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ENVIRONMENTAL LINKAGES OF RUBBERWOOD INDUSTRY

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ABSTRACT

Deforestation is one of the key issues causing economic, social and environmental problems in this country. The depletion of forest resources is closely linked to the increasing demand for main forest products; timber and fuelwood. This paper recognizes these needs and examine the correlation between environment and rubber wood industry.

Planting of rubber trees are not directed explicitly towards influencing the quality of natural environment. Yet, the contribution made by rubber plantation to sustain the environment is immense. The rubber plantation can be viewed as the largest "man-made forest cover" in the country and it accounts for 2.5% of the total land extent. The potential yearly production of sawable rubber logs and fuelwood is estimated to be over 325,000 m^3 and one million m^3 respectively. Moreover, the supply stream is regarded as renewable, eco-friendly and guaranteed. In addition, rubber plantations have been a major source of fuelwood for both household and industrial sectors. Rubber is highly under valued or "freely" available fuelwood in the household sector in rural areas. Nearly, 50% of fuelwood requirement in the industrial sector generates from rubberwood.

The emerging scenario suggests that the need for various forest products cannot be met on sustainable basis only from forest resources. The study further reveals that rubber plantations will continue to perform an important role in reducing the widening gap between demand and supply of forest products. This paper also highlights that there are significant payoffs for both general public and governments in attempting to better understand the environmental linkages of rubberwood industry and to act upon them.

1. Introduction

The decade of 1980s has witnessed a fundamental change in the attitudes of Sri Lankan citizens and consecutive governments in understanding the relationship between environment and development. There has been a growing awareness of the complementarities between sustainable development and a healthy environment. The

two are no longer regarded as mutually exclusive. It is well recognised that maintaining a healthy environment is essential for sustainable development.

While no universally acceptable definition of sustainable development exists as yet, there is increasing agreement that it should incorporate economic, social and environment objectives in a balanced manner (Fig. 1) (Munasinghe, 1993). Development programs that do not take adequate account of the impact on critical resources such as forests, soils, grasslands, freshwater, coastal areas and fisheries may degrade the valuable resource base upon which both present and future growth is dependent.

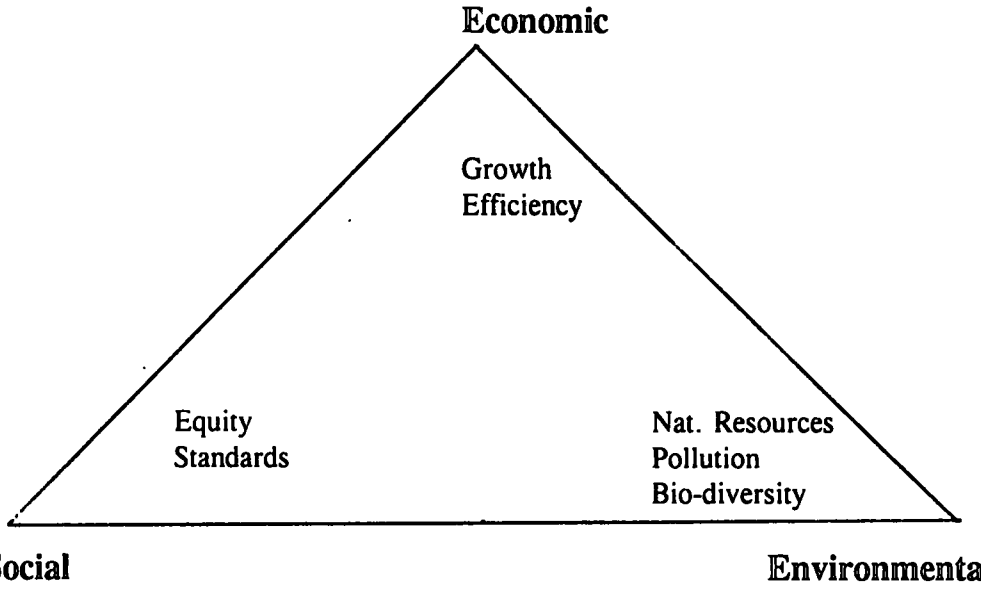


Fig. 1. Main objectives of sustainable development and tradeoffs

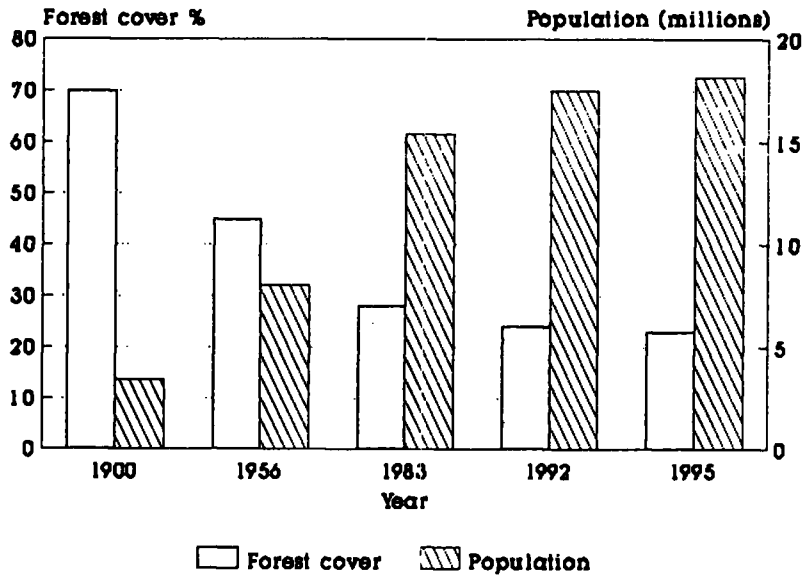
In the above context the emerging picture of the forestry situation in Sri Lanka is rather gloomy and the pressure placed upon the forest sector is immense. For instance, industries require sawnwood and other forest products. Households and certain industries need fuelwood to meet their energy requirements. The growing population looks for new land to cultivate and housing. Environmentalists are keen to preserve the remaining natural forest intact. Moreover, international conventions such as Climate Change Convention require an increase in tree cover as sinks for carbon dioxide. Hence, national planners are faced with a multitude of problems and responsibilities, with too few resources to address the problems adequately.

The objectives of this paper recognise these needs and attempts to focus on the links between environment and development with particular reference to

rubberwood industry. The assessment on social implications of rubberwood industry is outside the scope of this paper.

2. Problem

It is widely accepted in Sri Lanka that deforestation is one of the main issues causing environmental and social problems in this country. The country's closed-canopy natural forest cover has dwindled from 70% to less than 23% between 1900 to 1995 whereas the population has increased from 11.5 Mn to 18.5 Mn (Fig. 2) (FSMP, 1995). The average annual rate of deforestation between 1956 and 1992 has been more than 40,000 ha whereas the average annual planting during the same period has been only about 2000 ha. The decline in the forest cover would have been much higher if not for the valuable contribution being made by the non-forest tree sector such as rubber, coconut and home gardens to supplement the increasing demand for wood products mainly; timber and fuelwood.



Source : Population statistics Sri Lanka, 1992
FSMP, 1995

Fig. 2. Relationship between increasing population and declining forest cover

The demand for roundwood is expected to increase from about 1.4 million m^3 in 1995 to 1.6 million in 2020. During the same period, the need for bio-energy will increase from 9.26 million tonnes to 9.7 million. On the contrary, the natural

forest cover is expected to decline from 23% in 1995 to about 17% by 2020 (FSMP, 1995). Despite a declining forest cover, the population will increase from 18.5 Mn in 1995 to 22.5 Mn in 2020.

The forestry sector has very close links with the increasing population. For instance, in Sri Lanka's agricultural based economy, there is a strong link between population growth and deforestation. The depletion of the forest resources is closely linked to the demand for forest products: timber, fuelwood, and non- wood forest products. The increase in population and economic growth have resulted in higher demand for housing and business construction, which has automatically increased the demand for wood. At the same time more food is needed to support the increasing population. Agricultural production has been increased mainly by expanding the area under cultivation and natural forests have been cleared to provide more land. As a result of these trends, forest area per capita has declined from about 1.3 ha in 1900 to less than 0.1 ha in 1996. The remaining natural forests are under increasing pressure as the population grows and the resource base diminishes.

The emerging scenario suggests that the need for various forest products cannot be met sustainably only from forest resources. The widening gap between the demand and supply of forest products is likely to be matched by utilizing the available non-forest resources efficiently or by imports. The latter option however, will place a heavy burden on the balance of payments. Another scenario is that the excess demand for wood products will further induce illegal logging of the remaining forests. Energetic measures are therefore needed without further delay to protect the remaining natural forests. In this regard, a renewable resource such as rubberwood is expected to play a vital role both directly and indirectly in protecting the environment. Rubber plantations have the ability to supply forest products: timber and fuelwood while providing employment for the increasing population mainly through latex and timber based industries.

3. Rubberwood industry and environment

3.1 *General overview*

Sri Lanka has placed great importance in maintaining the remaining forest cover as nature reserves, national parks and wildlife sanctuaries. In view of the urgency to arrest the ecological decay and the limited availability of conventional species of timbers, effective utilization of less expensive and largely available species of timber become not only relevant but also inevitable.

As the forests have dwindled, economic forces have led to the increasing production of timber and other "forest products" not only from natural forest and forest plantations, but also from non-forest sources, notably from rubber and coconut

plantations. The rubber plantations themselves provide a renewable source of timber and together with plantation forests, help to complement the supply from natural forests.

Rubber plantations generally have a positive impact on environment. When rubberwood is sustainably produced from plantations, it substitutes sawlogs and fuelwood otherwise exploited from natural forests and thereby protect the environment (Fig. 3). Even though rubber plantations have not been categorized as a "forest plantation", the planted rubber area may be considered as the largest "man-made forest cover" in Sri Lanka which accounts for 2.5% of the total land extent (Fig. 4).

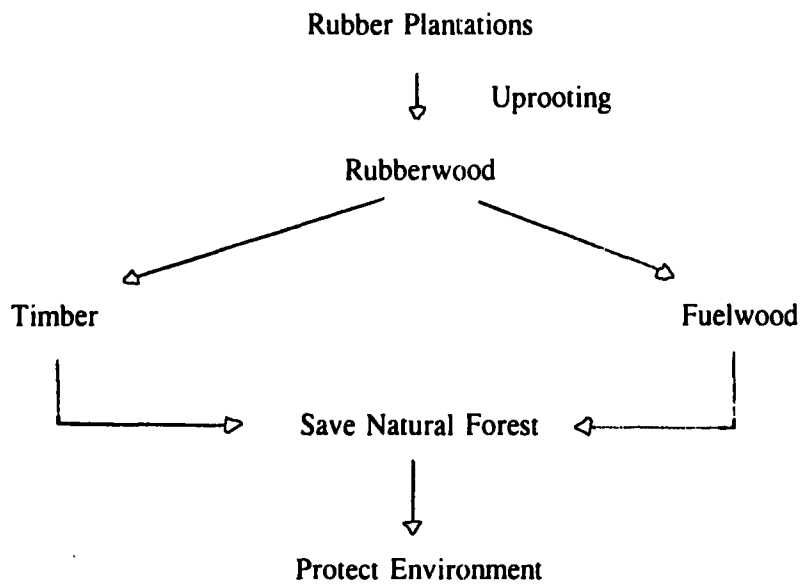
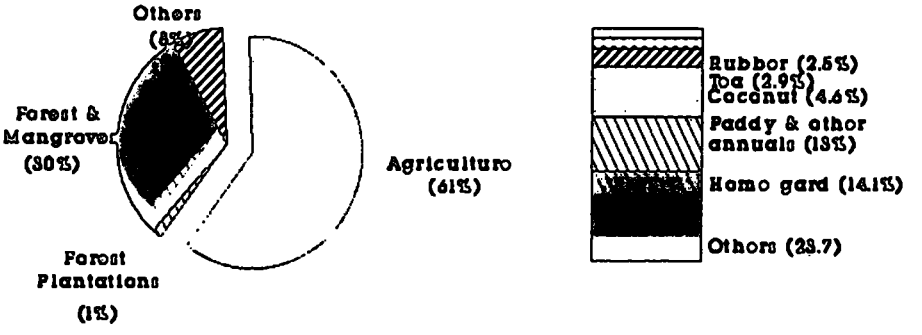


Fig. 3. Basic relationship between rubberwood industry and environment

Rubberwood is an under-utilized non-conventional timber resource in Sri Lanka. It is a sustainable, renewable, eco-friendly and a valuable source of timber which is available in abundant quantities. The supply of rubberwood is more reliable than other wood species and it is directly linked with the replanting program which accounts for 3% of the total planted extent per yearly basis.

Rubberwood constitutes the main non-forest timber resource of commercial importance for Sri Lanka's wood-based industry. Undoubtedly, the ecologists and environmentalists would consider furniture and other value added products made out of rubberwood as environmentally friendly as uprooted trees are recycled into a rich timber. Rubberwood production and utilization therefore reduce the pressure on

natural tropical forests. Sri Lanka is fortunate to have this important "new" source of wood for conversion into high quality timber at a time the world supply of timber is fast diminishing. Hence, it's a timely resource substitute to support the timber based industry and simultaneously sustain the environment.



Source: derived from FSMP, 1995
Central Bank, 1995

Fig. 4. Sri Lanka - Land use pattern (1995)

3.2 *Timber Industry*

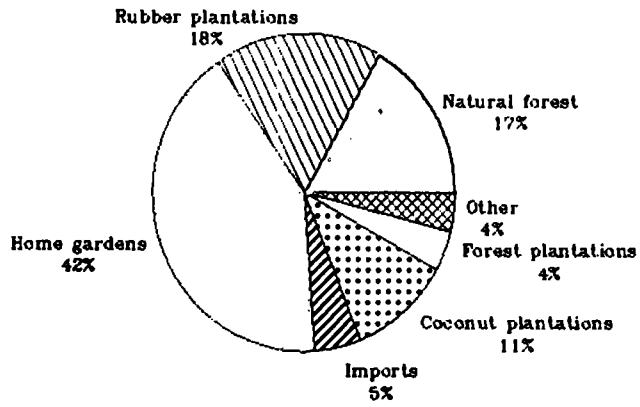
Traditionally, rubberwood has been used entirely as an energy source for domestic cooking and industrial purposes such as drying of RSS, bricks, tiles and other clay products. When forest logs were abundant in the past, very little interest was shown in the extraction of rubber logs for sawn timber production. The situation has changed dramatically in the recent years owing to the shortage and high cost of forest logs.

The last two decades witnessed a significant increase in demand for timber products such as sawnwood, panel products and industrial roundwood arising mainly from increased economic growth, "Mahaweli Development programme" and the "Million Houses programme" promoted by the Sri Lankan Government. As a result the prices of timber products have sky rocketed and timber has become the most significant expenditure item in housing construction.

In this context, Sri Lanka should be proud to have a well established rubber sector. These rubber plantations apart from providing the tree cover for environmental stability is also developing into a prime source of timber resource.

Rubber tree has an economic life span of 25-35 years. There are over 160,100 ha of rubber grown commercially in Sri Lanka. A rather conservative estimate of 200 m^3 of green wood (70 m^3 of sawable logs) per hectare would result the potential of extracting a large quantity of good quality timber from rubber plantations on a sustainable basis. Under Sri Lankan conditions rubber plantations can produce about 0.24 m^3 of peeler logs and 70 m^3 of sawlogs for every hectare felled at the end of a 30-year economic lifespan. The estimates are based on the findings of the 1986 Forestry Master Plan, which were corrected for their underestimation of the recovery rates (Samarappuli *et al*, 1995). The concept of planting rubber only for timber extraction are less attractive compared to combined use of both latex and timber. A high yield of latex is crucial to make the investment on rubber plantations financially viable (Samarappuli *et al*, 1995). The clone RRI 121 is regarded as appropriate to meet the objective of providing a higher yield of both latex and timber.

The domestic forest industries are heavily dependent on the supply of wood from sources other than natural forests. In 1994, the most important supply sources of sawnwood were Home gardens (42%), rubber plantations (18%), coconut plantations (11%), and forest plantations (4%), although 17% was obtained from natural forest (mainly through unauthorized fellings) (Fig. 5). Even on current trends, wood supply from these domestic sources will play an important role.



Sources: derived from FSMP, 1996
Samarappuli et al, 1996

Fig. 5. Estimated shares of sawlog supply in 1994

3.2.1 *Sawnwood industry*

Total sawnwood consumption in 1993 was estimated to be about 0.544 million m^3, of which imports were only about 29,000 m^3, *i.e.* about 5%. This implies that, at present, Sri Lanka is almost self-sufficient in sawnwood, although not all saw logs come from sustainable sources.

Annual sawnwood consumption in Sri Lanka per 1000 persons in 1993 was estimated to be 31 m^3. This is a relatively low figure by international standards compared to Malaysia (217 m^3), Thailand (67 m^3), Korea (112 m^3), India (21 m^3), Finland (349 m^3) and the United States (485 m^3) (FSMP, 1995). This indicates that as the economy grows, the per capita consumption of sawnwood will increase, despite the ongoing substitution of other materials for sawnwood.

As shown in Fig. 6 the demand for sawnwood is projected to grow from 0.567 million m^3 in 1995 to 0.889 million m^3 in 2020, *i.e.* by about 12,800 m^3/year, assuming that some substitution of other materials for sawnwood will take place (FSMP, 1995). This corresponds to an average annual growth rate of 2%. Meanwhile, the percentage share of rubberwood (potential) is expected to decline from 17.6% in 1995 to 8.3% in 2020. This is largely due to the reduction in rubber land under the prevailing trend.

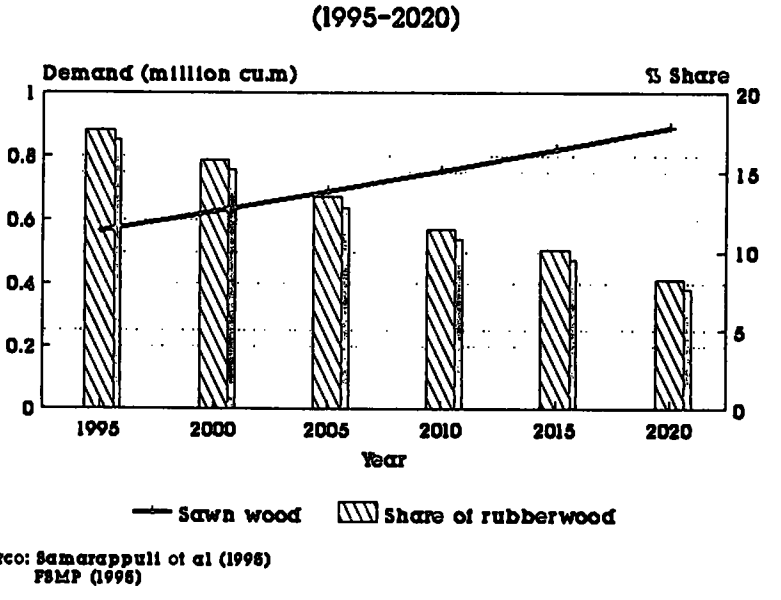


Fig.6. Projected demand for sawnwood and potential share of rubberwood (1995-2020)

The estimated output from rubber plantations will be more than 100,000 cubic meters of sawntimber (336,000 m^3 of sawable logs) per year. At present, a number of sawmills in the country are converting rubber logs into sawn timber for applications ranging from veneer products to knock-down furniture. The volume of rubberwood consumed by these sawmills, however, represents only a small percentage of the estimated 330,000 m^3 of sawable logs potentially available from replanting programmes on annual basis. The bulk of the wood is still used as fuel. The total output of sawnwood made out of rubberwood in 1993 was estimated to be about 47,000 m^3 (Samarappuli *et al.*, 1995). Most sawmills that use rubber wood have treatment capacity. Most of the other sawnwood types are not treated. Residuals are not utilized industrially, with few exceptions.

There are about 100 units with boron treatment facilities for treating of rubber wood, most of them are small in size. There are also nearly half a dozen operational pressure impregnation plants. These pressure impregnation plants are capable of treating about 15-20,000 m^3 of sawnwood per year.

The FSMP (1995) estimated that in 1993 the furniture industry consumed about 80,000 m^3 of sawnwood. Rubber wood has become the most important source raw material in furniture industry accounting for nearly 44% (Samarappuli *et al.*, 1995).

3.2.2 *Plywood industry*

The wood-based panel sector is not well developed in Sri Lanka. The main panel product is plywood. In 1993, the total plywood consumption amounted to about 28,000 m^3, of which nearly 5,000 m^3 (18%) were produced domestically by using almost entirely rubberwood and the remaining 82% was imported (Fig. 7). The total demand for wood-based panels is projected to grow from 32,000 m^3 in 1995 to about 80,000 m^3 in 2020 (FSMP, 1995). The increasing demand for wood-based panels will be met mainly by imports based on the current trends.

The local consumption of plywood, and wood-based panels as a whole, is low by international comparison. The per capita consumption of plywood and veneer in 1993 was about 1.8 m^3/1000 persons, whereas in 1991, the corresponding figures in Thailand, Korea, Indonesia and Australia were 7.4 m^3, 27 m^3, 5.5 m^3, and 11.4 m^3 respectively.

In 1993, the wood-based panel industries included 12 small plywood mills using rubberwood as raw material to produce plywood for tea chests, doors and construction purposes. A large plywood mill in *Gintota* originally installed by the government in 1941 was reopened under private management in 1994. It aims at processing 2000 m^3 of logs per month. The output range of the other plywood mills is 125-1300 m^3/year, the average being 400 m^3/year. By international standards, the

plywood and veneer mills are very small. The plywood mills in Malaysia and Indonesia have average outputs of 30.000 m^3/year, respectively.

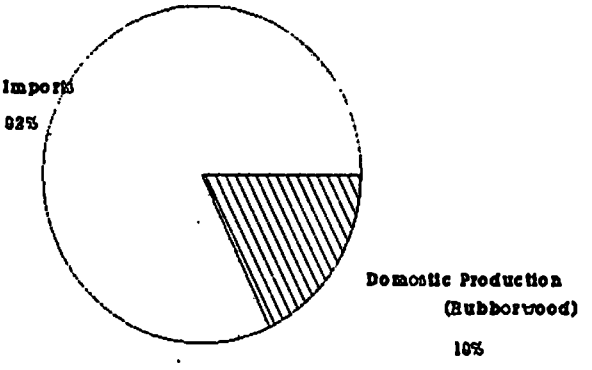
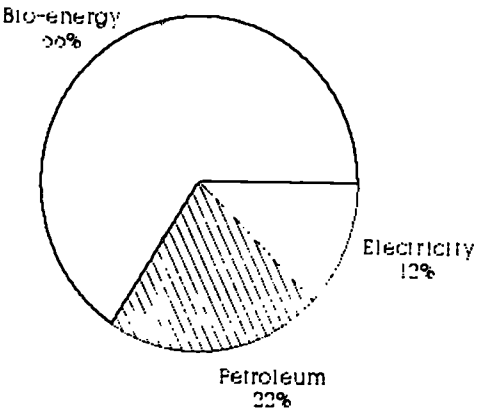


Fig. 7. Plywood consumption in 1993 by source

3.3 Bio-Energy Sector

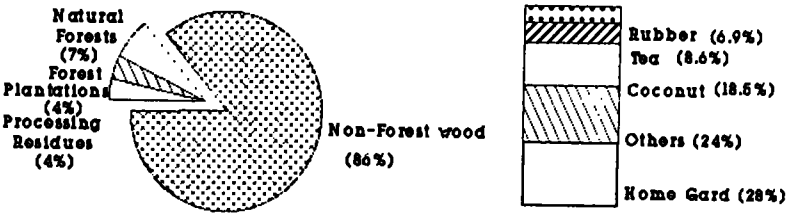
In 1992, Biomass fuel accounted for 66% of the Sri Lanka's total energy consumption compared to petroleum (22%) and hydro-electricity (12%) (Fig. 8). Since a major part of the hydro-electric potential has already been tapped (50% of hydro potential) the scope for future development in this sphere is limited. Domestic petroleum too is not available. The importance of biomass fuel as a source of energy is further illustrated if it has to be substituted by imported fuel. To substitute the energy provided by the biomass fuel would have cost the country about three times the present annual bill on oil imports.

Total energy consumption increased on average by 2.3% per year between 1982-1992. Several important changes in the 1970s influenced annual energy consumption levels and patterns. Firstly, the liberalization of the economy, in 1977, stimulated economic growth, and substantially increased the demand for energy. Secondly, the sharp increases in the price of petroleum products in the late 1970s resulted in the industrial sector switching from petroleum to fuelwood wherever this was feasible. In 1995, the non-forest wood sector has been the major source of bio-fuel (86%) of which rubberwood accounted for nearly 7% (Fig. 9). Nevertheless, the projected availability of rubberwood as a source of fuelwood has been declining. (Fig. 10). This is largely due to the fact that increasing amount of rubber logs are



Source : FSMP (1995)

Fig. 8. Shares of energy consumption by supply source (1992)



Source: derived from FSMP. 1995

Fig. 9. Bio-Fuel supply by sources (1995)

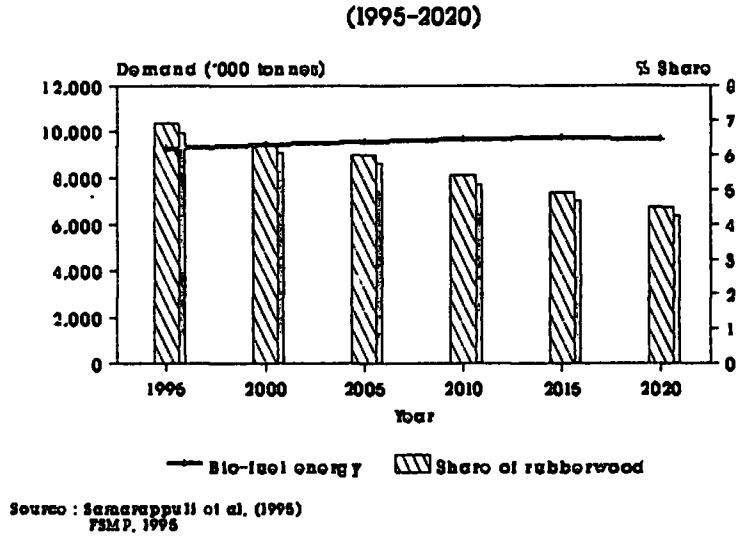


Fig. 10. Projected demand for bio-energy and share of rubberwood (1995-2020)

expected to be converted into valuable timber products, such as furniture, brush handles, wooden toys and plywood. A similar declining trend is observed for both natural forests and forest plantations (Fig. 11). The total consumption of bio-energy in 1995 is estimated as 9.3 million t. The shares of bio-energy consumption by different sectors of the economy are shown in Fig. 12. The Household sector accounts for 81% compared to 16% consumed by the industrial sector.

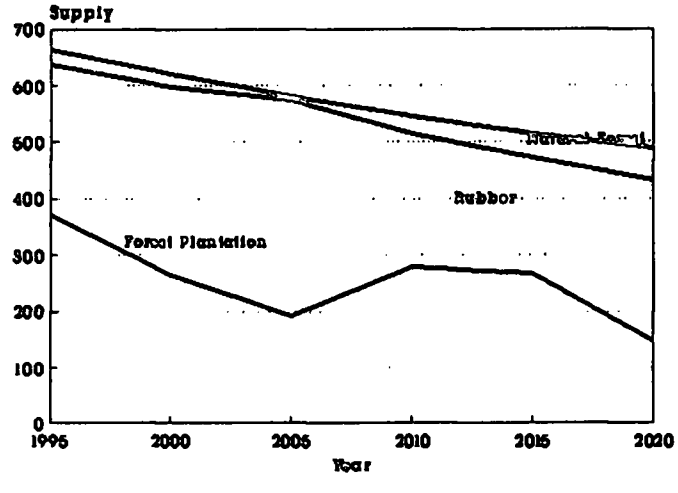
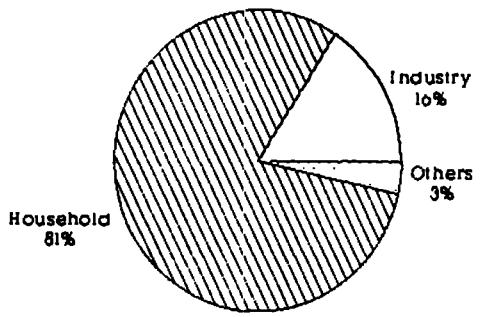


Fig. 11. Projected supply potential of selected fuelwood sources ('000 tonnes)



Source : FSMP (1996)

Fig. 12. shares of bio-energy consumption by sector (1992)

3.3.1 *Bio-energy consumption in the household sector*

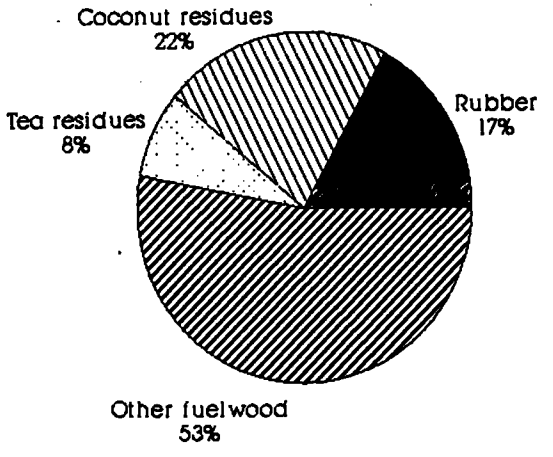
Bio-energy is of crucial importance to the rural people, many of whom do not have access to other energy sources. In 1992. fuelwood comprised about 70% of the total consumption of Bio-energy. More than 90% of the population uses fuelwood for domestic cooking (FSMP, 1995). In the hill country, fuelwood is also used to provide heat, especially during the cold months.

According to the latest national consumer survey (CFS, 1990), approximately 84% of fuelwood used by households have obtained at zero cost while the other 16% being purchased. Individual households have been quite successful in producing their own energy or collecting it from nearby sources. Nearly 80% of the total biomass fuel consumed by the households derive from sources outside the forest sector. About 74% of rural households obtain their requirements from noncommercial sources such as home gardens, "sparsely cultivated crop lands", rubber plantations and natural forests.

A shortage in fuelwood is expected by year 2000 based on the current trends. Most of the fuelwood problems would be felt at the local level, where the actual nature of the problem may vary depending on the environment, economic, and social conditions. In some particular localities there are already difficulties in finding fuelwood. The time spent on collecting fuelwood has increased. The retail price of fuelwood has gone up, and the local growing stocks have obviously been depleted. On current trends, the number of such localities will increase, and places that are already suffering will have increasing difficulties.

Despite the ongoing energy switching and the potential for further substitution, it is very likely that for the majority of rural people, bio-energy will be the only source of energy that would be available long into the future. This implies that any increase in the real price of fuelwood (in terms of actual price or increased time needed to collect), will affect mostly the poorest people, who already have inadequate access to cheap bio-energy, or who can ill afford to substitute other types of fuels for fuelwood. This group mainly consists of urban poor, landless rural people, and estate workers. If their energy needs are not met, the pressure to use existing natural resources unsustainably is bound to increase. Urban fuelwood markets may develop, that rely on mining the rural resources. This possible development would have adverse impacts on the environment and on the fuelwood supplies of the local people, who cannot afford the urban prices.

A nationwide Consumer Finance survey (1990) estimated the shares of various types of bio-energy in the household sector in 1986-87 as rubber wood 17%, coconut residues 22%, tea residues 8%, and other fuelwood 53% (Fig. 13). These results are in very close conformity with another in-depth nation-wide study carried out by Wijesinghe (1983) according to which the share of rubber wood accounted for 18%, crop residues (mainly coconut branches and husk) 29%, and other fuelwood (fuelwood from natural forests, home gardens, plantations, off-cuts, and sawdust) at 53%.



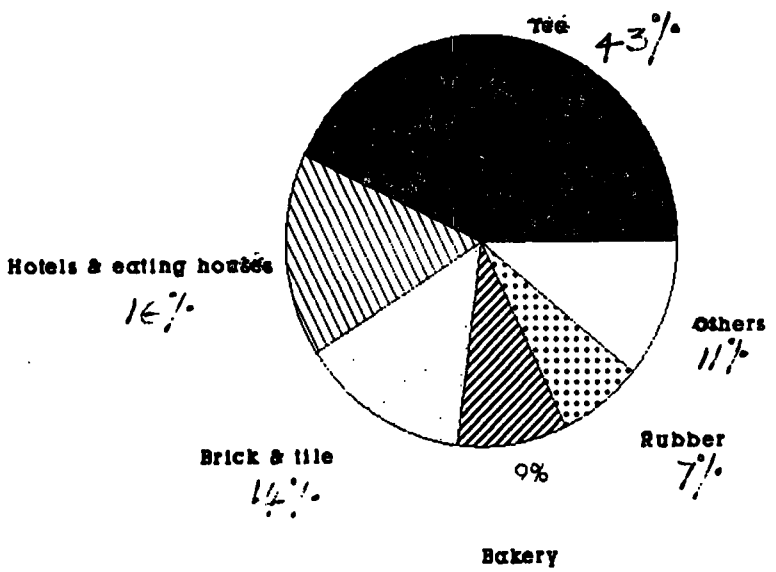
Source : Consumer Finance Survey (1990)

Fig. 13. Estimated shares of bio-energy consumption in the household sector by supply sources (1986/87)

3.3.2 *Bio-energy consumption in the industrial sectors*

Energy consumption in the industrial sector in 1992 was about 1120 ktoe, or 18.2% of total national energy consumption. The industrial sector accounted for 16% of bio-energy consumption during the same year.

Fig. 14 shows the estimated consumption of fuelwood in the industrial sector in 1993 by main fuelwood consuming industries/ sub-sectors. The tea industry is the main consumer of fuelwood (43%), followed by hotels and eating houses (16%), brick and tile industry (14%), bakery 9% and rubber processing sector 7%. The group categorised as "others" includes industries such as ceramics, pottery, fish drying, and distilleries. Most of these industries are located in rural areas. The tea industry is concentrated in the hill country. The coconut industries are based mainly in the northern part of the wet zone. The brick and kiln industry is mainly in the north western and central part of the wetzone. The various fuelwood consuming industries reflect the regional variation in fuelwood consumption.



Source : FSMP, 1995

Fig. 14. Estimated shares of bio-fuel consumption by the industrial sector in 1993

Rubber plantations have been a major source of fuelwood for industrial sectors such as the tea industry and the brick and tile industry. The industrial establishments purchase most of their fuelwood requirements. The main sources are rubberwood (more than 50%), state-owned natural forests, and private non-forest lands.

4. Negative impacts

All the measures that result in increased wood supply from sustainable sources such as rubberwood will also reduce the pressure on the natural forests. However, these wood based industries may also have some unintended negative impacts.

The environmental impacts of the rubberwood industry are related mainly to sawmill waste, leakage of treatment materials, effluent from the pulp mill, and noise pollution. Guidelines have been set out for mitigating the adverse environmental impacts of chemical treatment and sawmilling.

Moreover, there is a growing interest among the general public and government authorities in ensuring that the chemicals used for the production of rubberwood are as harmless as possible to humans and environment.

5. Conclusions and suggestions

During recent decades, natural forests have been disappearing rapidly, with an adverse effect on the future sustainable supply of timber and fuelwood. These negative trends are likely to be reinforced unless planned action is taken.

Rubberwood is an under-utilized non-conventional timber resource in Sri Lanka. This renewable raw material is available in abundant quantities. Rubberwood is the main non-forest timber resource of commercial importance for Sri Lanka's wood-based industry. Presently, it is widely used in the local timber industry and it provides 18% of raw material to sawnwood industry, 44% to furniture industry and 100% to local plywood industries.

The economically available volume of rubberwood logs corresponds to an amount of native tropical timber which is annually harvested from an area of about 4800 ha. It substitutes both sawlogs and fuelwood otherwise exploited from natural forests and thereby protect the environment.

The Sri Lankan rubber plantations should therefore be viewed as a "man made forest", designed to yield a combination of latex, timber and fuelwood. It is important to take adequate measures to ensure that the future supply of rubberwood not only be maintained but also increased to make up for the shortfall in the supply of forest logs.

The global concern on the environment and forests coupled with the need to provide wood for growing population will provide further impetus for development of the rubberwood based plantation sector. Proper recognition of the positive environmental consequences of developing the rubberwood industry would help to bargain additional support for such programs. The rubber plantation sector is therefore sitting on a goldmine. It can be regarded as the only timber in Sri Lanka that could be marketed to the export market under the "eco-label" being produced on a sustainable basis. Hence, attempts have to be made to market this unique timber with its "eco-label" to enhance its marketability and consumer preference.

ACKNOWLEDGEMENT

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