from the same household work together as necessary, and no rigid boundaries can be seen between men's and women's work. Yet the involvement of 'men alone' is less than the other two categories, and also points to the fact that across all activities the involvement of 'men alone' is in the range of 6-25 percent of households in homegardens, and between 7-19 percent of all households in fences and hedges. In contrast, the involvement of 'women alone' is in the range of 43-85 percent of all households in homegardens and 45-74 percent of all households in fences and hedges. No activity is the exclusive domain of men or women. Men are least involved in gathering deadwood, which is regularly carried out by women to procure fuelwood for domestic cooking. In fact, women's involvement is highest in this activity compared to other activities.

The management of fuelwood stocks is important in the household sector. A substantial volume of fuelwood brought either in headloads from distant sources or harvested from homegardens and fences/hedges are stacked for subsequent use. All 105 households covered in this study have 'firewood sheds', most of which are located in the backyard either adjoining a kitchen wall or completely separated from the house. Nearly 55 percent of the households have properly constructed outside sheds with permanent roofing, but with open sides. Of the remainder, 25 percent are outside extensions with very low roofs adjoining kitchens. Twenty percent are poorly constructed temporary sheds with no solid roofing located outside.

The management of household stocks is a coping strategy, adopted by women in particular to avoid problems of acute hardship and also to ensure a supply of dry fuel. Although the volume of stocks tends to vary remarkably, fuelwood sheds are reported to be an essential household unit. A number of reasons for this were pointed out by the respondents. Sixty eight percent reported that it is an essential physical unit to store the excess harvest or freely collected fallen wood. Fuelwood stocks are kept in sheds for relatively long periods (8-10 months). The better quality fuel as well as the residues like coconut fronds and husks are stocked in sheds. The lack of exposure to sun and rain reduces decaying. Indeed all the respondents pointed to the practical difficulties that they experience during the rainy seasons when gathering, headloading and burning wet wood are cumbersome tasks.

Many women agreed that fuelwood stocks are a symbol of prosperity and also food security. Symbolically, fuelwood stocks point to regular food preparation, and a household's ability to meet a basic need - energy for cooking. 72 percent of women pointed out that buffer stocks are a relief particularly during times of sickness and in times of scarcity, and on occasions

when additional fuelwood is needed to prepare food for social events. The gender specific features noted here are the women's concerns over energy security and their heavy engagement in managing household stocks. A point made by women is that empty firewood sheds are a symbol of a woman's ignorance of her conventional responsibilities.

During the dry periods in the year stocks are enriched by keeping a portion of headloads and pruned wood from the homegardens and fences. Twigs, small branchwood and residues, the segments that get decayed easily, are used first. Coconut fronds are also an important component of household stocks and are used for kilning hearths.

TABLE 13: PATTERNS OF INVOLVEMENT OF MEN AND WOMEN IN 4 PRODUCTION SOURCES

Activity	Homegardens		Fence/Hedges		Otherhousehold lands		Non-household lands	
	No. of households	%	No. of households	%	No. of households	%	No. of households	%
<u>Harvesting</u>								
Men alone	26	25	19	21	3	14	1	7
Women alone	45	43	46	52	2	64	13	93
Jointly	34	32	24	27	9	22	0	0
<u>Trimming & cross-cutting</u>								
Men alone	20	19	16	18	3	29	0	0
Women alone	59	56	52	58	7	21	14	100
Jointly	26	25	21	24	4	50	0	0
<u>Bundling & carrying</u>								
Men alone	19	18	14	16	2	14	0	0
Women alone	61	58	58	65	10	72	14	100
Jointly	25	24	17	19	2	14	0	0
<u>Splitting</u>								
Men alone	26	25	18	20	3	21	0	0
Women alone	47	45	45	51	7	50	14	100
Jointly	32	30	26	29	4	29	0	0
<u>Gathering deadwood</u>								
Men alone	7	6	7	8	1	7	0	0
Women alone	89	85	74	83	13	93	14	100
Jointly	9	9	8	9	0	0	0	0
# households which reported use of source	105	100	89	100	14	100	14	100

TABLE 14: OVERALL PATTERN OF INVOLVEMENT IN WORK IN PRODUCTION SOURCES

Activity	Homegardens			Fences/hedges			Other household lands			Non-household lands		
	Men	Women	Both	Men	Women	Both	Men	Women	Both	Men	Women	..Both
Harvesting	*	***	**	*	***	**	*	***	**	**	***	--
Trimming & cross-cutting	*	***	**	*	***	**	*	***	**	--	***	--
Bundling & carrying	*	***	**	*	***	**	**	***	**	--	***	--
Splitting	*	***	**	*	***	**	*	***	**	--	***	--
Gathering deadwood	*	***	**	*	***	**	**	***	--	--	***	--

Men = men alone; Women = women alone; Both = both jointly; * = Less significant;

** = Secondary pattern; *** = Primary/most significant pattern.

Men's low level of involvement in stock management and women's heavy involvement reflect a stereotyped division of responsibilities. Only 32 men mentioned their involvement in the management of fuelwood stocks for subsequent use while all women in the households surveyed agreed that stock management is closely connected with their domestic chores and gender roles. In addition, household stocks of a limited amount of processed (cut and split) wood help them to cope with limited kitchen space and relieve women from the burden of gathering fuelwood daily. This implies that while the long term goal is to avoid gathering during unfavourable weather conditions, the short term goal is to reduce time and energy spent on daily fuelwood gathering. Fuelwood is gathered mostly as a free commodity, therefore stock enrichment and maintenance activities at household level depend on the availability of an excess; but it should be noted that undertaking such activities is strongly motivated by the fact that they are considered to be effective strategies for coping with practical difficulties.

Activities related to stock maintenance are generally considered to be women's work and part of their domestic chores. Such activities include cross cutting, sorting, piling, enriching and use (see Table 15). In addition to stereotyped views of women's work and of it being women's responsibility to ensure energy security, it was found that two other factors also account for women's dominant involvement in these activities. The first is that these tasks are not considered 'masculine' in nature. Cross-cutting of branches is not considered an exclusively masculine task even though an axe or a knife is used. The fact that round branchwood or fronds rather than split wood is piled means that men's labour is excluded. Furthermore, men are not involved at all in sorting wood which takes place at the stage of choosing better segments to be stocked, or choosing dried/old stocks or small wood for immediate use. Women also play a dominant role at the stage of using stacked wood - only 4 households reported that men make use of household stocks. The second reason is that such work is only done as required, in particular when an excess is gathered/harvested. The women, whose work is mostly house-centred often combine the activities pertaining to woodfuel stock management with their domestic chores.

TABLE 15: GENDER SPECIFIC FEATURES RELATED TO WOODFUEL STOCK MAINTENANCE

Activity	Men alone	Women alone	Jointly
Cross-cutting	2	73	30
Sorting	--	105	--
Piling	--	95	8
Enriching	--	83	22
Use	--	101	4

This picture points to a number of conclusions related to gender. The first is that among all activities men's involvement is highest in harvesting and splitting of fuelwood, and these are considered hard work. The second is that men and women are jointly engaged in these two activities (see Table 13). The third is that women dominate two categories of activities: the bundling of fuelwood, and the gathering of deadwood. These patterns are common to homegardens, and fences and hedges, which are the sources most commonly used. It is difficult to generalize about non-household lands (which are used by only 14 households) due to their limited use.

4.5 PATTERNS OF INVOLVEMENT IN WOODFUEL RELATED ACTIVITIES IN THE SEVEN VILLAGES

This general picture described above seems relevant to all 7 villages. In all 7 villages, women play major roles in all activities (Tables 16-22). Men are involved primarily in harvesting and splitting round wood, and they are less involved in trimming, gathering deadwood, bundling and carrying in headloads and stock maintenance (see Table 14). The overall pattern emerging from the villages studies leads to the conclusion that women dominate the woodfuel flow process. Men make a smaller contribution and in some cases this is made jointly with women (Table 23).

This allocation of tasks by gender is associated with the conventional ideology pertaining to masculine and feminine types of work. Although men are not the main actors they are primarily engaged in harvesting fuelwood when tree climbing, felling and large branch pruning are involved. It is the traditional norm that women do not climb trees, so any harvesting requiring climbing is considered men's work. Women themselves believe that such work is unmanageable. Many also mentioned that splitting wood cannot be done by women alone because splitting large billets is a hard task. The process involves cutting large logs into billets of fairly short lengths ranging between 3-4 feet using either handsaws or axes to cross cut logs. The tools used depend on the size of the logs, the availability of better tools like hand saws, and also the availability of labour (two people must work together to use hand saws for cross-cutting). None of these tasks is considered suitable for women. However, if the branches or the logs are of small diameter then both cross-cutting and splitting are attended to by women and if the wood is of manageable size then cross cutting and splitting are done by women alone.

It is difficult to quantify the diameter of the logs or wood that women can cross-cut and split. The conventional ideology, as repeatedly mentioned by men and women consulted in the survey, is that in general both these tasks are too 'hard' for women to attend to systematically. However, 18% of the women in the sample mentioned that they split large size logs for self-consumption when men's labour is not available and when no other wood substitutes are available.

4.6 REASONS FOR WOMEN'S DOMINANT ROLE IN FLOW ACTIVITIES

A well demonstrated fact here is that all the ground level activities, including branch pruning up to a reachable height, are dominated by women across the study area. The reasons for this are:

- i. Tree felling and the upper level branch pruning, which are considered hard tasks, are not done regularly. Coppicing of *Gliricidia*, which is predominant in fences and hedges is done from the ground level. The situation is the same regarding pruning of coffee, cocoa and the lower branches of woody perennials. So coppicing and pruning of woody perennials in homegardens, and fences and hedges are usually done by women.
- ii. The use of split-wood, the large size billets in particular, for domestic cooking is not found to be common. Splitting of branchwood, fronds, coconut leaves etc., is not done using heavy tools, so women themselves attend to it when needed.

- iii. Fuelwood for self-consumption is not considered to be men's responsibility. Bundling wood and headloading it is conventionally thought of as the women's domain. In addition, the low levels of women's formal employment and the fact that they are responsible for household centred occupations etc., makes it seem natural for them to procure fuelwood for household consumption.
- iv. Nearly 89 percent of the respondents believe that these activities are a way for women to contribute to the household economy. Although the value is not monetized, it helps reduce the burden on the household budget. Even in situations where alternative clean energy can be consumed for domestic cooking women themselves are motivated to use non-commercial resources to save family expenditure.
- v. Another factor which accounts for women's greater control over the flow process is related to the possibility of attending to it either in combination with other work or simultaneously with other work.

4.7 COMMERCIAL WOODFUEL FLOW FOR HOME CONSUMPTION

Woodfuel for household consumption rarely comes through the commercial flow mechanisms as it is generally supplied by free gathering from household lands and outside sources. Of the total of 105 households, 22, or nearly 10 percent, purchase some fuelwood (see Table 11). No incidents of fuelwood purchases have been noted in Gomagoda, and only one incident each has been recorded in the 3 villages of Udagama, Narampanawa and Panwila. The highest number of purchases was recorded in Pitawala and Rajawella.

There are two primary sources of commercial fuelwood. These include a few excess producers in the respective villages and the sawmills. Of the total of 22 households, 16 purchase from saw mills, so wood-shavings are the available type. Men are engaged in piling and transporting wood shavings in hand carts. The flow mechanism is quite simple but is outside what is conventionally considered to be the women's domain. In about 6 cases where the supply is from local producers the situation is, unusually, dominated by women. Three types of produce are included, namely coconut branches, coconut husks and the branchwood of tree perennials. Women pile up the excess and sell the stocks to people in the neighbourhood. The mode of transport is headloading so women's engagement in buying from the local small-scale producers is notable. The average price paid for a kg of wood shavings is about 21-30 cents, while 0-20-0-25 cents is paid for a coconut husk and, 0.60 cents-1.00 rupee for a coconut branch.

This situation points to another gender specific feature associated with the mode of transport involved. When wood bundles and husks packed in gunny sacks are to be carried, headloading is the mode, and it is exclusively done by women, whereas when wood is purchased from saw mills in comparatively larger quantities, the task is exclusively performed by men. The primary mode of transportation is handcarts and no women reported that they were engaged in pulling them.

TABLE 16: PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN PITAWALA

Activity	Gender pattern	Homegardens		Fences/hedges		Other household lands		Non-household land	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No. of h/holds	%
Harvesting	Men	3	20	2	20	0	0	0	0
	women	6	40	5	50	0	0	0	0
	Jointly	6	40	3	30	0	0	0	0
Trimming & cross-cutting	Men	1	7	0	0	0	0	0	0
	Women	8	53	6	60	0	0	1	100
	Jointly	6	40	4	40	0	0	0	0
Bundling & carrying	Men	1	7	2	20	0	0	0	0
	Women	8	53	7	70	0	0	1	100
	Jointly	6	40	1	10	0	0	0	0
Splitting	Men	3	20	3	30	0	0	0	0
	Women	5	33	5	50	0	0	1	100
	Jointly	7	47	2	20	0	0	0	0
Gathering deadwood	Men	0	0	0	0	0	0	0	0
	Women	13	87	8	80	0	0	1	100
	Jointly	2	13	2	20	0	0	0	0

TABLE 17. PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN UDAGAMA

Activity	Gender Pattern	Homegardens		Fences/hedges		Other household land		Non-household land	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No.of h/holds	%
Harvesting	Men	3	20	3	21	0	0	0	0
	Women	7	47	8	57	0	0	1	100
	Jointly	5	33	3	22	0	0	0	0
Trimming & cross-cutting	Men	3	20	3	21	0	0	0	0
	Women	9	60	8	58	0	0	1	100
	Jointly	3	20	3	21	0	0	0	0
Bundling & carrying	Men	4	27	4	29	0	0	1	50
	Women	9	60	9	64	0	0	0	0
	Jointly	2	13	1	7	0	0	1	50
Splitting	Men	4	27	2	14	0	0	0	0
	Women	7	46	7	50	0	0	1	100
	Jointly	4	27	5	36	0	0	0	0
Gathering deadwood	Men	0	0	0	0	0	0	0	0
	Women	13	87	12	86	0	0	2	100
	Jointly	2	13	2	14	0	0	0	0

TABLE 18: PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN RAJAWELLA

Activity	Gender	Homegarden		Fence/hedges		Other household lands		Non-household lands	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No.of h/holds	%
Harvesting	Men	4	27	3	23	0	0	0	0
	Women	6	40	6	46	0	0	0	0
	Jointly	5	33	4	31	0	0	0	0
Trimming & cross-cutting	Men	2	13	2	15	0	0	0	0
	Women	8	54	7	54	0	0	0	0
	Jointly	5	33	4	31	0	0	0	0
Bundling & carrying	Men	4	27	3	23	0	0	0	0
	Women	8	53	10	77	0	0	0	0
	Jointly	3	20	0	0	0	0	0	0
Splitting	Men	4	27	3	23	0	0	0	0
	Women	7	46	6	46	0	0	0	0
	Jointly	4	27	4	31	0	0	0	0
Gathering deadwood	Men	1	6	2	15	0	0	0	0
	Women	12	80	11	85	0	0	0	0
	Jointly	2	14	0	0	0	0	0	0

TABLE 19: PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN GOMAGODA

Activity	Gender pattern	Homegardens		Fences/hedges		Other household land		Non-household land	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No.of h/holds	%
Harvesting	Men	4	27	3	20	1	17	1	50
	Women	7	46	8	53	4	66	1	50
	Jointly	4	27	4	27	1	17	0	0
Trimming & cross-cutting	Men	3	20	3	20	2	34	0	0
	Women	9	60	9	60	3	50	1	100
	Jointly	3	20	3	20	1	16	0	0
Bundling & carrying	Men	2	13	1	7	1	17	1	50
	Women	9	60	12	80	4	66	0	0
	Jointly	4	27	2	13	1	17	1	50
Splitting	Men	3	20	4	27	2	34	0	0
	Women	7	47	8	53	3	50	1	100
	Jointly	5	33	3	20	1	17	0	0
Gathering deadwood	Men	1	7	2	13	1	17	0	0
	Women	12	80	12	80	5	83	1	100
	Jointly	2	13	1	7	20	0	0	0

TABLE 20: PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN RAMPANAWA

Activity	Gender pattern	Homegardens		Fences/hedges		Other household land		Non-household land	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No.of h/holds	%
Harvesting	Men	4	27	3	21	1	33	0	0
	Women	7	46	7	50	2	67	4	100
	Jointly	4	27	4	29	0	0	0	0
Trimming & cross-cutting	Men	4	27	4	29	1	25	0	0
	Women	9	60	8	57	1	25	4	100
	Jointly	2	13	2	14	2	50	0	0
Bundling & carrying	Men	2	13	2	14	1	33	0	0
	Women	9	60	10	72	2	67	4	100
	Jointly	4	27	2	14	0	0	0	0
Splitting	Men	4	27	2	14	1	20	0	0
	Women	7	46	7	50	2	40	4	100
	Jointly	4	27	5	36	2	40	0	0
Gathering deadwood	Men	2	13	1	7	0	0	0	0
	Women	13	87	12	86	3	100	4	100
	Jointly	0	0	1	7	0	00	0	0

TABLE 21: PATTERNS OF INVOLVEMENT IN WOOD ENERGY RELATED ACTIVITIES IN PANWILA

Activity	Gender pattern	Homegardens		Fences/hedges		Other household land		Non-household land	
		No.of h/holds	%	No.of h/holds	%	No.of h/holds	%	No.of h/holds	%
Harvesting	Men	4	27	2	25	0	0	0	0
	Women	6	40	4	50	2	67	6	100
	Jointly	5	33	2	25	1	33	0	0
Trimming & cross-cutting	Men	4	27	2	25	0	0	0	0
	Women	8	53	5	63	2	67	6	100
	Jointly	3	20	1	12	1	33	0	0
Bundling & carrying	Men	3	20	1	12	0	0	0	0
	Women	9	60	6	76	3	100	6	100
	Jointly	3	20	1	12	0	0	0	0
Splitting	Men	4	27	1	12	0	0	0	0
	Women	7	46	4	50	1	33	6	100
	Jointly	4	27	3	38	2	67	0	0
Gathering deadwood	Men	2	13	1	12	0	0	0	0
	Women	13	87	7	88	3	100	6	100
	Jointly	0	0	0	0	0	0	0	0

TABLE 23: PATTERNS OF INVOLVEMENT IN WORK ACTIVITIES IN 7 VILLAGES

Activity	Pitawala			Udagama			Rajawella			Gomagoda			Narampanawa			Panwila			Gunnepana		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
<u>Harvesting</u> Homegardens Fences/hedges	W/B W	M B	-- M	W W	B B	M M	W W	B B	M M	W W	M/B B	-- M	W W	M/B M	-- B	W M	B M/B	M --	W W	B B	M M
<u>Trimming & cross-cutting</u> Homegardens Fences/hedges	W W	B B	M --	W W	B/M B/M	-- --	W W	B B	M M	W W	M/B M/B	-- --	W W	M M	B B	W W	M M	B B	W W	M B	B M
<u>Bundling & carrying</u> Homegardens Fences/hdges	W W	B M	M B	W W	M M	B B	W W	M M	B --	W W	B B	M M	W W	B M/B	M --	W W	M/B M/B	-- --	W W	M/B M	-- B
<u>Splitting</u> Homegardens Fences/hdges	B W	W M	M B	W W	B/M B	-- M	W W	M/B B	-- M	W W	B M	M B	W W	M/B B	-- M	W W	M/B B	-- M	W W	M/B B	-- M
<u>Gathering deadwood</u> Homegardens Fences/hedges	W W	B M	-- --	W W	B B	-- --	W W	B M	M --	W W	B M	M B	W W	M M/B	-- --	W W	M M	-- --	W W	M/B B	-- M
Stock maintenance	W	M	B	W	M	B	W	M	B	W	M	B	W	M	B	W	M	B	W	M	B
Carrying purchase	M	--	--	M	--	--	M	W	--	--	--	--	M/W	--	--	M/W	--	--	M/W	--	--
Selling excess	B	--	--	M	--	--	M	--	--	M	B	--	M	W	--	M	W	--	M	--	B

1 = Primary significance; 2 = Secondary significance; 3 = Tertiary significance; M = Men alone;
W = Women alone; B = Both jointly.

4.8 FLOW OF COMMERCIAL WOODFUEL FOR RURAL INDUSTRIES

A wide range of rural industries operating at village level has been investigated. These include:

- i. Pottery industry;
- ii. Bakeries;
- iii. Lime kilns, and
- iv. Brick kilns.

All these depend on commercial woodfuel. The types used in these industries vary to some extent. The flow patterns are related to the type of wood consumed, location of supply sources, and modes of transport. These industries are located far apart, but in association with motorable roads and potential markets (see Figure 6 for distribution).

(i) *Woodfuel flow for pottery industry*

Out of the 12 pottery industries identified during the reconnaissance survey, 5 industries were randomly selected for detailed investigation. The study was limited to 5 samples due to time constraints and as it was believed that these 5 had the ability to represent the local situation related to commercial woodfuel flows. All 5 operate as small production units and are primarily home-based or family-based industries. Cooking pots and flower pots are the major goods produced. The primary type of energy used in the pottery industry is woodfuel, but other types such as straw, paddy husk and coconut husks are used as cheap supplementary energy sources. Of the total production cost, energy alone is in the range of 9.5 and 18.7 percent (see Table 24). The fuelwood of jak (*Artocarpus heterophyllus*), rubber, ginisapu (*Michelia champaca*), kenda (*Macaranga peltata*), albizia (*Albizia spp.*), lunumidella (*Melia dubia*), amba (*Mangifera indica*) is used in kilning and there are numerous supply sources.

While all supplementary types are purchased locally, the bulk of the fuelwood requirements are purchased from the local sawmills. Occasionally, they are purchased from homegardens, but as the supply from this source is irregular, industries are reluctant to depend on it. However, when such stocks are available locally, they are relatively cheap and cost about Rs. 0.35 cent per kilogram, including transport the transport cost (exchange rate US\$ 1 = Rs. 56.40).

The regular source of supply is the local sawmills. The widespread location of sawmills in the area around Menikhinna town means that small-scale industries rarely experience difficulties in obtaining wood shavings. And the wood shavings are a source of additional income for the sawmills. About 10-15 years ago the mill owners encouraged people to come and collect wood shavings freely to clear the sites. At present nothing is given freely. Still they do not cross-cut the side shavings and do not stock them for sale. This implies that no consistent price is asked for a unit. Instead buyers pay about Rs. 150-175 for a hand-cart load which contains about 600-800 kilograms. The price is decided by the sawmill. The price paid for a kg of wood at saw mills is in the range of Rs. 0.21 0.30 cents. It comes to about Rs. 0.32 to 0.37 cents at the gate of the industries.

TABLE 24: BIO-ENERGY TYPES USED IN POTTERY INDUSTRY AND PERCENTAGE SHARE OF COST SPENT ON ENERGY

Production unit	Energy types (*)				% of cost energy	Type of wood (**)	Transport mode	Supply source
	Wood	Straw	Paddy husk	Coconut husk				
Walala	P	S	S	S	9.5	Jak Rubber Gliricidia Albezia Lunumidella Hawarinuga Amba Palu	Hand Cart (from saw mills); Lorry (from outside); Neighbouring areas; Outside deliverers	Locally; Saw mills; Homegard-ens; Neighbouring areas; Outside deliverers
Walala	P	S	S	S	18.7			
Pitawala	P	S	S	S	14.6			
Pitawala	P	S	S	S	10.9			
Pitawala	P	S	S	S	10.8			

(*) Primary, Supplementary. (**) Wood shavings, small round wood.
P = Primary; S = Supplementary.

Most of the wood shavings come from the timber of homegardens. Trees are either bought directly by the saw mill owners or through local contractors. Occasionally these industries get forest wood transported from outside areas, mainly from the dry zone areas. The cost of wood is relatively high and comes to about 58 cents per kilogram due to the long distance, and the high cost of lorry transport.

Transporters act as intermediaries, with hand carters being most involved. Women's engagement in this process was never mentioned, and the question regarding their engagement was seen as a reflection of the researchers' ignorance of the masculine nature of the task and of the unmanageable nature of the work for a woman.

(ii) Woodfuel flow for bakeries

Of the total of 32 bakeries recorded during the reconnaissance survey, 8 were studied in detail. As in the case of the pottery industry, detailed investigation was limited to 8 due to time constraints and as it was determined that this number could represent the local situation. All the bakeries where interviews took place use round wood shavings and branch wood. No substitutes or supplementary types are used. The bulk of consumption is for baking large batches of bread. All the owners interviewed stated that fuelwood gave the best quality of bread and expressed no intention of switching over to alternative energy types. The cost of energy is in the range of 5.3 - 8.8 percent of the total production cost. None of the bakeries studied depend on their own sources of woodfuel, or on freely gathered wood. So the activities in the process are limited to transportation, and splitting when fairly large girth logs are used.

The price paid for a unit includes the transportation cost, in addition to the price paid for the wood. Nearly 22-30 percent of the price is accounted for by the transportation cost and the remainder is for the wood itself (see Table 25).

TABLE 25: SHARE OF WOODFUEL COST IN BAKERY INDUSTRY

Production unit	Energy	% of total production cost on energy	% share of wood & transport		Wood types (wood shavings, round, branchwood)	Transportation
			Wood %	Tran. %		
Menikhinna	Wood	5.8	78	22	Jak Mango Rubber Ginisapu Kenda Hawarinuga Gliricidia Siyambala Lunumidella Palu Burutha Welan Timbiri	Hand cart (from saw mills); Lorry
Menikhinna	Wood	8.0	70	30		
Menikhinna	Wood	8.0	78	22		
Walala	Wood	5.3	77	23		
Sirimalwatta	Wood	5.6	78	22		
Sirimalwatta	Wood	4.7	71	29		
Yakgahapitiya	Wood	5.3	80	20		
Arangala	Wood	8.8	80	20		

There are two modes of transportation both of which are dominated by men. The first is the transportation of fuelwood in hand-carts from local sources, primarily from saw-mills, and to a lesser extent from homegardens. The saw mill fuelwood is composed of shavings of large logs of various species. Bakeries mostly purchase pruned branch wood from the homegardens sold in cubic metres. The price paid for the wood of saw mills is about 0.32 - 0.37 cents, while for homegarden wood they pay about .042-0.49 cents per kilogram (including transport).

The second mode of transportation is lorry transportation - which accounts for less than 10 percent of the total amount consumed. All the bakery owners interviewed mentioned that the flow is not decided by them, so the mechanism operates externally. Nearly 80-85 percent of the wood from the outside is forest wood from the Dry Zone. The rest comes from rubber plantations. The cost of fuelwood is relatively high, in fact a high price is paid for forest and rubber wood. The price paid is about 0.58 cents, and sometimes goes up to about 0.65 cents, depending on the transportation cost.

The chief advantage of using locally available woodfuel is that the bakery owners themselves arrange transportation. The price differences stem from the type of wood that bakeries obtain, from what sources and the ways in which bakeries get the fuelwood

transported. Although the unit price of homegarden wood and forest wood is relatively high, all the bakeries interviewed mentioned that round wood is preferred. This is due to the ability of round wood from homegardens and forest trees to burn for much longer when compared with the woodfuel that comes from saw mills. Most bakeries using sawmill wood reported that the wood shavings are extremely thin and sometimes are composed more of bark than actual wood. In such situations they tend to use mixed stocks, that is shavings together with round wood.

No traders are involved in the local flow process from homegardens and saw mills. In about 60 percent of the cases it was found that bakery owners directly buy wood from producers and arrange hand-carters to transport it. In about 40 percent of the cases trade cum transportation is done by hand-carters. A few bakeries mentioned that they hire tractors to bring homegarden fuelwood if heavy loads are available. When lorry transportation is involved, which is not often, usually one individual acts as both the trader and transporter.

(iii) Woodfuel flow for lime kilns

It should be pointed out that lime kilning depends on woodfuel alone; no substitutes are used. Of the 18 lime kilns visited during the reconnaissance survey 7 were interviewed for detailed information. Most of these kilns are located close to a dolomite quarry in Digana. Unlike the pottery and bakery industries where multiple types of woodfuel can be used, the lime kilning industry uses coconut logs as the primary woodfuel type. With the deepening scarcity of coconut logs, a small amount of small wood like trimmings of *Gliricidia* (*Gliricidia* spp.), jak, mango, amarind (*Tamarindus indicus*), weera (*Drypetes sepiaria*) etc., are used as a supplement. In acute scarcities, when the delivery of coconut logs is delayed for some reason or other, kilns use small amounts of coconut husk. The lime kilners who were interviewed mentioned that coconut is the preferred wood because it gives a clean white colour, and burns easily.

Among all the commercial woodfuel using industries, the cost of woodfuel in the lime kilning industry is by far the highest. Of the total production cost woodfuel alone comes to about 43-57 percent. The price is determined by the log length and is not sold by weight. A 3-4 feet length of log costs about Rs. 25.00 - 30.00. The conversion of this unit price to weight is difficult due to the variations in weight, even when the logs are of the same length. A few selected measurements show that the price of 1 kilogram of coconut wood is Rs. 1.75 - 2.50. This is the most costly type of woodfuel noted in the whole study. As the industry cannot use alternative wood types, due to the high chance of losing the desired quality of lime, the availability of coconut logs is a decisive factor for the continuity of the lime kiln industry.

Commercial users of coconut logs have to compete with other users as coconut logs are in particularly high demand as sawn timber. This competition is serious because only soft and damaged segments of the trunks are cross-cut and sold for woodfuel, whereas mature harder parts are sawn for timber. The increasing demand for coconut logs for non-energy purposes, and the enforcement of regulations prohibiting coconut felling without legal permits have resulted in reducing the usual supply. While the supplementary types are bought locally, there are two sources from which supplies need to be transported. The sources include local supply and external supply. Local coconut logs are available for sale primarily when palms are felled in homegardens or from large-scale coconut cultivations at land clearings, or during the felling of mature palms for timber. The external supply comes

from well-known coconut growing areas like Mawathagama and Kurunegala. The transporters are the main intermediaries, because the logs for fuelwood are considered secondary to the main trunks sold for timber. Either the contractors of palms or plantations cross-cut un-sawn or un-split segments and sell them in lengths. Transporters are the intermediaries providing logs from distant sources. While local palm logs are transported mainly in tractors and by hand-carters from external sources logs are transported in tractors or lorries (see Table 26).

Many activities like felling, cross-cutting trunks to 3-4 feet lengths, stacking, loading and transporting have been noted in the flow process and, quite clearly, no women are involved.

TABLE 26: TYPE OF WOODFUEL USED IN LIME INDUSTRY AND % SHARE OF ENERGY COST

Production unit	Type of energy	% of total cost on energy	Supply source	Main type of wood	Supplement of types	Local sources	Outside (**)
Walala	Wood	50	Locally from Kurunegala	Coconut logs	Gliricidia, jak, mango, Tamarind, weera, palu	Carts/push bought at Rs. 20 per log from producers	Lorry bought at Rs. 15-20
Digana	Wood	48	Locally from Kurunegala	Coconut logs	Sometimes coconut husks	"	"
Digana	Wood	57	Locally from Kurunegala	Coconut logs	"	"	"
Digana	Wood	58	Locally from Kurunegala	Coconut logs	"	"	"
Digana	Wood	50	Locally from Kurunegala	Coconut logs	"	"	"
Digana	Wood	57	Locally from Kurunegala	Coconut logs	"	"	"
Digana	Wood	43	Locally from Kurunegala	Coconut logs	"	"	"

* One log is about 3-4 ft, one log cost about Rs. 30/=;

** Contractors of palms sell young segments separately as logs of 3-4 ft. lengths to lorries coming from production areas.

** Kiln owners arrange transport to buy from contractors of the coconut plantations.

(iv) Woodfuel flow for brick kilns

The most widespread woodfuel based industry in the area is brick kilning. The brief reconnaissance survey enumerated about 142 brick kilns in the area, of which 13 were interviewed in detail for this study. Among commercial woodfuel users, the second highest energy cost is experienced by brick kilners due to the heavy use of woodfuel. Between 30-35 percent of the total production cost goes on woodfuel. While lime kilns prefer to use coconut logs to produce clean white lime, the brick kilns want to produce bricks of reddish brown colour.

Although all kiln owners interviewed mentioned their preference for wood, there is a marked increase in the use of non-wood substitutes. These include paddy husk, coconut husk and

coconut fronds. These substitutes help reduce the amount of wood used, but no one completely depends on these substitutes, most of which are available locally.

The supply is primarily from two sources: the local saw mills and homegardens (see Table 27). The price and flow patterns are similar to those previously discussed because the supply is from the same sources. One special feature is that whenever possible kilns try to add at least a few pieces of wood of gadumba (*Trema orientales*) and mango to give the bricks an attractive colour

The key intermediaries are the traders or traders cum transporters who directly buy wood from homegardens and saw mills and deliver it to the kilns. When wood is directly purchased by the users, then the intermediaries act as transporters. Seventy percent of the saw mill wood is transported in tractors, while about 68 percent of homegarden wood which is composed of billets, branches, roots etc., is also transported in tractors. The remainder is supplied by hand carters.

TABLE 27: TYPE OF WOODFUEL USED IN BRICK INDUSTRIES AND % SHARE OF ENERGY COST

Location	Energy types				% of cost on energy	Type of wood	Source (primary)	Mode of transport
	wood	straw	paddy husk	coconut husk				
1. Mahawatta	P	S	S	S	32	Jak	Saw mills Homegarden	Tractors Lorries Hand-carters
2. Mahawatta	P	S	S	S	31	Mango		
3. Mahawatta	P	S	S	S	32	Gadumba		
4. Rajawella	P	S	S	S	34	Siyambala		
5. Rajawella	P	S	S	S	35	Kenda		
6. Rajawella	P	S	S	S	33	Hawarinuga		
7. Rajawella	P	S	S	S	33	Weera		
8. Rajawella	P	S	S	S	34	Palu		
9. Rajawella	P	S	S	S	35	Lunumidella		
10. Walala	P	S	S	S	31	Welan		
11. Malpana	P	S	S	S	30	Gliricidia		
12. Rajawella	P	S	S	S	34			
13. Malpana	P	S	S	S	32			

P = Primary; S = Supplementary.

4.9 WOODFUEL SUPPLY SOURCES AND SPECIES

The woodfuel flow in Kundasale area exhibits 3 main features. The first is the local consumption of locally produced woodfuel. The second feature is that all local consumers depend on a range of supply sources, so trees in agricultural and non-agricultural areas, and grown and self-regenerated ones are of immense importance. The third feature is the lack of linkages between these rural areas and Kandy urban area. As a result, the woodfuel trade in the rural areas is separated from the urban trade. The trade is not organised, so individuals arrange their own supplies.

Tree planting practices are widespread in the area and almost all the households interviewed in this study grow trees that contribute to meeting their fuelwood needs. In fact, homegardens across the country are more accurately described as tree gardens. The wide

use of coconut in food preparation also provide them with coconut shells which are burnt with wood sticks, husks, twigs etc. These traditional practices are important aspects to be understood because the flow patterns and the users' dependence on woodfuel trade partly depends on what is needed and available.

Although, consumption and supply are not quantified, the nature of woodfuel supply sources were investigated during the interviews. A general pattern is associated with the production systems owned by the households. Supplies are primarily from the homegardens and fences and hedges. Homegardens and live fences are widespread in the whole area. The isolated trees in farmlands, reservations etc., are supplementary sources of supply.

A noteworthy feature is that no households heavily depend on traders. Nor do households tend to buy stacked wood. Locally purchased woodfuel types are produced in homegardens. In about 63 percent of the reported purchases, coconut branches, fronds and husks have been noted, while in the remaining cases the purchases are from saw mills. The saw mill owners interviewed in this study revealed that the saw logs primarily come from homegardens. So the wood shavings purchased for domestic cooking and other industries are produced in homegardens although the saw mills act as intermediaries.

The fuelwood used in rural industries is mainly locally produced. The pattern noted here is that stacked wood is sold in bulk to industries, whereas unstacked wood is sold for domestic cooking. This difference is also noted in transportation. Transportation for industries takes place in relatively larger quantities in carts and tractors, while headloading is for self-consumption.

Another noteworthy feature is that no one mentioned that they grow or utilize species solely for fuelwood in the study area. Fuelwood is one of the main outputs, but often reported as a by-product of trees. The people involved in the community forestry project in Digana mentioned that only the branchwood of eucalyptus is used for fuelwood and trees are primarily grown for timber. This means that most of the wood is obtained at times of coppicing and branch pruning.

A wide range of species are used. According to the respondents, all species, except ficus which has some religious significance among Buddhists, are used as fuelwood, but actual use depends on availability. Field enumerations showed that nearly 39 species have been listed by the households and at least 15 species have been recorded from each village. The most widely recorded species include gliricidia with 96 recordings, jak with 83 recordings, coconut with 44 recordings, sapu with 43, coffee with 42 recordings, and kududaula with 38 recordings (see Table 28). This pattern is a reflection of the importance of species with coppicing and branch pruning potential to meet fuelwood needs. Gliricidia, which is the most common fast growing species available in the area, is the most widely used. While coconut provides dead branches and other parts as well as husks and shells, all products of other species are available at pruning or coppicing times. In fact, when excess is obtained these species supply some stocks for the market.

TABLE 28: SPECIES WIDELY USED IN STUDY VILLAGES AND THE SPATIAL VARIATION

Local name	Botanical name	Pitawala		Udagama		Rajawella		Goma-goda		Narampanawa		Panwila		Gunnepa-na		Area Total	
		x	..**	x	**	x	**	x	**	x	**	x	**	x	**	x	**
Ginisapu *	<i>Michelia champaca</i>	09	08	05	02	07	06	05	01	05	02	06	04	02	06	43	25
Gliricidia *	<i>Gliricidia spp.</i>	13	08	13	12	15	11	15	11	15	13	13	12	12	11	96	78
Kos *	<i>Artocarpus heterophyllus</i>	15	09	12	08	14	05	11	04	11	03	06	03	14	07	83	39
Amba *	<i>Mangifera indica</i>	10	02	02	01	04	00	01	00	03	01	05	02	05	01	30	07
Hawarinuga *	<i>Alstonia macrophylla</i>	08	04	03	02	07	07	04	01	05	00	02	00	04	01	33	15
Lunumidella *	<i>Melia dubia</i>	05	02	01	00	01	00	01	00	01	00	01	00	00	00	10	02
Rubber *	<i>Hevea brasiliensis</i>	02	02	05	04	00	00	02	02	03	00	00	00	00	00	12	08
Coco	<i>Theobroma cacao</i>	03	01	10	00	03	02	06	02	00	00	00	00	03	01	25	06
Pol *	<i>Cocos nucifera</i>	12	09	10	06	05	00	05	00	02	00	02	00	08	02	44	17
Koopee	<i>Coffea arabica</i>	04	02	11	04	06	02	06	04	05	02	06	06	04	04	42	24
Alipera *	<i>Persea americana</i>	01	00	00	00	00	00	00	00	00	00	02	00	04	01	07	01
Kududaula *	<i>Neolitsea involucrata</i>	05	02	06	03	02	02	07	06	09	06	05	03	04	04	38	26
Naththasuriya	<i>Tithonia diversifolia</i>	02	00	01	00	00	00	00	00	00	00	01	00	01	00	05	00
Kottamba	<i>Terminalia catappa</i>	01	01	00	00	00	00	00	00	00	00	00	00	00	00	01	01
Pihimbiya	<i>Filicium decipiens</i>	00	00	07	05	00	00	00	00	00	00	01	00	00	00	08	05
Kenda	<i>Macaranga tomentosa</i>	00	00	04	00	07	00	05	00	04	00	04	00	02	00	26	00
Siyambala	<i>Tamarindus indicus</i>	00	00	01	01	01	00	00	00	00	00	00	00	00	00	02	01
Del	<i>Artocarpus altilis</i>	00	00	02	00	00	00	00	00	00	00	00	00	00	00	02	00
Karambu	<i>Syzygium aromaticum</i>	00	00	01	01	00	00	00	00	00	00	00	00	00	00	01	01
Milla	<i>Vitex pinnata</i>	00	00	02	00	00	00	06	05	07	06	02	01	00	00	17	12
Weralu	<i>Elaeocarpus serratus</i>	00	00	01	00	00	00	00	00	00	00	00	00	00	00	01	00
Kitul	<i>Caryota urens</i>	00	00	01	00	01	01	00	00	00	00	00	00	01	00	02	01
Kotta	<i>Ceiba pentandra</i>	00	00	00	00	01	00	00	00	00	00	00	00	00	00	02	00
Mara	<i>Albizia lebbek</i>	00	00	00	00	02	00	00	00	03	00	07	01	00	00	12	01
Keppitiya	<i>Croton laceifer</i>	00	00	00	00	00	00	01	00	00	00	00	00	00	00	01	00
Welan	<i>Pterospermum canescens</i>	00	00	00	00	00	00	02	02	01	01	00	00	00	00	03	03
Gansuriya	<i>Thespesia populnea</i>	00	00	00	00	00	00	02	01	00	00	00	00	00	00	02	01
Madatiya	<i>Adenanthera pavonina</i>	00	00	00	00	00	00	01	..01	00	00	01	00	00	00	02	00
Hurimara	<i>Albizia odoratissima</i>	00	00	00	00	00	00	01	01	02	01	01	00	00	00	04	02
(K)Tarpentine	<i>Eucalyptus spp.</i>	00	00	00	00	00	00	00	00	05	01	05	00	00	00	10	01
Wal-del	<i>Artocarpus nobilis</i>	00	00	00	00	00	00	00	00	04	00	00	00	01	01	05	01
Nelu	<i>Stonosiphonium cordifolium</i>	00	00	00	00	00	00	00	00	02	00	01	00	00	00	03	00
Tee	<i>Camellia sinensis</i>	00	00	00	00	00	00	00	00	03	00	06	03	00	00	09	03
Dawata	<i>Carallia brachiata</i>	00	00	00	00	00	00	00	00	04	02	02	01	01	01	07	04
Sabukku	<i>Grevillea robusta</i>	00	00	00	00	00	00	00	00	00	00	08	05	00	00	08	05
Diya-duhul		00	00	00	00	00	00	00	00	01	00	00	00	00	00	01	00
Ravan-idala	<i>Wendlandia dicuspidata</i>	00	00	00	00	00	00	00	00	00	00	02	00	00	00	02	00
Toona	<i>Cedrela toona</i>	00	00	00	00	00	00	00	00	00	00	00	00	02	00	02	00
Thekka	<i>Tectona grandis</i>	00	00	00	00	00	00	00	00	00	00	00	00	01	00	01	00

= Species entering the market; x = Number of households which reported use; ** = Number of households widely using

The ownership of supply sources has no impact on the use patterns. With regard to all three types of household land: homegardens, fences and hedges, and other farm lands, women own comparatively fewer units (see Table 29). Women have access and rights to gather fuelwood from all these units, irrespective of men's legal ownership rights. The men's greater ownership rights means power in making decisions regarding the marketable wood, and trade. The interviews conducted at 15 households revealed a quite striking segregation in the selling of fuelwood. In all cases the primary responsibility of procuring fuelwood for cooking is borne by women. Yet, when fuelwood is harvested or larger stocks are derived at tree felling, better round wood segments are separated from twigs. The twigs are retained as fuelwood for women for domestic cooking, while the better segments crosscut by men go for sale, as a source of cash income. This is a clear gender specific segregation in the woodfuel business in the rural areas.

TABLE 29: SOURCE OWNERSHIP BY GENDER

Study area/ village	# producing for market	Homegardens		Fences & hedges		Other family land	
		Women	Men	Women	Men	Women	Men
Pitawala	2	15		10		1	
		6	9	5	5	1	0
Udagama	2	15		14		4	
		6	9	6	8	2	2
Rajawella	1	15		13			
		7	8	5	8	0	0
Gomagoda	4	15		15		6	
		3	12	3	12		6
Narampanawa	2	15		14		3	
		3	12	3	11		3
Panwila	2	15		8		3	
		11	4	4	4	2	1
Gunnepana	2	15		15		2	
		5	10	6	9	2	0

4.10 DISCUSSION

The commercial users in the rural areas pay a significantly low price per unit, except for specific types of woodfuel like coconut wood. However, for the local producers the commercial users are the best buyers of excess local products. Due to the small scale and occasional supply and also the availability in various locations, the large scale traders and transporters are not heavily involved in the process. Nearly 80% of the excess producers interviewed sell the better segments of wood harvested from homegardens and fences/hedges. These are un-split round wood, so the procedure is that better marketable parts are cut and stacked for sale.

For the commercial sector in general two factors are important. The first is the fuelwood price, the other is the preferred woodfuel type to make quality products. In the rural areas the flow patterns are determined by the specific qualities of woodfuel requirements. The lime industry is a good example. In other cases, the ability to use the cheapest or any available type without harmful effects on the quality of products is a non-price factor influencing the situation. Industrialists tend to limit the use of cheaper substitutes only when such types affect the quality. Rather than losing the sales they prefer to pay for the wood and then add cheaper substitutes as appropriate.

The activities pertaining to the woodfuel flow in general reflect some important aspects of the gender division of labour:

- i. When supply is small scale and takes place from household sources women dominate the process, from harvesting and stacking for sale, whereas when the supply is from saw mills, where the activities are related to trade and transport it is dominated by men;
- ii. The selling/buying, transporting, is exclusively male dominated, so cash made out of local resources is directly handled by men;
- iii. The market potential enables small-scale producers to make cash out of woodfuel sales.

Due to the informal trading systems, the need for transportation and the lack of a consistent price there is a greater tendency for the intermediaries to benefit more than the producers. As a result what happens is that the producers tend to sell the woodfuel in stacks to the intermediaries, the hand carters, end users, and traders rather than wait to fetch a better price. The important socio-economic dimension here is that for the producers woodfuel is an occasional means of cash to meet contingency needs, while for the hand carters, who transport 60-70 percent, it is the sole means of employment and income. The price is often decided by the intermediaries rather than by the producers, because producers depend on carters, traders and other transporters.

The commercial woodfuel flow in rural areas is extremely complex due to the multiple sources used, the involvement of different intermediaries, the performance of activities related to the flow at different locations and their irregularity. Who does what of course is more determined by gender, and conventional gender ideology often limits women's engagement in the process between harvesting to selling, whereas trade is the privilege of men.

An important point in the rural sphere is that when the process is operating locally the role of outside intermediaries is low. The local mechanism keeps the system under the control of local actors, and women's labour is used more as a free family labour while men's free labour is often marked with cash from sales.



Fuelwood is split before being delivered to a depot (T.N.B.)



Fuelwood packed for transportation to a retail shop (T.N.B.)

5. URBAN WOODFUEL TRADE

5.1 GEOGRAPHICAL SETTING

Kandy urban area is the region's main service centre. Its population increased from 26,386 in 1901 to 114,950 in 1993, and then rose to 118,398 in 1995. This increase is associated more with the expansion of services than the growth of industries. The existing land use system in the Kandy urban area is characterised by a high percentage of residential uses, parks and open spaces, reservations, lakes, roads, commercial areas etc. (See Table 30).

TABLE 30: LAND USE PATTERN IN THE KANDY URBAN AREA

Land use type	Area km ²	% cover
Residential	9.78	37.2
Commercial	0.66	2.5
Public and semi public	1.38	5.2
Agriculture	1.87	7.1
Parks & open spaces	5.98	22.8
Reservations	3.46	13.2
Indusries	0.10	0.4
Lakes, roads & other	3.08	11.6
TOTAL	26.31	100

The urban area depends heavily on outside areas to meet the woodfuel requirements of the residential, commercial (eating houses) and industrial (bakeries) sectors. Although free gathering is also noted, it is for self-consumption and is a means of reducing the pressure on household incomes and ensuring a supply of energy for cooking.

The well-developed road network has enhanced transport linkages with other areas. In fact the 3 main routes running to Kandy from the southwest, north and the east are important in providing various types of wood from the forests and rubber plantations. It was noted that the bulk of rubber wood is transported through the route running from southwest and some from the north. The forest wood is transported through the routes running from north and east, which are connected with the dry zone areas. (see Figure 8).

5.2 FLOW MECHANISM

For convenience the flow mechanism can be described as having two components, although in fact these are closely interrelated: the first consists of those activities which take place before the woodfuel reaches the urban wood depots, or the mechanism between producers and urban dealers, and the second consists of those activities which take place after it reaches the depots, or retail distribution. The wood depots are the centres of urban delivery systems. Urban wood depots occupy the hub of the commercial flow mechanism. To study the commercial woodfuel flow mechanism and pricing system 11 fuelwood depots located in Kandy were selected. (see Figure 8 for locations).

(i) Delivery systems to urban wood depots

The urban woodfuel flow system can simply be described as a commercial woodfuel system or woodfuel business. The purpose of studying Kandy urban area was to understand the woodfuel business, marketing and trading activities, intermediaries involved, price composition, processing and also the delivery system to the end users. The reconnaissance survey revealed that fuelwood depots are scattered throughout the area and perform multiple functions, other than acting simply as "depots". In this study representatives of 11 fuelwood depots, almost all located within Kandy urban limits were interviewed.

As has been noted earlier, fuelwood depots provide focal points to investigate the "receiving mechanism" and the "delivery mechanism". The research on the receiving mechanism enabled the researcher to construct a complete picture of the interregional flow or the rural - urban flow. Unlike in the rural areas, where only a few intermediaries are involved, the rural-urban mechanism is characterised by well-established intermediaries. No links operate directly between producers and consumers and the whole flow system consists basically of a series of commercial transactions with the end users connected with the wholesalers or fuelwood depots through deliverers. Similarly the suppliers have no direct contacts with the consumers, so the links are through the commercial hubs - the depots. This implies that the wood depots form the "hubs" of the commercial system or the fuelwood business. (See Figure 9).

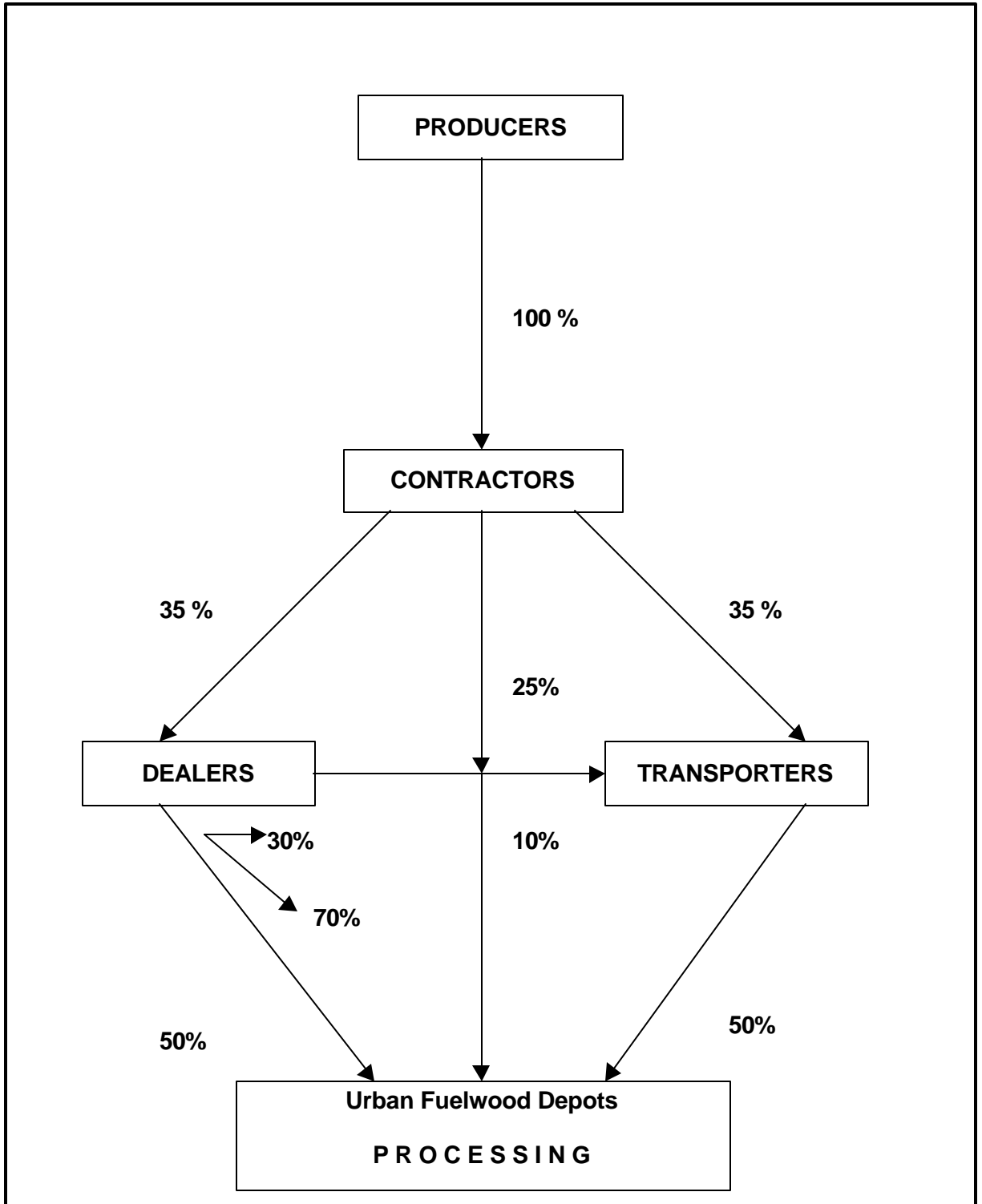
This simple flow process is organized around the activities of a number of intermediaries. In this respect, the commercial woodfuel flow is manipulated by the intermediaries without involvement of the consumers or the producers. The fuelwood produced in state forests, state rubber plantations and the private sector mainly comes through this system. The intermediaries involved include:

Contractors - Private individuals who undertake the responsibility to clear the lands. They undertake activities like harvesting, trimming, cross-cutting, digging out roots, and stacking for sale. The trading process starts with the stacked fuelwood.

Dealers - In about 35 percent of the cases stacked fuelwood enters the trading channels through a dealer. Dealers deliver only about 30 percent of this share directly to wood depots.

Transporters - The transporters are engaged in buying the stacked wood in cubic metres, either directly from the contractors or from the dealers. About 70% of the fuelwood purchased by dealers is delivered to urban depots directly. Transporters are involved in about 50% of the cases. It is important to note that many dealers interviewed mentioned that they have their own conveyances, lorries, to transport fuelwood from clearing sites to urban depots.

FIGURE 9: A SIMPLIFIED PICTURE OF THE COMMERCIAL WOODFUEL FLOW FOR THE URBAN DEPOTS



Urban fuelwood depots - Transporters and dealers have contacts with urban fuelwood depots, so the system is a well-established one. Urban fuelwood depots do not merely act as "fuelwood depots", or as a marketplace, but are engaged in wholesale buying, processing, retail trading, and supplying the door-step deliverers or the distributors. As a result, a number of activities are performed at urban depots and the responsibility of getting sufficient stocks is borne by them. The situation suggests that the commercial fuelwood flow to the Kandy urban area is through three main channels.

The general flow pattern from producers to urban depots shown in Figure 9 gives an idea of the level of engagement of different intermediaries, (see Table 31). For example, while 25 percent of the total handled by the contractors is directly delivered to the depots, another 40 percent comes through transporters. The remaining 35 percent comes through the dealers. Of this amount, 30 percent, which is about 10 percent of the total that goes to depots, comes through transporters, while the remaining 70 percent, which is nearly 25 percent of the total received at depots, is directly delivered by the dealers. This implies that one half of the fuelwood in the flow mechanism is delivered by transporters, so they are the main intermediaries. Where transporters and contractors are the same group of people (which has been noted in the field) at least 65 percent of the process is controlled by this group.

(ii) Delivery system from depots to users

One specific feature of the flow from depots to end users is that the urban fuelwood depots are the processing centres at which billets of wood are split into smaller units for delivery. This is of great importance in the whole commercial flow mechanism because when the unit of trade changes after processing a different pricing system is introduced.

TABLE 31: PERCENTAGE TRADED THROUGH INTERMEDIARIES BETWEEN PRODUCERS AND DEPOTS

Intermediaries	% share traded through intermediaries
Contractors:	
i. Direct delivery	25
ii. Through transporter	40
iii. Through dealers:	
a) delivered by dealers	10
b) through transporters	25
Urban depots	100

At the depots most of the fuelwood which has been purchased in cubic metres in billets form is split and sold by weight. The split fuelwood is sold in kilograms to the distributors. The normal unit is known as a 'hundred weight', which is nearly 50 kg. About 20-30 percent of the fuelwood is sold at depots in units less than 50 kg to the households. 70-80 percent goes through wholesalers and is sold in hundred weight units.

The main activity that takes place at fuelwood depots is the splitting which is done by hired labour. Traditional technologies like iron-wedges and axes are used to split the wood. Then it is weighed and sold to the distributors. This is done either by the depot owners or a person in-charge of the depots. The delivery of commercial fuelwood to the end users thus takes place after the fuelwood reaches the urban depots. As shown in Figure 10, this is mainly accomplished through small-scale traders. The delivery mechanism is rather complex. The fuelwood depots deal with processing, and are also engaged in delivering both processed and partly processed fuelwood to the end users. This implies that the woodfuel flow or distribution system includes self-collection of wood by users, delivery by depots and retail distribution by traders. For instance, 10 percent of the wood is delivered without splitting to the commercial users by depots, and 90 percent is processed. Then 10 percent of the processed wood is delivered directly to the commercial users by depots; 5 percent goes via retail sales at depots; while 85 percent is sold wholesale to retail deliverers. At the next level retailers deliver 90 percent to domestic users while 10 percent is delivered to the commercial users (see Figure 10).

The patterns in the flow mechanism between depots and end users reveal that greater control over the distribution is exercised by the wood depots. Just over 23 percent is delivered directly by the wood depots (see Table 32). Fuelwood depots hire tractors when needed for delivery. Out of 11 wood depots representatives interviewed 5 use hired bullock-carts to deliver the split wood. Of the total fuelwood handled by depots, 26.6 percent goes to commercial uses. This includes 10 percent unsplit billets which goes directly from depots to bakeries and 9 percent split wood most of which goes to hotels, restaurants and eating houses. Only 7.6 percent goes through retail traders to the commercial users, hotels, restaurants etc.

The field information reveals that among the consumers of the commercial fuelwood the household or residential sector is the largest. This sector utilizes nearly 74 percent of the total. Nearly 69 percent is distributed by the retail traders, this portion is composed of split wood. The primary mode of distribution is carts: bullock-carts deliver about 82 percent while the remainder goes in hand-carts. Although depots are not involved in retail distribution, about 4.5 percent is sold directly for household consumption, primarily to those who live in the neighbourhood.

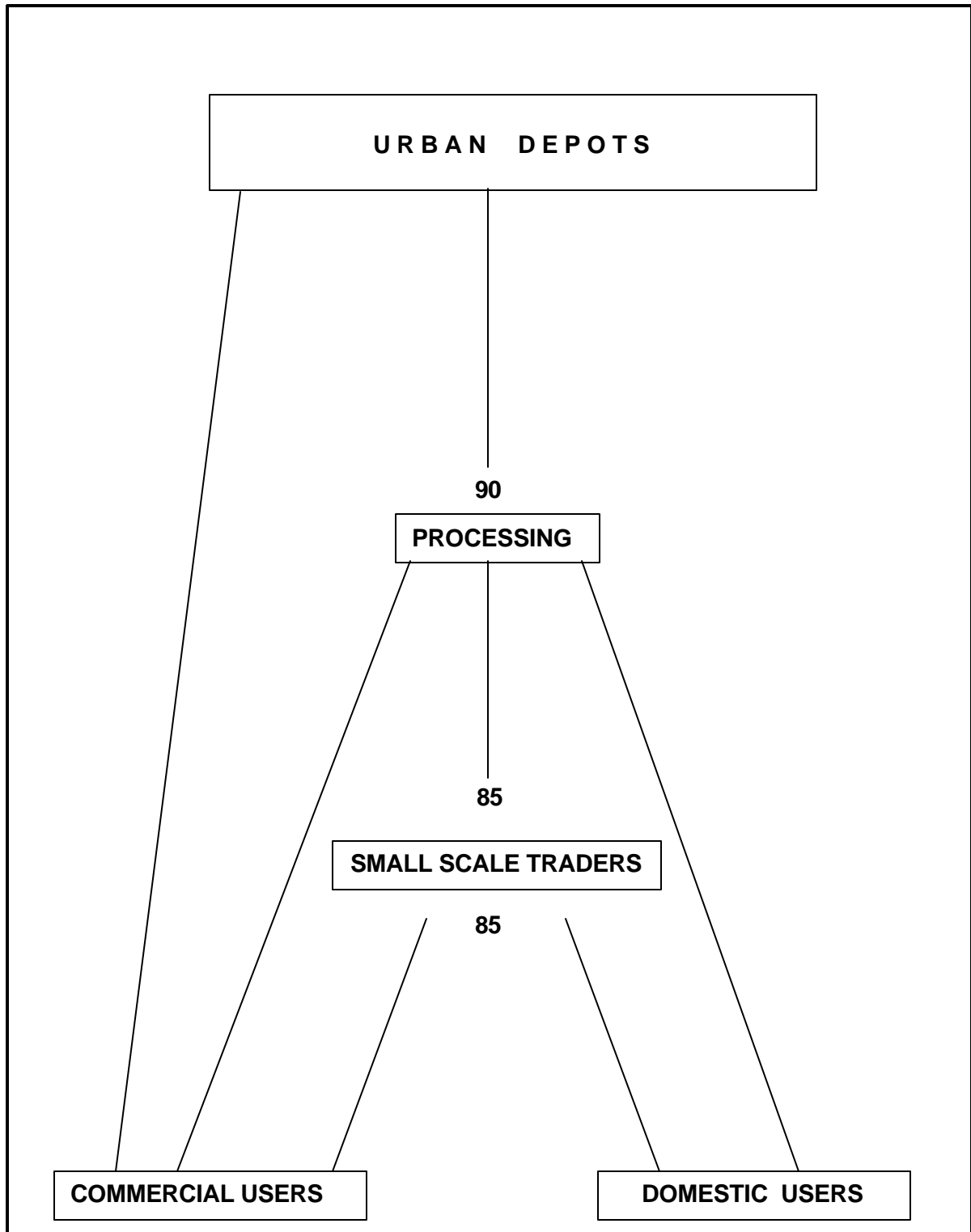
The distribution or retail delivery mechanism is dominated by carters. In fact this system is dominated by about 16 carters and, as noted in the field, these often cheat consumers by selling underweight amounts or poor quality wood - wet or raw fuelwood. Nevertheless, doorstep delivery is the most convenient for the consumers. For the households who cannot afford to buy and stock fuelwood, its daily distribution is most suitable, particularly for women who have to bear the brunt of collection.

TABLE 32: PERCENTAGE SHARE AND SYSTEM OF TRADE BETWEEN DEPOTS AND END USERS

Hub of the system	Intermediaries	Type	Delivery system/mode	% going through different actors	End users
Wood depot	Wood depot	Billeted wood	direct tractor delivery	10	Commercial users- bakeries
	Wood depot	Processed-split wood	Direct cart delivery	9	Commercial users- hotels, restaurants etc.
	Wood depot		Direct retail-sale, hand-carry, head-loading	4.5	Households domestic use
	Retail trader/deliverers	Processed-split wood	Retail deliverers, Bullock carts, Hand-carts, Doorstep delivery	76.5	[7.6] Commercial users - hotels, restaurants etc. [68.9] Domestic users

Although enumeration of the daily distribution of woodfuel was not done in this study, according to the information given by the wood depots a total of about 7,000-11,000 kg of fuelwood is handled by 11 depots per day for all urban consumers. Although this tends to vary tremendously, the situation reveals that nearly Rs. 16,800-26,400 worth of fuelwood is traded daily in Kandy city only through the flow mechanism centred around fuelwood depots. All 11 depots deal with wholesale trade while retailing is primarily done by the carters who are men. The annual volume of trade is highly variable, and the estimations given by the depots reveal that at least 2.5 - 3.5 million kilograms of fuelwood is traded annually in Kandy city. This implies that the annual flow of billeted wood from outside areas to the urban area is in the range of 2500 - 3500 cubic metres per annum. This has to be taken as a generalised figure because it is not possible to give proper estimates due to the weight variations among fuelwood types and also the problems related to the conversion of stacked wood measured in cubic metres into weight units. The primary mode of transport to depots is the lorry, and then the processed wood is delivered primarily in carts. The important point to note here is that there is no consistency in the flow system and no recorded information is available concerning the intermediaries, thus all the figures are no more than rough estimations. The deliveries to the depots take place when wood is available. For instance, the rubber wood is available only at clear fellings. Similarly, it has been reported by the carters and wood depot managers that they often have to wait several days for wholesale deliveries. The whole system of trade is informal, and as a result the trade is often below the estimated average. Another point to be noted here is that no women are involved. Although they are the primary porters of wood in the domestic sector in rural areas, the urban income opportunities in this sector are allocated strictly according to gender roles and are dominated by men.

FIGURE 10 : PATTERN OF THE COMMERCIAL WOODFUEL DISTRIBUTION FROM URBAN DEPOTS

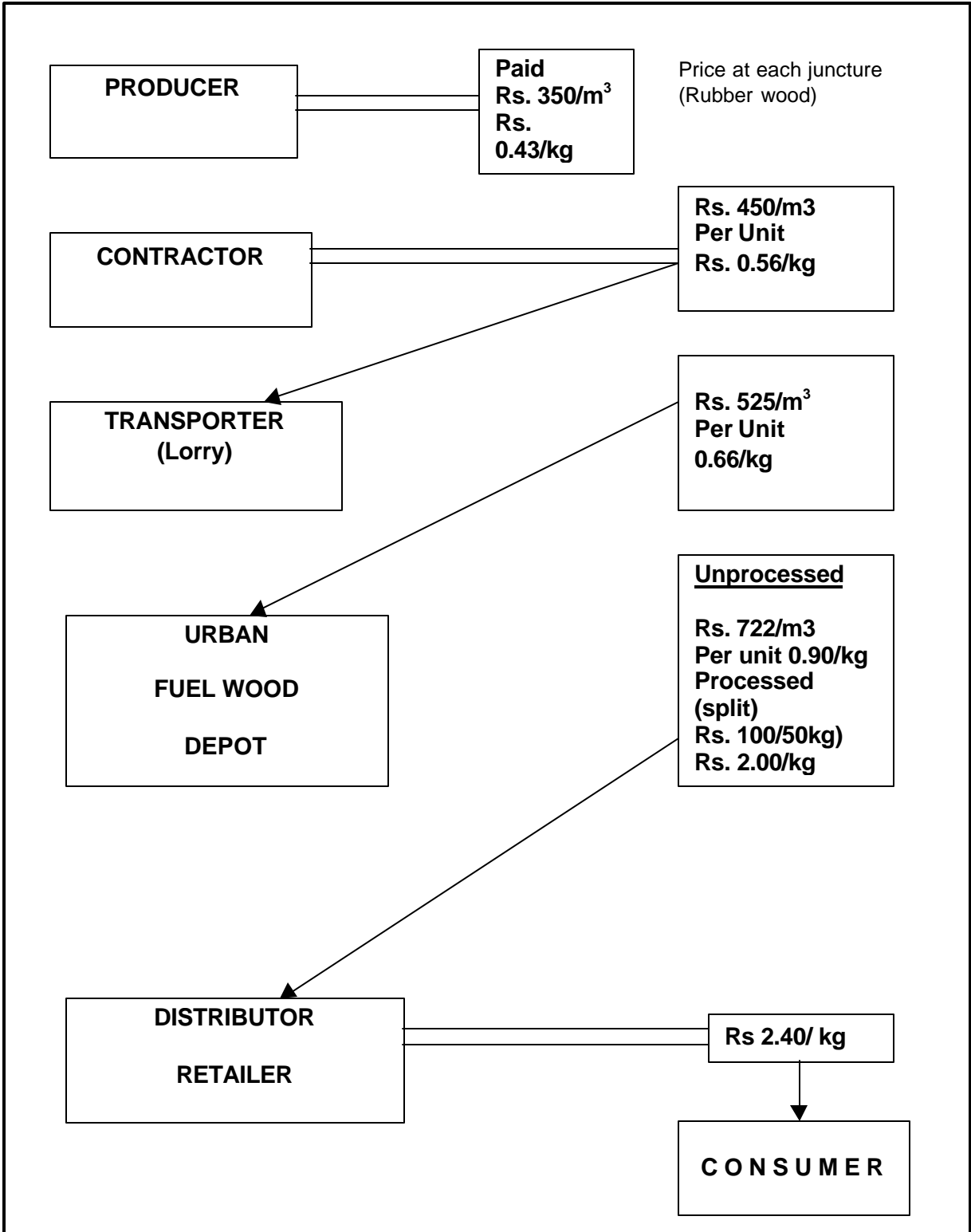


5.3 PRICING SYSTEM IN THE FUELWOOD TRADE

The pricing mechanism is also very complex because it is decided by the intermediaries. There is no state agency which controls the price. Figure 11 shows the intermediaries and junctures in the chain of flow at which the price is increased. While it increases as it moves on with the increasing number of intermediaries, the amount received by the producer is still low, (see Figure 11).

The difference between the price paid by the consumer and the price paid to the producer is Rs. 1.97 cents. Of the Rs. 2.40 paid by the end user for a unit (1 kg.) nearly 43 cents go to the producer. This also varies according to the type of woodfuel, location, personal contacts with the transporters, and the distance to the market. The percentage coming down the line to each juncture starting from the consumer is an interesting phenomenon. Eighty three percent of the price paid by a consumer to the retailer (which is Rs. 2.40 per kg) goes to the urban fuelwood depots. According to the analysis this includes the cost of wood and transportation, stacking, processing, municipal tax for space occupation (depots occupy open space) and the management and a profit. Inconsistencies in the information given by all wood depot managers make it clear that they try to cover up the profit margin and exaggerate their costs. Calculations revealed that only 5 cents per kilogram goes for splitting. Then only about 27.5 percent paid by the consumer goes down to the next juncture, to the transporters and this includes the cost of wood, transportation and profit. Then, the 23.3 percent of the end price goes down to the contractor and this includes 17.9 percent that goes to producer and all other costs involved in harvesting, cross-cutting etc. The scenario emerging out of this 'funnelling down mechanism' discloses how the total price (Rs. 2.40) paid by end users goes down the system (see Figure 12).

FIGURE 11: WOODFUEL PRICING MECHANISM



Further analysis was done to see the percentage retained by intermediaries at their respective junctures. Accordingly, of the price paid per one kilogram which gets divided among intermediaries, 17% goes to the retail deliverers, 56 percent to wood depots where only 5 cents is spent per kg for splitting, 4 percent to the transporter, 5 percent to the contractor and nearly 18 percent to the producer for his investments.

Those who are involved in this trade mechanism earn an income out of the system. For instance, contractors keep nearly 13 cents per each kg of fuelwood; transporters (lorry transportation) keep 10 cents; urban fuelwood depots keep 24 cents for unsplit wood and Rs. 1.34 cents for split wood; the retail distributor keeps nearly 40 cents. The outstanding feature is that as fuelwood moves along the trade mechanism the price increases significantly. At the centre of this flow mechanism - at the fuelwood depots - more than one half of the price paid by the consumer is retained. Smaller units become profitable and as a result, fuelwood splitting increases the profit margins at the depots.

Finally, the amount earned by the producer for his investment is closer to the amount earned by retail distributors per unit. Due to the lower profit margin in this process up to the level of wood depots the small-scale producers are discarded from the system. For the same reason small scale fuelwood flow from rural to urban areas does not occur. The transporters' profit margins are small, so by transporting more they can increase the profit per lorry load of billeted wood which contains nearly 20 cubic metres.

As the mode of transport (which is primarily the bullock cart) does not require any fossil fuel it is a manageable system with a small investment. All carters interviewed mentioned that they sell at least 800-1000 kilograms per day. One cart load contains nearly 800-1200 kilograms of split wood. At least Rs. 1,920 worth of split wood is sold per day and the earnings for their labour, cart and bull is about Rs. 320 per day. As has been mentioned, it is really a struggle for the carters because there is stiff competition among them, but they confine themselves to their own specified areas by mutual agreement.

To understand the whole system field observation was made covering the transportation of a lorry load of rubber wood from Mawathagama area to the fuelwood depot located in Asgiriya and then the delivery to the households. The specific information gathered is given in Table 33. According to the fuelwood depots fuelwood sales have declined, particularly during the past 10 years, due to the adoption of gas (LPG) for domestic cooking. But, whatever the problems the wood depots have to face their net returns are extremely high when compared with those of all other actors involved.

FIGURE 12 : PERCENTAGE OF THE END PRICE AT EACH JUNCTURE

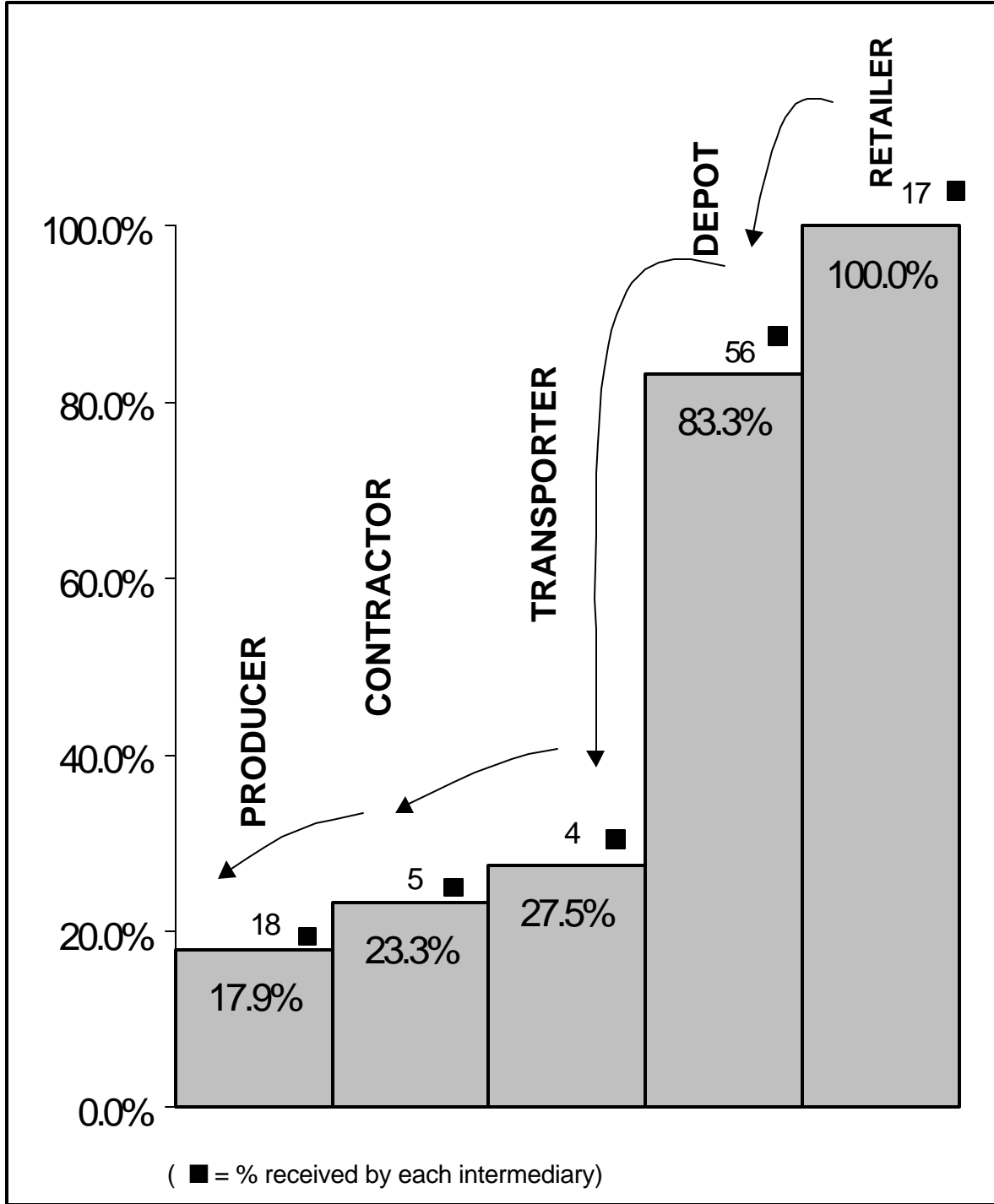


TABLE 33: COST AT EACH JUNCTURE AND RETURNS TO INTERMEDIARIES

Actor	Selling price 1 kg.	Amount received per unit	Net cost	Return to the intermediary
Producer	0.43	0.43	?	0.43
Contractor	0.56	0.13	0.07	0.06
Transporter	0.90	0.34	0.14	0.20
Wood depot	2.00	1.10	0.25	0.85
Carter	2.40	0.40	0.20	0.20

(Calculations were based on field observation in Asgiriya).

5.4 GENDER ASPECTS OF THE URBAN WOODFUEL FLOW

The commercial woodfuel flow, as has been mentioned earlier, is primarily controlled by the large-scale suppliers and it is an interregional phenomenon. Only in the distribution of split-wood does the flow mechanism involve the retail distributors. This section examines how the socially constructed roles and activities of men and women have influenced the division of activities in the flow mechanism. The activities in the commercial flow of fuelwood to the urban markets are not identical to those noted in the rural sector particularly in the process related to home consumption. The urban woodfuel flow starts at the level of tree felling, which operates with the primary objective of clearing land.

The whole process emphasises the singular importance of men's labour, (see Table 34). All on-site activities or the activities at production sites are performed by men. Once wood for the market is stacked, the remaining twigs and small branch wood are gathered by women for home consumption, but this takes place only if the management allows women to collect them. The actual trading process is also dominated by men, from the level of selling stacked wood to transporters/dealers, then to depots, including processing and distribution.

There are two matters to be examined here. The first is the exclusion of women in the commercial woodfuel flow process/woodfuel business. The second is related to the disparity between the self-consumption sphere, where women's labour plays a major role and the commercial sphere from which women have been excluded. The gender disparities show that the fuelwood business does not provide employment opportunities for women, or an income. Women are not engaged in tree felling, trimming, cross-cutting, stacking and transporting to the urban fuelwood depots, nor they are in the delivery system from wood depots to the end users. There are no paid work opportunities for women in this mechanism, so the cash returns from the woodfuel business are enjoyed exclusively by men.

TABLE 34: GENDER DIVISION OF ON-SITE ACTIVITIES

Wood	Felling		Trimming		Cross-cutting		Stacking	
	Men	Women	Men	Women	Men	Women	Men	Women
Rubber	100%		100%		100%		100%	
Forest	100%		100%		100%		100%	

Why two contrasting pictures have emerged with regard to gender performance was a very sensitive question. Because each picture is affected not only by the activities but also by location, and the purpose of attending to the activities. Obviously it is not completely due to the masculine nature of the work. The village situations analyzed earlier show that women are more heavily engaged in the process of fuelwood flow than are men. This is confirmed by analysing global experiences which show that the task of providing fuelwood is connected with home maintenance and so is seen as women's work. "Fuelwood" is in the domain of women. When it becomes an income earning opportunity and employment venture men have the privilege of reaping the benefits.

There are technical reasons behind this situation as well. The field discussions revealed that tree felling, the use of equipment like hand-saws and transportation are all outside the domain of women's conventional work. No men believed that women had the skill to do such tasks. So the woodfuel business which involves large-scale operations has never been conceptualised as women's work, nor as a possible area for women to be employed on a daily wage basis. Fuelwood development for the generation of employment and income has not been taken into consideration by development agencies, indeed even those which focus heavily on income generation and employment opportunities for women have paid little attention to the potential of this sector.

Along with the conventional ideology regarding the masculine nature of the activities involved in the commercial woodfuel flow, the commercial context of the activities influences their allocation. The conventional division of responsibilities displays a clear distinction between women's work and men's work in the commercial woodfuel flow. This distinction prevails between gathering for self-consumption and harvesting for commercial supply. Free gathering is seen more as a task related to household maintenance, while commercial supply is seen in the context of employment and income generation for which men are responsible. The work which does not directly bring an income is performed more by women. This is why women's engagement in trimming and collecting branchwood for household consumption has not been considered important. Not only are those twigs categorized as "leftovers" but they are also not valued in terms of their contribution to household energy consumption.

Another question which arises under these circumstances is whether the level of operation has gender implications. Whether large scale production has, as in many other situations, been kept under the control of men needs examining. The large-scale operations for land clearings, and the harvesting and gathering of fuelwood for small quantities for daily consumption are divided in a gender specific manner and coincide with conventional gender roles. These differences are also connected with the conceptualisation of fuelwood in one situation as a "by-product" of trees and in the other as a "major product" of trees. The visits to the plantations during the investigation made it clear that fuelwood is an additional source of income derived from the plantations managed for cash income, and it is produced from the last harvest of a plantation's life cycle. The survey of the rural situation revealed that, where women are heavily engaged, fuelwood is one product among many others and is usually thought of as being available throughout a plantation's life rather than only at the end of its life cycle. Women's lack of concern for growing trees specifically for fuelwood is related to these conventional practices. Perhaps on the same grounds women are being excluded from the systems operating inter-regionally.

5.5 WOODFUEL RELATED LIVING PATTERNS

The woodfuel business, although noted as a man's occupation, is a household survival strategy for those who are engaged as intermediaries in the flow mechanism, while in rural areas the fuelwood sales bring cash to meet contingency needs. For wage earners, for the casual labour in particular, it is an opportunity to earn cash. For instance, 2 to 3 people work at each wood depot splitting wood and selling them to carters. The benefits of the daily wage opportunities are enjoyed by their families. The wage income of a daily labourer is in the range of Rs. 140 to 240, which is equivalent to a local casual labour wage. Almost all the respondents interviewed mentioned that it is a means to support their families. According to the interviewees, as women have no formal employment in these families, it is a sole source of family income.

The discussions held with the families of fuelwood carters' showed that although it is the sole source of income only 60-70 percent goes for family use. Only in 4 cases did 90 percent or more of the daily earnings go to the family. The rest goes on carters' personal expenditures which includes lunch, 3 cups of tea, smoking materials and some alcohol. All the carters interviewed occupy very congested housing units, so the quality of life is rather poor. Neither the carters nor the women of their families believe that women could be involved in the woodfuel trade because the work is too hard for them. Therefore, it would be difficult for women to be integrated into the existing trade mechanisms and it is doubtful that they would be accepted.

Relatively better standards of living, with better houses with service facilities are enjoyed by the fuelwood depot owners. A repeatedly mentioned problem is the tendency for the consumption of fuelwood to decrease, and for the price that the consumers have to pay to the deliverers from outside to increase. They stressed three points in regard to this phenomenon. The first is the difficulty in getting better logs of rubber wood, because it is in demand as timber for making furniture and packing boxes. Rubber wood packs well and the wastage is minimal, the time spent on splitting is less when compared with forest wood, so depots get maximum returns from rubber wood sales. The second is the greater tendency by the household sector to use alternative, clean types of energy. Records at wood depots showed that their sales have been reduced by about 35-40 percent. The third point is the increasing price of wood coming from outside and the increased fuel price that affects the cost of transportation.

Under these circumstances, the future of the woodfuel business must be properly supported to make it a profitable income venture for the producers. The potential to promote supplies from hinterland areas and to connect hinterlands with urban markets has not been investigated so far. This is a way to contribute to the incomes of the small-scale rural producers, particularly to women. According to the women interviewed in the rural survey, if such mechanisms are developed women will be motivated to produce an excess of fuelwood and to consume fuelwood more efficiently, because every kilogram of wood that they can save will be sold for cash for household use.



Fuelwood transportation for commercial purposes is a man's job (A.W.)



Men dominate the commercial woodfuel trade (T.N.B.)

6. GENDER ASPECTS OF THE COMMERCIAL WOODFUEL FLOW

6.1 TWO EMERGING SCENARIOS

From the perspective of gender the distinctions between rural and urban woodfuel flow systems, and between gathering for self consumption and for trade, are related to the following:

- i. The distinction between "heavy work" and "light work";
- ii. The distinction between "production and reproduction" or "work and services";
- iii. The distinction between work that provides cash returns and that which provides non-marketed goods and services;
- iv. The techniques, tools and modes of conveyance used in the respective flow processes.

The analysis reveals that woodfuel gathering for self-consumption is considered a much lighter task than supplying woodfuel for the urban market. The work involves collection in small quantities for daily use. In rural areas, many tasks are performed daily with some marked peak events associated with activities like branch pruning or tree felling. The commercial flow system differs because it is a large-scale business, which involves large scale harvesting, transportation and delivery.

6.2 HEAVY AND LIGHT WORK

The difference in men's and women's engagement in the fuelwood flow mechanism has been described in association with the nature of work and with a gender ideology that has been forced on the division of work. Who defines the 'heaviness' or the 'lightness' of the work and how it is differentiated in the woodfuel flow process are interesting questions. Analytical interpretations based on group discussions to some extent help understand how the work is differentiated. 'Heavy' work is defined in relation to the activities exclusively performed by men. These activities include, 'tree climbing', 'tree felling', 'cross-cutting' large trunks of trees, long distance transporting using conveyances like lorries, tractors, bullock carts and hand carts and splitting billets at fuelwood depots. Although headloading is a heavy task, it is exclusively done by women and also considered a manageable activity for women to attend to alone. Fuelwood gathering for domestic use seems to be considered "light" as a result of the low priority given to work for subsistence or domestic well-being. Other reasons are the non-monetisation of the work done and the fact that the goods procured by women are "free".

Even if women walk several kilometres to collect a bundle of wood and carry it home in a headload it is not considered heavy work. The heaviness of course has nothing to do with the weight of the wood, but is differentiated in relation to the "strength" of the gender which performs the work. Such definitions are purely subjective. In addition, according to a group interview, the risky tasks are considered to be men's work. It is believed that tree climbing, tree felling, cross-cutting etc., are not safe for women to perform. Concern over the safety of the work for women is emphasised, especially where cash or trade is involved, but the potential adverse effects of women's exposure to smoky kitchens or of carrying excess weights are not considered risks. It appears therefore that gender roles are allocated not

only according to the physical nature of the task but also largely according to whether the work is done for cash or for domestic well-being.

The scale of the work done also seems to be an important factor in defining whether work is men's work or women's work. In large scale operations, men's labour is considered essential, while in small scale operations, like splitting branchwood for home consumption, it is not seen as work needing to be performed solely by men. For example, carrying fuelwood bundles in headloads is not considered unsafe for women, but transporting them in advanced conveyances to depots is. A further, and perhaps more important, reason for defining work as men's or women's work relates to how the work is done and where it is performed. Work is considered heavy, and thus men's work, when relatively larger equipment is used. It is also considered beyond the capacity of women when it is to be performed for a long stretch, e.g. from morning till dusk. Although women interviewed were reluctant to accept that they are physically weak and unable to attend to the hard work, the traditional work norms related to women's gender are re-enforced in the woodfuel business. Often women themselves believe that it is disgraceful for them to climb trees, fell trees etc., whereas men believe that it is disgraceful for men to make women attend to these tasks.

A point to be noted here is that women themselves accept that tree climbing, pruning upper branches, felling trees, cross-cutting wood trunks are beyond their capacity, and these are men's work. These activities, according to their own explanations are too heavy for them to attend to, and they are reluctant to go against the social norms. In addition, there are no better technologies available for women to adopt to fulfil these tasks.

6.3 DISTINCTION BETWEEN WORK FOR MONEY AND SUBSISTENCE WORK

Fuelwood collection for self-consumption is perceived as a completely separate domain. The data presented in Chapter 2 affirms that, even where woodfuel is supplied from local sources for commercial uses, as in the case of Kundasale area, the system is dominated by men. This means that work to produce marketable goods is considered to be masculine work. Men's marketable and mobilizable labour is used to provide marketable goods. Women's labour is not recruited for activities related to commercial supply or distribution.

A noteworthy feature is that where supplies are from the sources owned by the households, women's labour is used as free family labour. Women attend to the activities related to woodfuel supply for home consumption. As their labour is not spent on work providing money, the long hours of wood gathering and headloading is associated with ensuring household welfare, and domestic chores. Women themselves have noted that saving their labour is of little interest to the household because there is no demand for women's labour in the production sector or in the formal service sector.

Women of wealthy families view woodfuel availability as a symbol of household self-sufficiency. And women of low income earning families are uncertain about the alternative uses of their labour either to earn cash or save household expenditure so they undertake the burden of collection more as a means of contributing to the satisfaction of household needs. In terms of the opportunity cost of women's labour, the effort is not economic when it depends on remote sources. The average wage that a woman earns from casual work in the area is in the range of Rs. 12-15 per hour, whereas the converted price of fuelwood gives about Rs. 3-4 per hour for gathering and portaging fuelwood on headloads.

This situation suggests that the economic profitability of fuelwood gathering for self-consumption can be rationalized in terms of women's contribution to their families. For women, it is not a production loss because most of them have no alternative ways of using their labour. Further research is necessary to provide a full coverage of the whole issue, to incorporate the loss of women's energy, and the health costs such as repetitive strain injuries that women have reported during a detailed study conducted in Sri Lanka.

On the one hand in the rural sector women's work in the fuelwood flow mechanism cannot be simplified and isolated from household livelihood strategies, relief of poverty etc. On the other, it is a matter of local sustainability. If fuelwood is available for free gathering where the hidden cost is their labour, women themselves have the self-interest to gather fuelwood. A completely different situation emerges with regard to the commercial flow, because activities concerning the commercial supply of woodfuel are placed outside the domain of women, the domain of welfare, and the domain of daily survival.

6.4 PRODUCTION AND REPRODUCTION SPHERES

The marked differences between the rural and urban sectors in the pattern of men's and women's engagement in the woodfuel flow throw light on the debate on men's productive roles and women's reproductive roles. In the rural flow mechanism women's greater engagement in fuelwood gathering for self-consumption is a reflection of the connection between household needs and women's domestic chores. Their free labour or helping hand provided for fuelwood supply for rural industries show that their interest is to get some cash for the household out of fuelwood sales. In contrast, in urban areas where women do not have access to supply sources, it has become a purchased commodity and nearly Rs. 10-12 is spent on it daily.

Fuelwood gathering as an activity and a responsibility is part of the domestic chores of women in rural areas. As has been noted earlier it helps women to save expenditure and also reduce the pressure on the household budget. The conventional practice of considering fuelwood management to be a woman's domestic activity has been weakened in the urban domain. In urban areas, generally men have to bear the cost of fuelwood, particularly in low income earning families, on top of other cash needs.

The exclusion of women's labour from commercial woodfuel systems, or the fuelwood business, however is a result of the separation of women's reproductive roles from large-scale operational systems. The "heavy" or masculine work is considered unsafe for women due to their biological nature. It has been perceived that such work harms the reproductive or the child bearing capacity of women, could disturb pregnancies, or create delivery problems etc. It was found that during pregnancies and for a period of about 4 months after child delivery women are not allowed to split wood, stretch and cut branches above ground, and carry heavy headloads etc. These normal practices reinforce the idea that large-scale operations in the woodfuel business are unsuitable for women. Some activities have been placed outside women's domain simply for biological reasons, while others, particularly their engagement in woodfuel flow mechanisms or business, are avoided on the grounds that men should seek paid labour opportunities to support their families while women should attend to domestic chores.

It was found that there is no demand for women's labour for such work in the woodfuel trade. This is an area where women are perceived as inconsistent and inefficient workers. But both gender groups also accept that men are inefficient in attending to domestic chores while women are relieved not to have to undertake the work that men attend to. Neither group believes that major changes in role allocation will have a positive impact upon the household.

6.5 TECHNIQUES, TOOLS AND MODES OF CONVEYANCE

The techniques used from the level of felling trees to splitting wood are traditional. For instance, tree felling is done by cutting the trunks at the root collar at ground level and no incidents of using advanced tools like power-saws have been noted. Trimming is done using an axe. Cross cutting is done using hand saws. Not only are these techniques primitive and involve intensive work, but the tools are also conventionally handled by men. In addition, technologies have never been introduced to ease women's work and provide more opportunities for them.

This applies to the mode of conveyance too. All 4 modes of conveyance: lorries, tractors, bullock carts and hand-carts are not operated by women. Women do not drive lorries; not because it is considered exclusively masculine work, but due to the conventional norm that it is not a dignified occupation for women. In addition, driving has no fixed working hours, or a fixed work location. Even the smallest mode, the hand carts, are not considered a conveyance that women can handle on their own account.

Although retail distribution in carts can be seen as a small-scale operation, house-to-house deliveries are not performed by women. Cart delivery involves intensive work. Here too, it is not considered to be dignified work for women. The behaviour and occupations of women are not defined in terms of needs to earn cash; or on the grounds of equity and equal opportunities, but on the social construct of what constitutes a dignified way of living for a woman. The questions that need to be raised here are how can the woodfuel trade be promoted as an income earning venture for women, how can gender disparities be eliminated, and what efforts can be made to promote opportunities for women in the woodfuel trade.

6.6 CONCLUDING REMARKS ON GENDER AND TRADE

The findings of the survey of the rural and urban sectors, which coincide with self-consumption and trade respectively, point to the fact that fuelwood has entered into the domain of men with its commercialisation. Rural women, particularly those in the urban hinterland, recognise the commercial demand for woodfuel. As a result, women themselves make adjustments at the household level, by saving marketable segments for sale, using less demanded segment/types for household cooking. The fuelwood management practices, although limited to a few who produce an excess, are partly influenced by market opportunities, and are important aspects in the whole flow process.

Market opportunities are not confined to urban areas, but exist in rural areas also, among domestic consumers, as well as industries. The small scale woodfuel trade primarily centred around a few types like coconut husks, fronds and branches, give some income for women, who are the managers of household produce, although the amounts earned are insignificant

and irregular. Women are excluded, when it comes to fuelwood for rural industries and urban demand, and their labour is replaced with men's labour.

To a great extent this is a drastic transition. This transition is not due to women's lack of interest in dealing with commercial opportunities. This is mainly a result of the separation of the production side from the trade. The trade mechanism begins with harvesting of trees/felling trees and cutting branches for sale. So the tree managers, or the production source managers are not considered part of the system, nor do the returns go to those who have been engaged in the production mechanism. As a result the payments for labour and the investments go to those who are engaged in the commercial flow mechanism, implying that there is no stimulus for women to increase production for local self-sufficiency, for income, or for employment.

The demand for women's labour in the process is insignificant, so although women are in need of income earning opportunities they are excluded from the commercial woodfuel system. From the development perspective there are three critical points. The first is that this sector has made no effort to contribute to uplifting women's living standard by way of introducing women-friendly technologies to stimulate women to become engaged in the flow process. The second is that no significant efforts have been made to turn fuelwood production and supply into an income-earning venture in rural areas. Although, fuelwood has become a commercial and marketable commodity, which conventionally has been freely procured, very limited opportunities have emerged for the small-scale producers to enter the trade. Although women deserve such opportunities as local tree resource managers, opportunities have so far only evolved around the large-scale production systems.

The factors creating a demand for woodfuel, and stimulating users to use wood energy are not known to the producers. The commercial fuelwood users, which consist mostly of the urban domestic sector, and to a lesser extent industries both in rural and urban areas tend to think that they are exploited by traders, and have no sense of the share that goes to producers. The small-scale producers, among which women play a prominent role have no sense of market mechanisms, its trends, needs and their own future potential to enter and contribute to and benefit from the commercial venture. Not only is the system controlled by a few well-established supply centres, the depots, but also women cannot compete without assets and without organising themselves. The women's lack of assets and the lack of institutional support for women to enter the system has allowed men to dominate the system. Women's lack of resources, primarily the ownership of land or the production systems is a reason for women's exclusion. On their part they have no rights to organise producer friendly and user friendly mechanisms.

From the perspective of local sustainability the needs to stimulate small-scale producers to be equipped to cater for the markets can be stressed. For instance, as has been noted earlier, local supplies are relatively cheaper for local industries so if women can organize and produce in relatively large quantities they will directly benefit. Moreover, with the depletion of large scale sources of supply such as the Dry Zone forests and the reduced supply of rubber and coconut trees in times to come, the local industries will turn back to local producers and urban traders will link with the hinterland areas.

This implies the need to narrow the gender gap, and enhance the contributions or returns to women from commercial mechanisms. Gender planning, however, is outside the biomass energy sector in Sri Lanka. Due to lack of locally accepted formally organised tree planting programmes, and processing technologies, women's responses to market trends are insignificant. Clearly the commercial woodfuel demand has to be recognised and taken into consideration in planning for the future.

In the rural sector women can potentially integrate woodfuel production into their local production systems and resource management activities. Thus they can contribute to the rural wood energy based industries by way of relieving industries from over-exploitation, and organising local production to connect directly with the end users, the industrialists. The village-based supply centres, if promoted, can be managed with little investment.

7. GENDER, POLICY ISSUES AND FUTURE DIRECTIONS FOR RESEARCH AND ACTION

7.1 INTRODUCTION

The woodfuel scenario in Sri Lanka is highly complex. This is partly due to its spatial context which tends to get overlooked in the process of generalization. For instance, this study reveals that the woodfuel scenario of the rural areas of the Kandy district is not relevant to the urban scenario. This study also demonstrates that inter-regional flows and the commercial mechanisms are important to the urban area. This implies that the supply/demand balance noted in the FSMP regarding Kandy District does not apply to the urban area. In contrast, the deficit situation noted by Howes and Endagama (1995) is a reality because the interregional flow itself is evidence of this. This suggests that generalisations regarding either the balance or a deficit are of little significance where spatial imbalances exist in the production and consumption patterns. Furthermore, the inability to highlight such conditions may result in inappropriate planning and underevaluation of the interregional linkages and income opportunities related to the woodfuel trade. While information on market potentials remains unavailable to the local producers they will not be motivated to involve themselves in rural-urban trade.

The policy issues pertaining to gender and woodfuel trade are associated not only with the forestry sector alone, but also with the local resource-based development sectors, environment, industries, energy sector, trade, health, and overall development within which gender equality has to be emphasised as a national priority. In fact this situation has a much broader geographical context because these aspects are relevant to local, national and regional development. This multi-sectoral context points to the need for harmonising the discrepancies between sectoral policies.

One critical limitation that we observe across regions and sectors is the missing agenda for gender equity or policy concerns to eliminate prevailing gender gaps and achieve the goals of gender equality. This implies that although one could argue that women themselves should come forward to achieve the goals, the national policy guidelines, rights to resources, regional development agendas and intervention mechanisms could do much to satisfy women's needs, because the majority of women's work is decided by external governance.

It is important to note that, although the state has ratified the relevant international conventions and prepared action plans for women, gender mainstreaming has not taken place. In this context, the wood energy development sector, among many others, needs to set its mandate. When one turns back to the FSMP (1995) of Sri Lanka it can be seen that it has stressed the fact that although no serious crisis is likely to emerge, there are local difficulties in meeting the basic energy needs sustainably. Urban consumers, are the ones who face serious difficulties in meeting their needs sustainably, while rural users, the women, will have to face a greater burden with the increasing demand and competition for woodfuel resources likely to emerge in the future.

The need in this situation is to draw up plans to enhance production, improve flow mechanisms, regulate prices and ensure better returns to those who work in the production sphere and manage the supply sector. Similarly, to contribute to the country's development production sectors using wood energy must be guaranteed a sustainable supply at a reasonable cost. National level estimates on supply and consumption have no meaning unless both sides are stimulated and amalgamated efficiently.

The research findings presented in this report enable us to reexamine future policy implications although full coverage pertaining to gender in the woodfuel flow needs national level investigations. However, the elimination of predominant gender disparities in the commercial woodfuel mechanism must become a national priority if the state is committed to accomplishing gender equality. This goal cannot be achieved in isolation and without introducing local agendas. The subsequent discussion is an attempt to point out some major concerns.

7.2 REGULATORY ISSUES

The commercial woodfuel trade in Sri Lanka is a rarely investigated phenomenon. The woodfuel trade is largely dominated by the private sector, although the depots of the State Timber Corporation are authorised to sell fuelwood derived from the natural forests and forest plantations. It is important to note that the depots of the State Timber Corporation have no links with the local delivery mechanism so their efficiency in supplying is low when compared with the private sector. The fuelwood business is subjected to regulations of the Forest Department which is under the Ministry of Agriculture, Lands and Forestry. Fuelwood of many species grown in non-forest lands cannot be transported without transport permits.

The transport of fuelwood is regulated by this permit system. The procedure involved in getting permits is cumbersome so on the one hand it discourages the supply from external areas, trade and urban-rural linkages and the involvement of small scale suppliers. On the other hand, every effort is made by the suppliers, primarily the small-scale traders, to avoid getting permits. Transport permits are issued for those who can show that the trees are felled on valid permits. As the issuance of transport permits is kept under the control of the administrative bodies of the respective areas, it is often done more on personal contacts enabling only an established group of people to be involved in the business. This situation suggests that the resource mobilisation through which the imbalances between supply and demand, which have been noted as a main issue in FSMP, could be smoothed has not been fully encouraged.

The state regulations pertaining to 'tree felling' and 'transportation' are interrelated. It is an offence to fell some species without permits. If trees are felled illegally there is no way for the producer to contribute fuelwood for the market. None of these are relevant to rubber wood trade, but a permit system was introduced for coconut in early 1977. Many of the better quality species like jak, teak, etc., producing high density wood, grown in homegardens, or in farmers' own lands have to go through this procedure. The fuelwood transportation should, in fact, go through legislation related to timber transport.

The permit systems have been introduced to maintain trees and perennial vegetation cover. In addition, it is also seen as a measure to inhibit deforestation and the illegal transportation of timber including fuelwood. These regulatory measures have been considered as a

necessity. The permit system has been enforced on the assumption that wood has been produced from titled lands. The tree growers' title ownership was a requisite for them to get benefits from a harvest of timber and fuelwood. What often happens is that if tree growers have no titles to the lands, then they repetitively use one permit to cut a number of trees. There are many practical advantages and disadvantages related to this system. It has requested farmers to justify their tree harvesting needs. This has a tremendous adverse impact on women because they have no titles to the lands on which they grow trees, even if the lands belong to the household. Harvesting of species producing non-timber products or valuable timber have been delayed until their natural cessation. The disadvantages are greater for the small-scale producers. They have to go through the formal procedure several times, if they want to harvest and transport woodfuel a number of times a year. Opportunity to contribute to the small-scale tree growers from woodfuel trade, under these circumstances has been controlled or reduced. For large-scale tree growers, particularly the better-off ones who have coconut and rubber plantations, the procedure is straightforward, because complete site felling and transportation can be done on one permit. The regulatory measures are not only non-stimulatory but also discourage farmers, including women, from joining the commercial sector.

However, it is important to note that the woodfuel trade started without State interventions. Neither development potential, nor market investigations have been done to improve the flow mechanisms to maximize returns to the suppliers and encourage users. Trade is operated by intermediaries on their own account in an informal manner. For women who do not have title ownership to the lands, these regulatory measures create a double burden associated with both harvesting and transportation.

7.3 POLICIES AND WOODFUEL TRADE

In this study an attempt was made to understand woodfuel flow patterns and mechanisms and their gender related aspects. The permit system discourages small-scale producers and intermediaries from enhancing flow mechanisms. It impedes the cash returns to the producers, because rather than delivering fuelwood to the urban markets where a relatively high price can be fetched, farmers tend to sell them to dealers or to local entrepreneurs.

In addition, the state regulations have a direct impact on production. In the long run, local people are unable to harvest the trees that they plant on common areas. Land and tree tenure issues pertaining to the development of state lands need more attention and it may be possible to introduce joint management strategies in the future. This means that the state policy in promoting tree planting should guarantee the returns to the tree growers and sustainability. At present either people have to select poor quality woody perennials whose wood can be transported without permits or prepare to accept low returns on their investments by engaging in illegal trade.

The species specific regulatory system is non-stimulatory with regard to indigenous species. Yet, it is important to note, as has been noted in the field survey, many species producing fuelwood are not fast growing species. Indigenous tree planting for the by-products of fuelwood has a strong social context and for women it is most beneficial. Due to the regulatory barriers indigenous tree planting cannot be promoted with the intention of promoting commercial ventures. These measures impede farmers from getting maximum

benefits. The inability to get transport permits results in burning timber to clear land in dry zone areas.

The gender implications of these regulations are extremely important because women do not have equal title ownership to land. In fact, this was found to be one of the main reasons why women are not involved in the woodfuel trade. Moreover, they cannot be involved in getting harvesting permits or permits for transportation. The permit applications for harvesting trees and woodfuel are submitted by men thus impeding women's involvement. Thus women's primary concern over fuelwood for self-consumption rather than trade is reinforced. The state regulations obviously reaffirm men's involvement and authority in the woodfuel trade due to their ownership rights to the lands on which trees are grown. No attempts have been made so far in Sri Lanka to develop a full picture and analysis of the gender perspective on woodfuel development. In this respect it is a research priority to screen the regulatory measures, trade mechanisms, production scenarios, and propose the ways and means to ensure gender equity and equality in the forestry and related sectors in Sri Lanka as well as in the countries in the region. The responsibilities in this regard cannot be placed on the forestry sector alone but a commitment should be made by all the state agencies responsible for promoting gender equity and equality.

7.4 FUELWOOD TO REDUCE IMPORTED ENERGY

The FSMP (1995) has recognized that improved access to bio-energy resources and the promotion of fuelwood production as a by-product in various agroforestry systems will help to reduce the need to substitute imported energy for fuelwood, thereby saving foreign exchange. The need to promote flow mechanisms along with production to reduce adoption of alternative types has not been taken into consideration. Whether the forestry sector intends to see fast adoption of new forms of energy or is ready to promote production and speed up the delivery mechanism and support services is not clear.

While the state is planning to reduce imported energy and save foreign exchange, women are trying to reduce household expenditure on energy and save family expenditure. What we see here is a common intention to reduce the pressure on expenditure by way of increasing production and reducing the use of costly alternatives.

The projected trends in bio-energy, as given in FSMP, point to an increase in homegarden supply from 26% to 33% between 1993 and 2020. If this is to be achieved, then gender sensitive support services are needed, simply because the activities related to fuelwood in homegardens, fences and hedges are performed more by women. The market can be expanded only if reliable supply systems are organised and the commercial potential of bio-energy and its prospects for generating income (including for women) are incorporated into wood energy policies. At present, these are missing in the forestry sector.

In association with the proposed state strategy to improve security of land and tree tenure and to provide extension, credit, low-cost seedlings, and other support services to promote fuelwood production, there is a need to identify committed and efficient actors who are in need of such assets and who have demonstrated an interest in undertaking this challenge. This task cannot be fulfilled without analysing the gender related patterns and practices. It is also necessary to know whether the need here is to make local people self-sufficient or to become producers for the commercial sector.

If the goals are to narrow the gap between the sustainable supply and demand in specific locations, the matter in hand is simple but unachievable because the gap between supply and demand tends to vary. Spatially some areas produce an excess that cannot be consumed by local consumers, while in other areas demand is so high there is no way to promote the local supply to satisfy it. The challenge here is to create interregional linkages, for instance by linking demand concentrated urban areas with rural hinterlands; rural industrial clusters with local and neighbouring production areas. This study has revealed that, although all fuelwood types can be burned, only certain types can be used in the manufacture of quality products. Therefore local and interregional flow mechanisms are needed for the benefits of both producers and consumers. Suitable mechanisms to deal with these aspects must be determined and introduced.

7.5 RECOMMENDATIONS

The findings of this study reveal that a clear distinction exists between urban and rural areas in the woodfuel trade. Some of these findings can be turned into recommendations from the perspective of gender and the promotion of woodfuel trade to enhance the returns to tree growers.

i. Regulatory reforms

As long as woodfuel trade is highly regulated in terms of permits, the trade will be under the control of affluent intermediaries who can either escape from the regulatory procedures or get permits without serious difficulties. As the supply of woodfuel for local industries and self consumption is people's own contributions to the sustainability of these systems, the need here is to relieve them from the pressure coming from state agencies so that they can reap the benefits of their investments. Transport licenses should be issued to the farmers involved on the grounds of their engagement, irrespective of their gender. Farmers (men and women) must be given licences to transport pruned branchwood without any difficulty. Technically such practices will improve tree production and lead to better land husbandry. Rather than issuing licences for transportation separately, licences valid for transportation must be issued to those who are engaged in managing tree stocks. This will strengthen the flow mechanisms between rural and urban areas, and provide opportunities for small-scale producers to enter the urban trade. The spatial imbalances in woodfuel availability can be smoothed out through efficiency in trade for which regulatory reforms could contribute tremendously.

ii. Trade efficiency

The bio-energy shortage cannot be eliminated only through promoting production; an attempt must also be made to improve transportation systems. Transportation has no institutional framework, and the private lorry transporters involved in transportation operate quite independently of each other. As a result their supplies are irregular and unreliable. The State Timber Corporation, which has the authority to sell timber from forests and plantations, is not involved in transportation. To improve efficiency in the woodfuel trade woodfuel dealers must be motivated to organize themselves to ensure better distribution of supplies among depots and to the end users.

iii. Wood energy development

At the national level, strategies are needed to reduce the adoption of fuelwood substitutes. Such strategies can be justified in terms of local sustainability, renewability of the bio-energy and in terms of enhancing cash returns to tree growers and rural dwellers. On the one hand the forestry sector has attempted to promote tree farming by private sector and small-scale farmers, and on the other every effort has been made to control the free flow of wood. In fact, as has been mentioned by the transporters, severe penalties on the transportation of fuelwood of some species point to the fact that engagement in such risky business is not worthwhile. Wood energy development has many junctures, from the level of production to the consumption, so the problems in all these segments must be addressed.

iv. Management of woodfuel

In the non-commercial area and production segments women play a vital role. Their day-to-day handling and engagement points to the fact they are the key actors in managing the stocks. From the point of view of energy security, they avoid acute scarcities under which food processing, food preparation and the consumption of boiled water etc, are threatened. The connection between energy security and food security must be formalised. The other important aspect is related to efficient use: Either by adopting improved stoves or by greater efficiency of use in the kitchen etc. women can contribute to energy conservation on a day-to-day basis. From the perspective of energy development and management discussed by the United Nations Conference on Environment and Development (UNCED, 1992), it can be stated that women can contribute tremendously to the efficient management of woodfuel at the household level, in every kitchen on a day-to-day basis. Efficient use management is not only a way to reduce waste, but also a way to reduce the pressure on supply sources and ensure the availability of stocks for the market. The management of local woodfuel resources, in particular the small-scale woodfuel production units, is extremely important if we are to continue the supply of woodfuel to small-scale industries such as bakeries. The sustainability of these industries depends on their being able to obtain wood locally and regularly.

v. Gender specificity of commercial and non-commercial flows

The wood energy sector is one area among many others where gender equality has not been taken into consideration. One question which needs to be raised here is to what extent the fuelwood trade can contribute to improving the living standards of those who are involved in the production of woodfuel and in the flow mechanisms, and how well can it contribute to eradicating gender disparities in getting benefits. There is a well-marked distinction between the woodfuel for household well-being and for cash returns. The findings of this study show that women do not benefit from the cash returns from the trade of woodfuel so the system makes no contribution to uplifting the living standards of women. The process of promoting women's engagement should begin from the level of their right to production sources; their entitlement to get legal permits to harvest and transport, and recognition of their roles in the woodfuel systems. Providing opportunities for small scale producers to be involved in the commercial woodfuel trade would empower women and uplift their living standards.

vi. *Inter sectoral linkages*

The sectors like energy, agriculture, rural development etc., responsible for forestry development, as a whole must take initiatives to form and strengthen local organisations to prepare local agendas to increase local production. The requirement is to strengthen local flow mechanisms, integrate wood energy into development, enhance wood energy based industries, promote rural-urban delivery systems, introduce pricing systems, and improve technology from the level of harvesting to the level of consumption. In Sri Lanka no single agency is responsible for all these, so there is a need to establish inter-sectoral linkages with the involvement of the people. How should sectoral interventions be organized to deal with local situations, production systems and people, especially as people consist of heterogeneous groups, and may differ in terms of interests, skills, and socio-economic status? What social variable could be used to identify practically desirable groups worth analysing? Adoption of gender as a social variable and analytical framework is of little value unless those who are involved in this area are able to apply gender concepts in a practical, effective and reasonable manner.

vii. *Gender analysis of policies*

Sectoral policies, particularly the forestry and energy policies, need to be analyzed from the gender perspective. Without such analysis mainstreaming gender will not be possible. Each sectoral policy has stressed the goal to contribute to uplifting people's living conditions. Yet regulations and policies have not assessed their differential impacts on the lives of men and women separately. As a result the needs for equality and equity in development are not effectively recognized.

viii. *Research*

Research pertaining to commercial woodfuel flow must be conducted to construct local, regional and national scenarios. The study outlined in this report is only an entry point. One of the objectives must be to construct agendas for local forestry, energy and trade on which regional and national frameworks for production, trade and technology can be introduced. Due to the diversity of the production systems and spatial differences it is difficult to generalize, or to replicate the situation of one area to another area.

ix. *Understanding of rural urban linkages*

The research information pertaining to gender in commercial and non-commercial woodfuel flow mechanisms is limited and sketchy. What is known is the consumption patterns. The linkages between urban commercial distribution mechanisms and the flow from hinterlands are less understood. Better understanding of these is necessary for policy reforms and regulatory reforms.

x. *Training*

Two types of training are needed. The first is gender sensitization for all agencies involved. The second is participatory development for extension services in the forestry, agriculture, energy and rural development sectors. Training and experience in community participation and gender planning in land resource-based development are essential to ensure the

benefits of woodfuel trade for men and women. A series of training programmes are needed, and should be designed by local institutions. To avoid replication a coordinating body should be identified and supported.

7.6 FUTURE DIRECTIONS FOR RESEARCH AND ACTION

For future development regional, national and local agendas are needed for an integrated approach. In addition to the sectoral integration for which many countries in the region have their own mechanisms, the principles of equity and equality need to be built into the process.

The lesson learned in this study is that the commercial wood energy flow mechanisms are found at two levels. The first is in the form of local circulation and the second takes place inter-regionally. If countries in the region are to prepare for crisis management, the serious imbalances prevailing in some areas/localities and the possible destruction that industries will have to face must be taken into consideration. Similarly, to capture the development potential flow mechanisms must be properly investigated. The promotion of mobilisation mechanisms simultaneously with production enhancement will stimulate producers, managers, intermediaries as well as consumers to contribute to the development efforts pertaining to wood energy. All these aspects are insufficiently investigated matters so these areas must be prioritised in research.

The relationship between gender and wood energy tends to exist at every stage in the process, from production to consumption. It can be argued that as both genders are involved the benefits must be shared. The knowledge accumulated by the two gender groups, and their engagement patterns and activities, have yet to be fully discovered. As a result information delivered to policy makers, wood energy planners and technical experts seems to be sketchy. As most of the woodfuel is used for self-consumption and not for business and income generation, its contribution to human well-being has not been given enough emphasis and the economic implications of the scarcities have not been fully investigated. While women play a central role in the self-consumption sector men dominate the business sector. In this respect many actors of different calibre will have to make a collaborative effort to carry out gender sensitive planning and execution of development programmes to contribute to those who are adversely affected by scarcities and by inadequate incomes, and also to those who are practically engaged in the process - at various stages in production, mobilisation and consumption.

The actors who could potentially contribute to gender responsive development are the Rural Wood Energy Development Programme of the FAO, national mechanisms or responsible co-ordinating bodies of the states, local administrative systems and ordinary people - men and women. Most research related to women and wood energy affirms the fact that women are the responsible gender for providing woodfuel, one of the basic needs, and they are the major victims of resource depletion. The fact proven here is that in the wood energy sector too the notions of "housewife" and "basic needs" have been strongly connected with women and the ideology regarding their gender roles. A collective effort is necessary to eradicate gender bias in contextualizing woodfuel as women's responsibility and as a commodity of economic and survival importance.

To contribute to improving the socio-economic well-being of rural communities, particularly of women who have shouldered the responsibility for procuring fuelwood and silently managing the production systems, many efforts are needed. These include:

i. Set an agenda for the future

Development of regional, national and local agendas to make changes across the region in terms of improving conditions of women and their income generation capacities. RWEDP, in particular, has expressed a great interest in this issue. It has the institutional set-up to bring together experts and those who are concerned with the issues and to facilitate this process in the future.

Although almost all the member countries have prepared their own plans to improve their wood energy sectors, as part of the development of the forestry sector, no country has so far made a noteworthy effort to mainstream gender into the policy frameworks and prepare gender sensitive plans and programmes. This implies that, as has happened in the forestry sector, the strategic interventions may isolate people, women in particular. The time has come to realize that isolated, mushroom type interventions are not making a sound enough change. This study has revealed that whatever the efforts the state makes, women still have to bear an enormous burden of collecting fuelwood from all sorts of sources, some of them remote, while men are engaged in work which has a 'masculine' labour label or leads to an income. To overcome these problems RWEDP should step up its support to the relevant policy formulation agencies in their gender mainstreaming activities, while the forestry sector has to reorient its strategies on the ground.

Although 'woodfuel' is not a neglected part of the forestry sector's policies, in reality the assets allocated to this sector are insignificant. It is a basic need, a renewable resource and a commodity which can easily be produced locally. Nations will either have to prepare for this with local people, or ensure that countries can adopt alternative energy types without burdening the users. In the preparation of local level agendas, focusing on specific spatial contexts, the countries in the region need to be guided by technical experts, sectoral administrators, social scientists, economists and gender experts. The future directions for woodfuel production, flow mechanisms, and energy security must be worked out on the basis of international collaboration but the preparation of local development plans must be given priority.

ii. Gender focused research

It is noteworthy that existing research in this area is often piecemeal and insufficient. To contribute to improved living conditions research needs to be expanded to cover the socio-economic aspects of development including gender, production scenarios, flow mechanisms, and technological improvements. Not only must all these components be planned in a gender sensitive manner, but the conditions for gender equality must be ensured. The research presented in this report is a case study. It is difficult to replicate the results without knowing the ground realities across areas of diverse bio-physical and socio-economic conditions. Similarly, this study has not investigated the production situations in detail, for instance, production source management. To prepare for the future, member countries of the region must conduct in-depth studies, to accumulate information needed to prepare local, national and regional agendas for better integration of gender concerns.

iii. Networking

The other crucial need is to establish regional co-operation around "Gender and Wood Energy" for which RWEDP could take the initiative. Networking is a way to strengthen capacity, learn from knowledgeable persons, share and exchange experiences. The experience pertaining to community/social forestry programmes started in the 1980's in the region can be reviewed to identify future directions. The proven fact is that the programmes that have marginalised gender concerns in fuelwood development have only marginally contributed to solving the problems and improving the lives of most women. In Sri Lanka, tree stands consisting of a few exotic varieties have been established under the name of fuelwood development programmes, but these programmes have not been able to improve the overall fuelwood situation. Rather than repeating this mistake again, new plans of action need to be prepared, exchanging experience and knowledge that has been accumulated by various sectors/experts in the region.

A network could bring together gender specialists, wood energy technical experts, sectors dealing with forestry, agriculture, energy and trade. While regional co-operation is essential to prepare for the future, national groups can form their own local networks as a responsible facilitating body to connect all the concerned agencies with ordinary people, and prepare locally adoptable mechanisms to improve production, mobilisation and consumption. It can become an advocacy body dealing with all aspects of wood energy. To work out a suitable programme, a Regional Advocacy Body needs to be formed.

iv. Criteria to identify change

Similarly, to review the work and evaluate the achievements regional experts must establish suitable criteria to screen the contribution of wood energy development to improving the living standards of people, and also its contribution to gender equity. Although the need for gender planning has been emphasised, the specific criteria out of which appropriate changes can be identified have not been worked out. The criteria may reflect the broad goal of gender equality and socio-economic and environmental goals etc. Both long term and short-term goals must be addressed collaboratively. In this regard what has been done so far is to get measurements of biomass production from experimental plots, to determine their potential contribution. What is needed is to see what contributions are being made practically to improve people's lives. Women are probably most sensitive to such changes and are most likely to feel improvements associated with changes in income. A set of indicators should be worked out with local men and women who can monitor and evaluate them and test them for their relevance. Guidelines for the region and the countries involved must be prepared to improve the likelihood of the indicators being adopted. To accomplish this goal research must be done in each country, so appropriate methodologies must be worked out with a group of experts and then studies must be initiated. A set of guidelines for gender equity in wood energy development can be circulated for wider adoption.

v. *Training and awareness*

Although much effort has been made across the region, with the initiatives of the United Nations to encourage support programmes to uplift women's living standards, the people in different levels in the bureaucratic hierarchy have not been able to grasp how gender mainstreaming can be realised, how evaluations can be carried out, and how to improve the situation. "Gender sensitization" is relevant to all the sectors involved in wood energy development. Whether or not it will be well accepted by senior officers is not known. To accomplish the goal of contributing to uplifting the living standards of women through wood energy development, much work should be done to raise awareness regarding gender as a matter of development concern, as an important socio-economic variable, as an analytical framework, and as a tool for planning. This is where we can turn theory into practice. So far a comprehensive training needs analysis has not been done. Therefore, it is proposed to conduct a training needs analysis and provide support for all the countries concerned to organize a series of training workshops. The people to be involved in these may be senior level policy makers, provincial administrators, local governments, NGOs, and community groups. To begin with, countries should identify training needs and prepare individual plans. The RWEDP can, with a group of experts, screen the training needs and guide the countries and provide its support by way of exchanging experts etc., and training of trainers within respective countries. Most of the directions proposed here are designed to bring resources together and make a collective effort.

ANNEX 1 : RURAL HOUSEHOLD SURVEY GENDER ASPECTS OF WOODFUEL FLOWS

Field Researcher:.....
 Date:.....
 Name of the respondent:
 Ethnicity:.....
 Type of Unit (Nuclear).....
 Address:.....
 Religion:.....

I. HOUSEHOLD

Subject #	Age		Relationship	Education		Employment/ type of work	Monthly income
	Male	Female		Grade	Vocational Training		

II. HOUSEHOLD STRUCTURE

Total area:..... No of Rooms:.....

Structure

Walls		Roof		Floor		Kitchen detail	
Main unit	Kitchen	Main unit	Kitchen	Main unit	Kitchen	Chimney	Type of hearth
Specify		Specify		Specify			Specify
Brick Plaster Wood Warichchi Thatched		Asbestos Tiles Galvanized Thatched Other		Tiles Terrazzo Cement Mud Other			3 Stone Mud spread Improved stoves Husk stoves

III. HOUSEHOLD RESOURCES (fuelwood producing systems)

Land (Homegarden):..... Other:..... What Crops:.....
 House Ownership:.....

IV. HOUSEHOLD ENERGY USE PATTERNS

Purpose (activities)	Share by Types											
	Woodfuel		Kerosene		Gas		Electricity		Other		Primary uses	
	1	2	1	2	1	2	1	2	1	2	Male	Female
Cooking												
Boiling water												
Ironing												
Industry												
Lighting												
Television etc.												
Heating												
Other												

1 = Percentage; 2 = Cost per month.

Gender involvement:

Ask men - do you collect fuelwood? Yes/No.

What activities are you involved in? Harvesting/trimming/cross-cutting/processing/carrying/marketing.

Ask Women - do you collect fuelwood? Yes/No.

What activities are you involved in? Harvesting/trimming/cross-cutting/processing/carrying/marketing

V. COMPOSITION OF COOKING ENERGY

Type (consumed)	Amount per week	Percentage
Real Wood		
Fronds		
Coconut husks		
Paddy husks		
Straw		
Agro waste		
Saw dust		

VI. WOODFUEL FLOWS

Source	Ownership by gender	Distance to source		Average weight per trip	Mode of transport	No. of trips/purchase per week	Collector	
		Km	Time per trip				Primary M/W	Secondary Both
Homegardens								
Fences/hedge								
Own farm								
Outside land (free)								
Outside land (purchased) **								
Riverine vegetation								
Other reservation								
Market								

** who pays: Male/Female; Cost per unit (1 kg).....

VII. IF EXCESS IS PRODUCED

Do you sell? Yes/No (if yes answer following questions) % sold?.....

How often?.....

DETAILS

Type sold	To whom do you sell?		How do they carry?		Purpose	Selling price/unit	Who sells?		Production source
	Male	Female	Male	Female			Male	Female	
Coconut fronds									
Coconut husks									
Coconut shells									
Coconut trunks									
Branch-wood Jak									
" Mango									
" Rubber									
" Other									

VIII. SPECIES

List of species used for fuelwood	Rank according to preference	Give reasons

IX. RELATED ACTIVITIES AND INVOLVEMENT BY GENDER

Source	Harvesting (*specify)			Trimming & cross-cutting			Processing			Carrying			Marketing (** specify)			Stock maintenance		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Homegardens																		
Fences/hedge																		
Own farm																		
Outside land (free)																		
Outside land (purchased)																		
Riverine vegetation																		
Common areas																		

- *specify:- Harvesting dead-wood/harvesting live-wood (i.e. pruning); ** specify:- Selling at homegarden/farmland/carry and sell,*
- *1 = Men alone; 2 = Women*
- *alone; 3 = Both jointly.*

ANNEX 2 : GUIDELINES FOR SAWMILL SURVEY

1. Location:
 2. Name of the respondent:
 3. Do you sell wood for fuelwood at the mill? Yes/No
 4. If Yes:-
- Date of the visit:
Who owns the mill? Male/Female

Who are the buyers	Approximate % share	Who pays	Who carries	Mode of transport	Demand for specific types
1. Households					
2. Bakeries					
3. Lime industry					
4. Brick industry					
5. Other					

5. What is the price per unit (cubic meter)? Rs.
6. From where do you get timber?

Location	Primary	Secondary
1. Homegardens		
2. Forests		
3. Plantations		
4. Other		

7. What type of wood goes for fuelwood? Shavings/rotten segments/other
8. List the benefits you get from selling wood waste?
1..... 2 3..... 4..... 5..... 6.....
9. Prepare a descriptive report on the operational system:

ANNEX 3 : GENERAL GUIDELINES USED FOR THE SURVEY OF INDUSTRIES

1. Name:
2. Who owns? Male/Female
(describe the production system)
3. Location:
4. Type of industry: Brick/Pottery/Lime/Bakery
5. Who operates the production system? Male/Female/Both
6. Fuelwood usage:

Type	Who supplies?	Supply sources	Type of unit purchase	Price per unit	Cost of wood	Cost of transport	Mode of transport
Fuelwood							
Straw							
Paddy husks							
Coconut husks							
Coconut fronds							

7. Do you collect fuelwood for the industry?
8. What is percentage of expenditure on wood and its transportation?
9. Do you think supply is reliable?.....
10. Do you want to adopt alternative sources?
11. Gender involvement in the production process at the supply system:

Activity	Men	Women	Both
Harvesting			
Trimming & cross-cutting			
Stacking			
Selling			
Transporting			

12. Have you noticed any difficulties in the delivery system?
13. Why do you want to use fuelwood?
14. Do you prefer to use specific types for good quality output?
15. What types of fuelwood do you use?

Type	Species	Who provides best quality?
1.		
2.		
3		

16. Who/what are the sources of supply?
17. Do you find it difficult to get better quality wood?
18. If so what are your coping strategies?
19. Write a report on the industrial operation and gender engagement in woodfuel supply:

ANNEX 4 : GENERAL GUIDELINES USED FOR THE SURVEY OF FUELWOOD DEPOTS

1. Name:..... Date of the visit:
2. Nature of the business:
3. Ownership: Male/Female
4. Who is involved in the management? Male/Female
5. What are the sources of income of the depot owner? 1.....2.....
6. What are the types of wood depot deals with?
7. What are the sources?
8. Identify the geographical location of sources?
9. Who delivers?
10. What is the nature of sale? Wholesale:Retail.....
11. What is the price paid for the delivery/per unit?
12. How often does delivery take place? Weekly/daily/monthly
13. Are there any seasonal differences?
14. What is the mode of transport?
15. Do you pay separately for transport?
16. What is the volume of a lorry load?
17. Describe the activities you arrange at the depot? 1.....2.....3.....4.....5.....6.....
18. Do you deliver billets directly to the users?..... If so give percentage & mode of transport:.....
19. Do you deliver semi-processed wood?..... If so give percentage & mode of transport:
20. Do you deliver split wood directly? If so give percentage & mode of transport:
21. Explain to whom (by gender) you sell split wood? Give percentage:
22. What is the unit of sale? Kg/m³
23. What is the selling price per unit?
24. Who are your main customers?
25. How do they carry?.....
26. Explain the flow mechanism between fuelwood depot and end users?
- (calculate the net cost and returns for the fuelwood depots from trade)

ANNEX 5 : GENERAL GUIDELINES USED FOR THE SURVEY OF LARGE SCALE SUPPLY SOURCENERS/CONTRACTORS

1. Name: Location: Date of visit:

2. Type of production system and owner (by sex):.....

3. Type of wood traded ?.....

4. What are the reasons for harvesting trees?

5. Who undertakes the harvesting?

6. What type of arrangements do you make?

- i. Land clearance
- ii. Felling trees and removing timber
- iii. Felling only
- iv. Cross-cut and transport to urban areas
- v. Other

7. How do you sell/sign contracts?

- i. By area
- ii. By volume of the harvest
- iii. Other

8. Who does the following activities:

Activity	Men alone	Women alone	Both together
Felling			
Trimming			
Cross-cutting			
Stacking			
Loading lorries			
Transporting			

9. What is the selling price per unit? Rs.

10. Who deals with trade? Contractor/dealer/owner

11. Do you arrange delivery? Yes/No. If yes % share of harvest:

12. Do you give to a dealer? Yes/No. If yes % share of harvest:

13. Do you give to a transporter? Yes/No. If yes % share of harvest
(write a description of operational mechanism, gender involvement and pricing)

ANNEX 6 : GENERAL GUIDELINES USED FOR THE SURVEY OF TRANSPORT SYSTEM (RESPONDENTS, LORRY DRIVERS/OWNERS CARTERS)

1. Name: Location: Date of visit:.....
2. Who owns the conveyance? Lorry/tractor/bullock-cart/hand-cart
3. What is the arrangement between you and owner?
4. What type of wood do you transport? billet/split-wood/other
5. From whom do you buy? How often:
6. How much do you pay for a unit?
7. Who are your customers?

Customer	Selling unit	Selling price	Use	Gender of the buyers
Depot				
Industry				
Households				
Other				

8. What is your expenditure per (day/load/unit)?.....
9. What is your profit margin?
10. What are the problems that you experience?
 - i. In getting stocks
 - ii. In delivering
 - iii. Other (competition etc.)

11. What are the other sources of your income?
12. What are the incomes sources of your family members?
13. Can you make a living out of the business?
14. Are you happy about your profit margin?
15. Who decide the price?
16. What type of fuelwood can you sell easily?

ANNEX 7 : RESEARCH TEAM AND SPECIFIC TASKS PERFORMED

- 1. Prof. Anoja Wickramasinghe - Research Co-ordinator and Principal Investigator.**

TASKS

Identify field area, prepare research plan, identify field team, plan field work, make participatory recordings and construct activity profiles of men and women, train the team, lead reconnaissance and rapid appraisal, meet key informants and groups, visit wood depots, conduct on-site discussions, develop research tools and techniques, visit supply sources and depots, produce formats to tabulate data and information, conduct weekly meetings, consolidate field observations and prepare report.

2. Field Research Team -

1. Mr. P.B.S. Dissanayake
2. Ms. Rekha Niyanthi
3. Mr. Tilak Bandara
4. Mr. A.G.S.S. Nandana
5. Mr. Keerthi Rajapaksa

A. Group Tasks - (including Research Co-ordinator)

- i. The first 4 members were involved in preparatory work;
- ii. Household survey (whole team);
- iii. Field observations of the on-site activities;
- iv. Conduct meetings with key informants and groups with or without the co-ordinator;
- v. Data tabulation by 3 members (2,3 and 4)

B. Special Tasks -

1. Mr. P.B.S. Dissanayake
 - i. Visit all intermediaries involved in trade and investigate trade patterns, pricing, expenditure;
 - ii. Visit industries and gather information on woodfuel use, cost, delivery systems etc.
2. Mr. Keerthi Rajapakse
 - i. Visit urban woodfuel depots and identify the sources of supply, type of wood that depots process/and sell;
 - ii. Visit saw mills and identify major species sawn at mills and types sold at mills.

C. Team work by the Research Co-ordinator, Mr. Dissanayake and Keerthi Rajapakse -

- i. Revisit wood depots and the intermediaries in the delivery system;
- ii. Reexamine the information consolidated by the co-ordinator on flow mechanism and pricing system.

D. Groups Meetings -

Reiterate findings by the co-ordinator.

E. Specific tasks of the Co-ordinator -

Prepare interim report, summary tables for the report, and draft maps/figures, and write up of the complete report.

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