

6. The analysis of sustainable fuelwood and charcoal production systems in Nepal: A Case Study

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EXECUTIVE SUMMARY

Introduction

Energy is essential not only for survival but also for improvement of the quality of life of the Nepalese people. In this regard, the positive role of clean, affordable, indigenous and renewable sources of energy that could be produced and supplied on a sustainable basis would be significant in the development of this poor, least-developed country in South Asia. Currently, traditional biomass fuels contribute directly to the energy supply as well as in the livelihoods of great number of Nepalese people.

Virtually all people in rural areas relied on traditional biomass fuels, primarily fuelwood for meeting their domestic cooking and heating energy needs. Some of them were also depending on fuelwood for domestic lighting. For many of them, there was no choice but to continue the use of traditional fuels for domestic energy. Similarly, the urban poor could also not afford to use the imported commercial fuels for cooking and heating and had to rely on dried biomass, primarily fuelwood, for meeting their cooking energy needs. Therefore, majority of the Nepalese people have been using and will continue to use the dried biomass fuels for energy for many years to come.

This case study relied solely on secondary information available from different sources, i.e. published reports and documents of R&D and academic institutions, individual researchers, government forestry agencies including Department of Forests (DoF), Forest Products Development Board (FPDB), Timber Corporation of Nepal (TCN), etc. There was no collection of primary data for the purpose of this study.

Woodfuel production and supply systems

In Nepal, the most important woodfuel production sources included national forests under different types of management, under government forestry department, by forest users group (FUG) of local community forest (CF) or by lessee of leasehold forests, etc. Besides, private forests and trees on non-forest lands (TOF) also contribute to both traded and non-traded woodfuel supplies in many areas. The priority of any forest owner, manager or developer would therefore, be to dispose of their forest and tree products at a highest possible price in the market, be that product from private, community or public sources. So the Nepalese producers of traded woodfuel would be no exception to this universal marketing practice.

The present demand of woodfuel was primarily for traditional applications (for cooking and heating). The type of fuels used for these purposes was mainly fuelwood and a limited amount of charcoal, only for specific end uses. Most of the households self-collected the woodfuel they used for free at production sources. Some users might be using hired labour for collection but invariably without payment of

stumpage fee or government royalty. Which means, a major share of the woodfuel consumed in the country therefore, did not pass through any formal or informal marketing channels.

Three institutions in the public sector, namely the District Forest Products Supply Committees (DFPSC) under Department of Forests (DoF), the Forest Products Development Board (FPDB) and the Timber Corporation of Nepal (TCN), both under Ministry of Forests and Soil Conservation (MFSC), were the key players in the production and supply of woodfuels in the markets. Currently, none of these institutions produce or sell charcoal in the country.

Currently, most of the fuelwood consumed in the country is by rural households and in traditional industries, which is totally a new scenario compared with the situation about two decades ago. Then, even the urban households depended on fuelwood for domestic cooking. However, in recent years the urban households have rapidly been switching over to alternative commercial energy, primarily LPG and kerosene for cooking and heating.

Mostly these households in newly emerging market places, alongside of newly built roads, small towns and district headquarters not yet connected with road seemed dependent on fuelwood for meeting their energy needs for cooking, heating and also for cooking cattle feed. The other end uses were heat application for agro and food processing. Some of the woodfuel used by these users were supplied through formal or informal marketing channels.

Applicability of certification in Nepal

In the recent past, two initiatives of forest certification were undertaken for the certification of important forest products of community forests, primarily for initiating sustainable management of community forests and for promoting the trade of forest products derived from CF for income generation to the local people in rural areas. It was reported that Nepal has developed specific set of criteria and indicators at the national level for the certification of community forestry and leasehold forestry management with the forest user groups under the guidance of Center for International Forestry Research (CIFOR). It was reported that these criteria and indicators are yet to be properly organized and applied in a systematic manner.

However, the term “forest certification” could not be viewed solely from the point of view of certification of specific forest products such as timber, woodfuel, non-timber forest products, but must embrace the overall aspects of forest management systems. This means until a forest is managed according to the principles of sustainable forest management, there could be no prospect for certification of only specific forest product from any forest. Therefore the woodfuel certification system must include all types of woodfuel production sources, including government-managed national forests, forest plantations, CF, as well as private forests and TOF.

Currently, all private forests and most TOF are in the form of small blocks of generally, naturally grown trees or isolated or scattered trees on private and institutional lands. The present land-ownership ceiling in the country is also very small and does not encourage for initiating any large-scale forestry in the private sector with commercial objective. Despite of this limitation the current woodfuel contribution of some private sources in the supply of traded woodfuels in specific

areas is still significant. So far, there has been no system of record-keeping at the central level for recording total volume and value of woodfuels produced and traded in the markets at different parts of the country. But without sufficient knowledge and information about the different woodfuel production sources and their contribution in total volume and value of traded woodfuels in the market, it would be difficult if at all possible to think of certification of sustainable woodfuel production for trade from private forests and TOF. As a matter of fact woodfuel production from these sources would be one out of many other products produced for trade and or consumption locally.

However, the direct woodfuels produced as by-products of forest harvesting, thinning or pruning from government- managed national forests and forest plantations or from FUG managed CFs seemed reasonable for consideration of initiating certification through certification of the forest management system rather than woodfuel as a product of these forests. Therefore, the principles, criteria and indicators suggested in this case study have been based on these considerations, which means certification of sustainable management of production sources or the forest, and not certification of sustainable woodfuel production only as a product.

Criteria and indicators for certification of woodfuel production systems

The philosophy of forest certification entails that products of forests traded in the markets come from sustainable managed forest fulfilling economic, ecological and social concerns. Therefore, certification has been viewed in this case study as a tool for verifying forest management that complied with a series of internationally accepted standards. In other words, the objective of forest certification would be to provide assurance to consumers that their purchases of forest products are not contributing to the destruction of natural forests either locally or globally.

A thorough review of the past forest certification in Nepal as well as the standard criteria and indicators identified and set at both international and regional level has identified six principles, 24 criteria and 84 indicators for initiating sustainable management of productive national forests under the public domain. This would include primarily the government-managed national forests and forest plantations, and the CFs. As the long-term sustainability of woodfuels supply sources for both traded and locally consumed woodfuel supply sources could not be ensured without initiation of forest certification, which means promotion of SFM, implementation of these principles, criteria and indicators would be desirable for initiating certification of the sustainable woodfuel production systems and the trade of certified woodfuels managed in the public sector in Nepal. One additional principle, four criteria and 12 indicators have been suggested for consideration exclusively for promoting the production and trade of certified charcoal.

But for the certification of woodfuels produced from private sources such as private forests and TOF, a separate monitoring mechanism which would be based on the product tracking and transformation process under the chain of custody certification method has been suggested for consideration.

Review of findings

The wood energy resources for the production of direct woodfuels in Nepal primarily included the national forests under different types of management. It included both

natural growths as well as forest plantations. It was noted that direct woodfuels derived from the national forests such as government-managed forests and CF for trade, remained in the same order of magnitude as that obtained and sold from the TOF. These woodfuels were derived in the form of by-products and residues during implementation of forest management plans that prescribed matured tree felling, pruning, thinning, etc. Production of direct woodfuels under these arrangements, therefore, could not be viewed as an independent activity but part and parcel of overall forest management that allowed the harvesting of prescribed trees not only for woodfuel but also timber, NTFP and other products of importance to the society. Such plans in principle must take into consideration the social, economic and environmental perspectives at national and FMU levels and also maintain the record of product harvesting, product flow and financial transactions by developing and implementing principles, criteria and indicators for certification of SFM.

Conclusions and recommendations

This study suggests that the term “certification” could not be viewed solely as certification of the tree products such as timber, woodfuels or NTFP, but certification of overall management of the forest. And it means, until and unless forests are managed according to the principles of SFM that qualify for certification of forest management system, certification of only the products of forests such as woodfuel will not be possible.

Certification of the sustainable woodfuel production systems and the trade of certified woodfuel, primarily the direct woodfuels produced as by-products of forest harvesting, thinning or pruning, from government-managed national forests and forest plantations, as well as from FUG-managed community forests seemed possible to consider at the FMU level. But it will require a simultaneous certification of both production sources and the production process, which means the certification of forests (or wood energy resources) for initiation of sustainable management, and the certification of important forest products, including direct woodfuels for its sustainable production for trade in local markets or for export.

The standards (parameters) to be applied for certification of government-managed national forests and forest plantations and CF and for certification of specific forest products produced from these sources depend solely on the criteria and indicators (C&I) that will be developed and applied at the national and FMU levels. As achievement of SFM is a long-term commitment and takes considerable period of time, no productive function of forests can be halted indefinitely. Therefore, a rational strategy would be to identify the parameters of SFM within the country, including principles of forest management, and criteria and indicators for monitoring the move towards it. But these parameters should incorporate all common elements of C&I developed at the regional and international levels for promoting SFM globally.

Development and institutionalization of national standards of SFM is a cumbersome process, which requires the participation of important stakeholders, as well as a consensus agreement applicable for a long time. But as a stopgap measure, until a full-flagged national forest certification standard is put into implementation, development of principles, criteria and indicators for monitoring sustainable production of specific products like fuelwood and charcoal from public production sources for trade seems a reasonable approach for the short-term approach.

As no country could afford to stop its prescribed forest harvesting operations until a full fledged SFM system is in place, all routine forestry operations like thinning, pruning and logging; collection of woodfuel and non-timber forest products (NTFP) for trade, must continue side by side with institutionalization of SFM practices during management of important woodfuel resources. However, institutionalization of SFM practices in all productive national forests, forest plantations and CFs demand a long-term commitment from directly relevant stakeholders, including researchers, academicians and individuals involved in the establishment, management, flow and trade of all types of forestry goods and services.

Besides, the principles, criteria and indicators developed for the certification of government-managed national forests and forest plantations and CF and for the certification of sustainable production of direct woodfuels produced from these sources for trade, would not be applicable for the certification of direct woodfuels produced from the private forests and TOF due to already stated reasons. Similarly, the stated principles, criteria and indicators would not be suitable for the certification of sustainable production of indirect woodfuels and recovered woodfuels from all sources, and also for the certification sustainable charcoal production for promoting the trade of certified charcoal. In order to certify these woodfuels for trade, a separate “chain of custody” monitoring system has been proposed for adoption. Under this process the production and flow of these products will be tracked during transformation and transportation.

Experience from past suggested that a cheap, practical, simple and feasible means of forest certification of international standard did not exist in Nepal. This made it not only difficult but also unaffordable to implement the FSC level of standards prerequisite for all government and community managed forests without outside financial and technical assistance.

In order to institutionalize SFM in Nepal, interested stakeholders have recently formed an ad hoc national working group under the umbrella of Nepal Foresters' Association (NFA), which would coordinate the national initiatives of forest certification. The ad hoc national working group was established with representation from relevant stakeholders from GOs, NGOs and private sectors.

INTRODUCTION

Energy is essential not only for survival but also for improvement of the quality of life of the Nepalese people, through improvement in their overall economic conditions along with the economic status of the country. In this regard, the positive role of clean, affordable, indigenous and renewable sources of energy that could be produced and supplied on a sustainable basis would be significant in the development of this poor, least-developed country in South Asia. Currently, traditional biomass fuels contribute directly to the energy supply as well as in the livelihoods of great number of Nepalese people. According to CBS (2005), the total population in the country was 23.1 million in 2001, which was growing at the rate of 2.25 percent per annum. Out of the total population 19.8 million (or 85.8 percent) lived in rural areas and the remaining 3.3 million (or 14.2 percent) in urban areas. The estimated per capita GDP for the year 2004/05 was US\$ 294. It is reported that between 37–42 percent of the country’s population lived below the nationally defined poverty line in 1999. If the definition of “US\$ a day” is applied, which is often used for the purpose of making international comparison of poverty, then it comes out to be 37%. These people have been thriving

with a very low annual income of less than NRs 4 404 (equivalent to about US\$ 62 per year), which is below the absolute poverty line[†], under average daily income of US\$0.17 per capita. There was a wide variation in poverty incidence across various geographical regions. Poverty was much more severe in rural areas, where 8.7 million people (or 44 percent) lived below the poverty line compared to 0.76 million (23 percent) in urban areas (NPC, 2002a).

Virtually all people in rural areas relied on traditional biomass fuels, primarily fuelwood for meeting their domestic cooking and heating energy needs. Some of them were also depending on fuelwood for domestic lighting. For many of them there was no choice but to continue the use of traditional fuels for domestic energy. Similarly, the urban poor could also not afford to use the imported commercial fuels for cooking and heating and had to rely on dried biomass, primarily fuelwood, for meeting their cooking energy needs. Therefore, majority of the Nepalese people have been using and will continue to use the dried biomass fuels for energy for many years to come.

Nepal is a land locked least-developed country (LDC). It is situated between India and China in South Asia, bordering Tibet, China in the north and India in the east, south and west. The per capita energy consumption in the country according to WRI (2005) was only 14.66GJ in 2001, which was lower than the consumption of its neighbouring countries such as India 21.52GJ, Pakistan 18.46GJ and Sri Lanka 17.71GJ in that year.

The other peculiarity of the country's energy sector is a high dominance of traditional energy sources (as much as 88 percent), primarily fuelwood and other dried biomass residues such as crop and animal residues, in total primary energy consumption. The low per capita consumption of energy could be interpreted as an indicator of the present level of the national economy. Besides, political instability and insurgency had severely affected the life of the people and the economic conditions in the country for almost one decade. With recent negotiations and a peace deals between the different political parties of diverse interests, the country has now shown a sign of better days ahead. It will certainly increase the demand for energy to restart the engine of economic growth at a much faster pace than ever before.

The second section gives a general background of the energy context and the past initiatives of forest certification in Nepal, and section three provides the rationale, objectives and methodology of this study, together with the explanation of methodology design.

In the fourth section the wood energy systems have been explained, with details separated into the wood energy resource systems, the woodfuels production and supply (flow) systems and the institutions responsible for production and supply (flow) of woodfuels. Section five presents a common analysis of the woodfuels production and supply (flow) systems, including analysis of the woodfuel marketing and trade, followed by separate analysis for fuelwood production and supply (flow), and charcoal production and supply (flow).

[†] The Agriculture Development Bank of Nepal defines absolute poverty line as the per capita income of the farm family less than NRs 3,035 per year at the base year 1996-97 and the size of land ownership of less than 10 ropani (0.5 hectare).

The sixth section highlights on the issues and problems limiting woodfuel certification and in the seventh section the natural production systems suitable for forest certification have been identified. Suggested criteria and indicators for the certification of woodfuel production systems have been provided in section eight, which explains the basis for selection of principles, criteria and indicators for sustainable woodfuel production; elaborates the suggested principles, criteria and indicators for sustainable management of woodfuel resources; and describes the suggested principles, criteria and indicators. Besides, the suggested chain of custody monitoring criteria for fuelwood as well as the suggested chain of custody monitoring criteria for charcoal has been provided separately under this section.

The review of findings has been included in section nine, and the last but not the least, section 10 provides the conclusions and recommendations of this case study. The list of publications cited during preparation of this case study has been provided in references after the last section. Other information having direct bearing to this case study has been provided as appendices at the end of this report.

BACKGROUND

The energy context

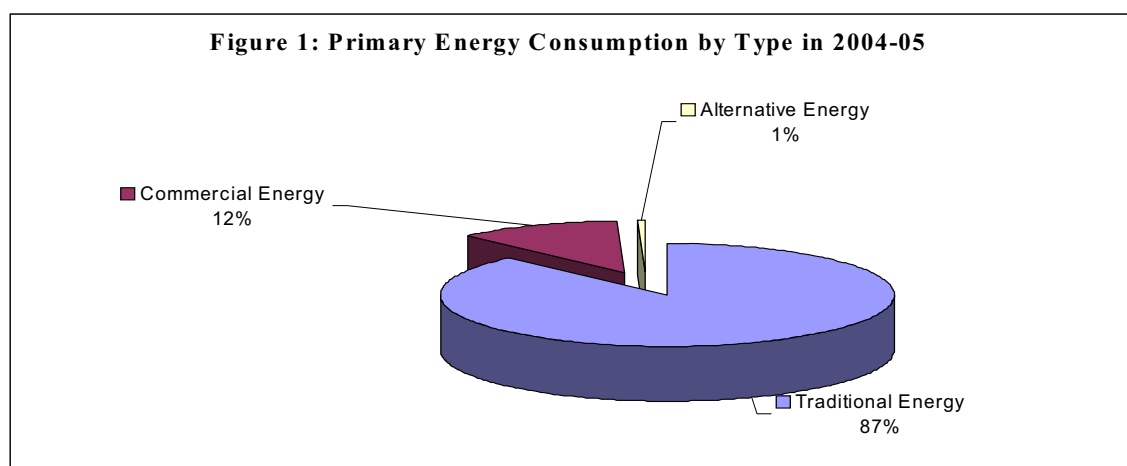
In Nepal, as in many developing countries in Asia, Africa and Latin America, traditional energy sources, primarily dried solid biomass fuels such as fuelwood, charcoal and residues of agricultural crops and animals, contributed the most in total primary energy supply. The energy statistics of the country includes three sources of energy, i.e. traditional energy (or non-commercial energy) sources in the form of solid biomass fuels, primarily fuelwood; commercial energy (or conventional energy) sources, mainly fossil fuels and electricity, including hydroelectricity; and alternative energy sources (or the new and renewable energy) such as solar thermal, solar photovoltaic-power, wind-power, micro-hydropower, including biogas (*gobar gas*) generated from cattle dung as modern bioenergy for cooking and lighting in rural areas. Their contributions in total primary energy supply in the country in fiscal year 2004-05 were approximately 88%, 12% and 0.6%, respectively. The combined share of all types of commercial energy in total primary energy supply was less than 12% (i.e. petroleum fuels 8.2% and electricity and coal, both approximately 1.8% each), Table 1 and Figure 1.

Table 1. Primary Energy Consumption in 2004-05

Source	Amount (PJ)	Share (%)
Traditional Energy	322	87.7
Commercial Energy (Petroleum fuels 8.2%, electricity 1.8% and coal 1.8%)	43	11.8
Alternative Energy	2	0.5
Total	368	100.0

Source: Derived from MOF (2006) and verified with the data in Energy Issues in Nepal paper presented by R.P. Ghimere from WECS in RETRUD- 06, Nepal

Figure 1. Primary Energy Consumption by Type in 2004-2006



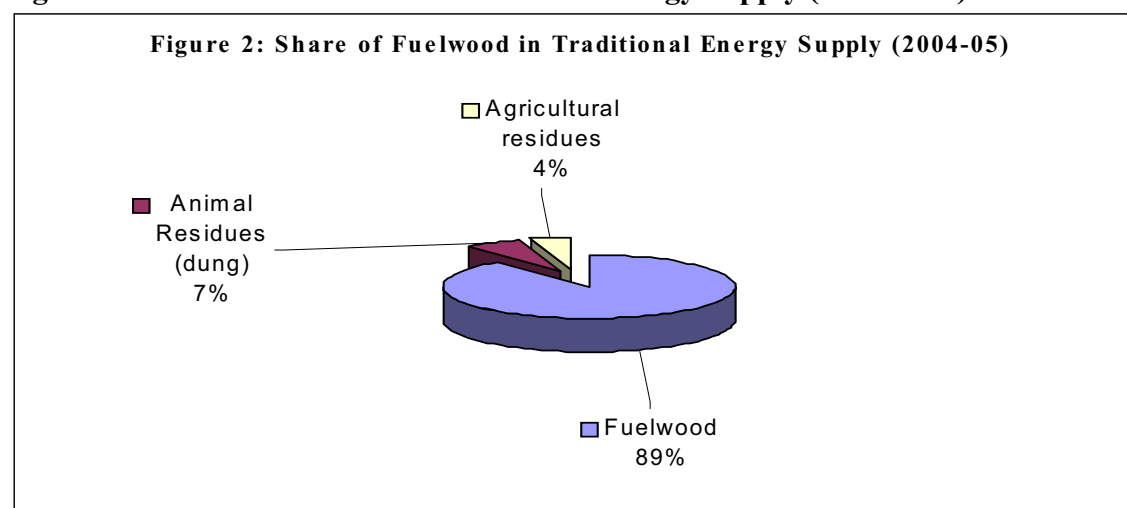
Source: Derived from MOF (2006) and verified with the data in Energy Issues in Nepal paper presented by R.P. Ghimere from WECS in RETRUD- 06, Nepal

Table 2: Traditional Energy Consumption by Type in 2004-05

Source	Amount (PJ)	Share (%)
Firewood (woody biomass)	287	89.2
Animal residues (dung)	21	6.5
Agricultural residues	14	4.3
Total	367	100.0

Source: Derived from MOF (2006) and verified with the data in Energy Issues in Nepal paper presented by R.P. Ghimere from WECS in RETRUD- 06, Nepal

Figure 2. Share of Fuelwood in Traditional Energy Supply (2004-2005)



Source: Derived from MOF (2006) and verified with the data in Energy Issues in Nepal paper presented by R.P. Ghimere from WECS in RETRUD- 06, Nepal

Within traditional energy sources, fuelwood contributed approximately 90%, followed by animal dung 6.5% and agricultural residues 4%, respectively, Table 2 and Figure 2.

Until recently, biomass fuels are mostly used in traditional heat applications with primitive combustion technology, but lately animal dung is being used also for the generation of biogas (*gobargas*) to provide modern bioenergy for cooking and lighting in rural areas.

Woodfuel has been the principal energy for cooking, space heating, agro and food processing in the rural domestic sector. Besides, many traditional industries and commercial enterprises also rely heavily on traditional energy sources for process heat.

Charcoal is not at all used for cooking even in urban areas. So it has remained not so important among different types of fuels consumed in the country. Its use has so far been confined to specific end uses, such as for metal-works by black-, silver- and goldsmiths; for warmth of lactating mothers and newborn babies during the post-delivery weeks; for barbecue; and for body heating also by some urban adults during the severe cold months in winter. The commonly available energy statistics from concerned government department, however, does not include the information regarding charcoal production and consumption in the country. Furthermore, the present statistics shows a decreasing share of traditional fuels in total energy consumption, which is correct in percentage term but in absolute term its consumption too has been growing year after year. But this fact has remained unrealized by most planners. Of course, the growth in total energy consumption has predominantly been dominated by commercial sources due to various reasons. One should not ignore that a large proportion of the households in the country live in rural areas and totally rely on traditional sources for meeting their almost all domestic energy needs. Besides, many households in small towns and business centres, as well as the poor in rural areas, even today, rely on wood and agofuels for meeting their basic energy needs, for cooking, heating, and food and agro-processing.

It is reported that the total primary energy consumed in the country was about 388 PJ (or 8.62 Mtoe) in year 2004–05. Out of which, traditional, commercial and renewable (alternative) energy sources contributed 340 PJ (or 7.56Mtoe), 45.5 (or 1.01 Mtoe) and 1.8PJ (or 0.04Mtoe), respectively. Among traditional sources, fuelwood alone contributed over 78% in total primary energy consumption, followed by animal dung (6% of national share) and agricultural residue (4% of national share). All types of commercial and alternative (renewable) energy sources contributed only the remaining 12 % (i.e. petroleum fuels, coal and electricity all together contributed about 11.5% and the alternative (renewable) sources contributed about 0.5%). The residential sector was the largest consumer of energy, over 90%. Of the total energy consumed in this sector about 78% was in the form of fuelwood. The industrial and commercial sectors also consumed about 0.6% and 0.5% of traditional energy, mostly fuelwood for food, mineral and agro-processing, for commercial cooking, drying, for different thermal applications, including cremation of dead bodies and for ritual fires during religious and special occasions. All other sectors of the national economy consumed only the remaining 10% of total. (Source: WECS database, May 2006).

Past initiatives of forest certification

In the recent past, two initiatives were undertaken for the certification of important forest products from community forests (CF), primarily for initiation sustainable community

forest management, for promoting marketing of the forest products from CF for income generation to local people.

The first initiative was from the Private Public Alliance (PPA) program funded by USAID through Asia Network for Sustainable Agriculture and Bio-resources (ANSAB) in collaboration with the Federation of Community Forest Users Nepal (FECOFUN). The ANSAB-FECOFUN certification initiative was for promoting international trade in NTFP for generating the income opportunities to rural communities from sustainable management of CF. This exercise was one of the many activities under the integrated package of Public Private Alliance (PPA) Programme, launched in Dolkha and Bajhang districts in 2002.

The Rain Forest Alliance, a USA based non-governmental organization, assisted in the certification process to FECOFUN. So far, 21 community forest user groups, covering 14 077 hectares of community forests, have been certified under the generic standards of the FSC group certification system in the last two years. In this task, the FECOFUN served as a group manager and received a certificate of good forest stewardship from the Forest Stewardship Council (FSC). During the process many forest users group members and the staff of the Department of Forests (DoF) and non-government organizations (NGOs) serving at the local level got the opportunity of training in forest certification (Dahal, 2005).

The second initiative was by Integrated Human Ecology Project (IHEP) under the UNDP/ Small Grant Programme in 2002 (IHEP, 2004). It covered two community forest users groups (FUGs), both in Parbat district of western Nepal. The project considers the certification as a slow and gradual process that required a long-term capacity building measures at the local forest user groups' level. The aim is to attain the international certification standards only after some years of project implementation. For this, it proposes to follow a process of identification of the preliminary set of certification standards in consultation with local forest user groups, field test and improve the preliminary set of standards based on findings, again conduct a second field test and incorporate its findings for further improvement until the local standards match the international certification standards.

The immediate interest of IHEP was to improve the conditions of community forests into good forests (or *Asal Ban*), which would only be one step ahead of their present conditions and not really for promoting the export of forest products from these forests. The project gives high emphasis to the poor with incorporation of some pro-poor certification standards in community forest management. Besides, the project aims at raising the awareness about forest certification at local forest users group (FUG) level, in order to prepare FUGs to adopt and implement the FSC forest certification standards in community forests (IHEP, 2004).

FAO-RAP (2000a) reports that Nepal, as a member of International Tropical Timber Organization (ITTO), has developed specific criteria and indicators at the national level for community forestry and leasehold forestry management with the forest user groups under the guidance of Center for International Forestry Research (CIFOR). But the criteria and indicators developed under this initiative were not yet properly organized nor applied in a systematic manner. An informal communication with the person involved in drafting of the CIFOR criteria and indicators revealed that this framework comprised of six principles, 24 criteria and 83 indicators.

FAO-RAP (2000b) reports Nepal's participation in the sub-regional workshop "Development of National-Level Criteria and Indicators for the Sustainable Management of Dry Forests of Asia" in Bhopal, India, from 30 November–3 December 1999. The background paper (of Zhu, *et al.*) of that workshop presents a separate list of C&I for Sustainable Forest Management in the Region, particularly for Bhutan, China, Mongolia and Nepal, which include seven criteria and 52 indicators.

RATIONALE, OBJECTIVES AND METHODOLOGY

Rationale

In Nepal, as in many other countries in the world, the growing interest in wood (bio) energy in recent years has opened a new avenue for additional production and harvesting of wood (biomass) for bioenergy development. Side by side, this growing interest in bioenergy has raised a new concern on the presumption that increased woodfuel use to supplement imported commercial fuels may cause additional pressure on already dwindling forest resources and lead to further deforestation and ecological devastation. Therefore, it has been felt necessary to know whether the woodfuel used currently (in traditional and modern energy applications, if any) in the country comes from sustainable sources or the collection and use of woodfuels contributed to further deforestation and ecological devastation. And for this reason, a thorough understanding of the existing wood energy resource systems and the present patterns of fuelwood and charcoal supply have become crucial from the point of view of both continued use of woodfuels in traditional forms, as well as for promoting modern applications (in the form of solid, liquid and gaseous fuels or by combined heat and power generation).

In order to promote the use of wood energy in different forms in perpetuity, therefore, the first and foremost factor that needs to be assessed clearly is the sustainability of woodfuels production, which means identification of potential woodfuel supply sources, on going woodfuel production, flows and resource management systems, etc., which call for development of the national standards of sustainable woodfuels production, and ultimately the standards for all systems of biomass fuel production. In this regard, this case study has tried thoroughly to review, analyze and identify the suitable C&I of sustainable woodfuel production for trade, where sustainability implies the social, economic, ecological, cultural, institutional and legal perspectives of fuelwood and charcoal production, trade and uses in Nepal.

Objectives

The main objectives of this case study are to:

- characterize the production, commercialization and consumption of fuelwood and charcoal in Nepal,
- identify process and operation units (harvesting, preparation and production) influencing the sustainable production of woodfuel, particularly fuelwood which deserves certification and monitoring,
- identify fuelwood and charcoal flows from different supply sources: forests, planted forests, TOF, forest and industrial by-products,
- describe the specific operation units and process units involved with fuelwood and charcoal production such as: wood harvesting and preparing, wood species for charcoaling and charcoal making,

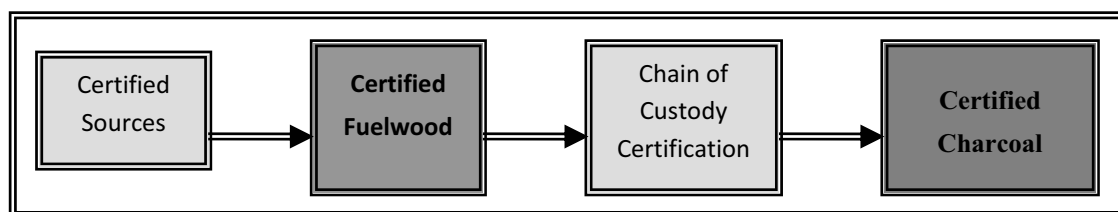
- analyze the environmental, socioeconomic[‡], cultural, institutional and legal aspects associated with production of fuelwood and charcoal derived from different supply sources (forests, planted forests, TOF, forest and industrial by-products) and using different woodfuel production techniques and,
- suggest, analyze and describe suitable criteria & indicators, which need to be monitored.

Methodology

The study has relied solely on secondary information available from different sources, i.e. published reports and documents of R&D and academic institutions, individual researchers, government forestry agencies (i.e. Department of Forests (DoF), Forest Products Development Board (FPDB), Timber Corporation of Nepal (TCN), etc. There was no collection of primary data for the purpose of this study. Relevant reports and papers by individuals, national and international organizations, including reports of relevant seminar and workshops provided additional information, together with limited interactions with directly relevant individuals. Proposing C&I for certification of fuelwood and charcoal production for trade, attention was paid to the features such as clarity, flexibility, feasibility, applicability, country's limitation, compatibility and adoptability as suggested in FAO-RAP (2000b).

Additional C&I needed for monitoring the sustainability of supply of indirect and recovered woodfuels and production and supply (flows) of charcoal were identified by adopting the *chain of custody certification* method all along, from production sites to local markets, to end users, and also during transportation and trade of fuelwood and charcoal. For the purpose of this study, the total amount of fuelwood used for charcoal making was treated as an input and the total amount of charcoal recovered under specific operation unit and process unit as an output. The suitable principle, criteria and indicators for specific operation units and production units were determined following the stages illustrated in Figure 3.

Figure 3. Stages considered for the study of sustainable charcoal production



Basis for methodology design

Taking into consideration all basic aspects highlighted above, under the six main objectives, this case study was designed for identifying the process and operation units (i.e. harvesting, preparation and production) that influence sustainable production of fuelwood, both as woodfuel or for charcoal making, which deserved certification and monitoring for trade. The design also considered the need for analyzing the environmental, socioeconomic, cultural, institutional and legal aspects

[‡] The social and economic impacts of woodfuels and woodfuel production as well as the relationship between economic activities related to woodfuel production and livelihoods

of fuelwood and charcoal production from different sources and under different production systems (techniques) in order to suggest, analyze and describe suitable C&I for ensuring sustainable production and supply of fuelwood and charcoal from existing wood energy resources. While formulating the methodology for this study, the prevailing systems of fuelwood and charcoal production and supply (flows), were familiarized by making review of the available secondary information.

THE WOOD ENERGY SYSTEMS

FAO (2004) defines the wood energy systems as:

“All the (steps and/or) unit processes and operations involved for the production, preparation, transportation, marketing, trade and conversion of woodfuels into energy.”

In the conceptual view of wood energy systems FAO (2004) introduces three different woodfuel supply sources: a) nature - for direct woodfuels derived from forests and TOF, b) wood industries - for indirect woodfuels derived as residues and by-products and, c) society - for discarded wood recovered for woodfuels from abandoned wood products, including old furniture and demolition wood from old constructions. It also incorporates the user’s side information, which is shared among the main demand sectors. Additional considerations regarding wood energy trade complete the picture. The commodities (wood energy vectors) to be considered in wood energy accounting have been divided into four types of products: fuelwood, charcoal, black liquor and others (i.e. methanol, ethanol, pyrolytic gas). The main supply sources for the different types of woodfuels (commodities) were identified as below in Table 3.

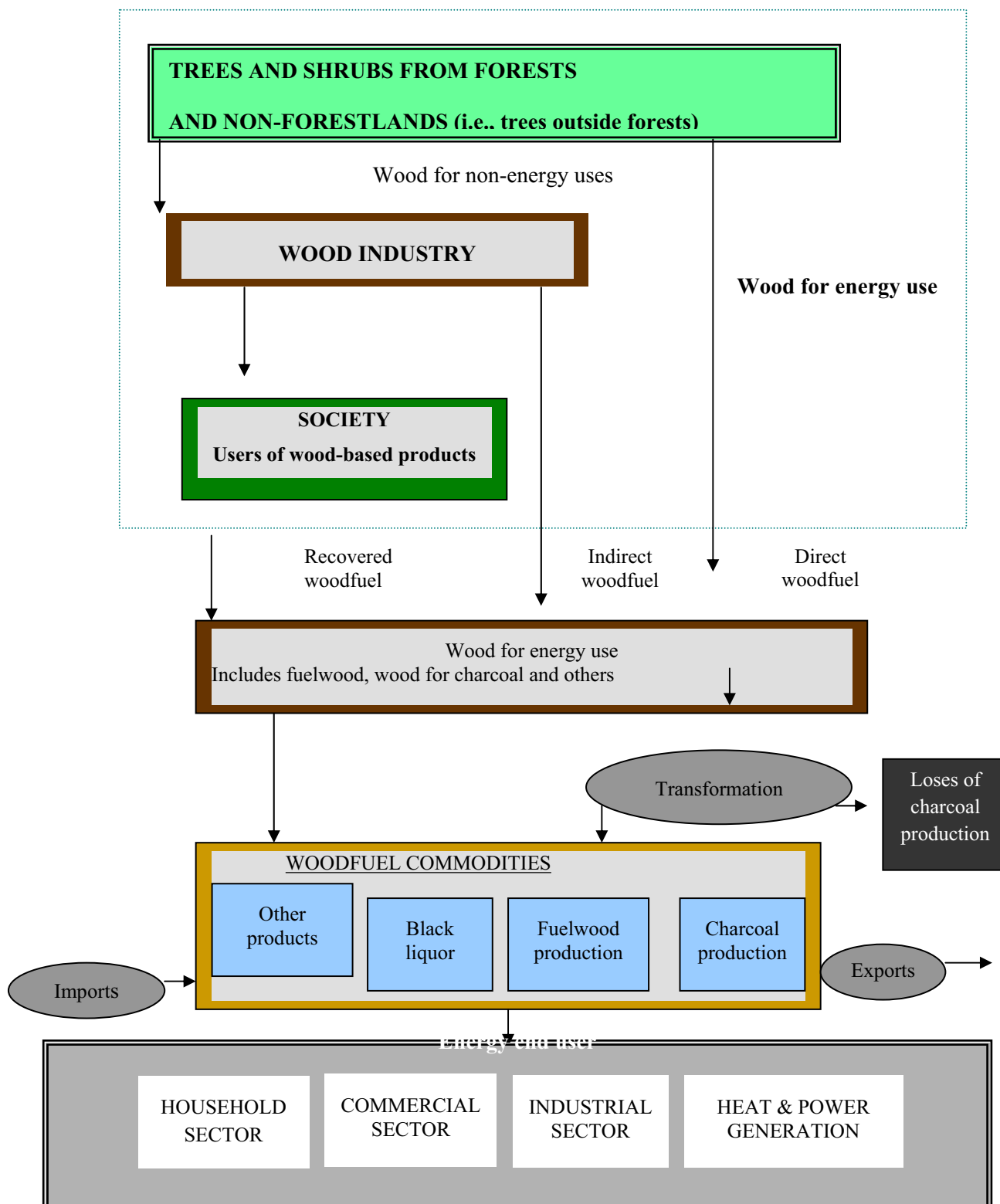
Table 3. Woodfuel types from different supply sources

Commodities (wood energy vectors)	Supply side (sources)		
	Direct Woodfuels	Indirect Woodfuels	Recovered Woodfuels
Fuelwood	x	x	x
Charcoal	x	x	x
Black liquor		x	
Other (methanol, ethanol, pyrolytic gas)	x	x	x

Source: FAO (2004)

The woodfuel balance scheme, from supply sources to end users, taken from FAO (2004) is presented below in Figure 4. The figure identifies the main supply sources (side) for different types of woodfuels (commodities), e.g. the supply sources for fuelwood and charcoal include all direct, indirect and recovered woodfuels, for black liquor only the indirect woodfuels (by-products) of wood industries, and for other types (i.e. methanol, ethanol, pyrolytic gas) all direct, indirect and recovered woodfuels.

Figure 4. Woodfuel balance scheme from supply sources to end-users



Source: FAO (2004)

Wood energy resource systems

The UBET (2004) defines woodfuels as: all types of biofuels originating directly or indirectly from woody biomass. It includes the trees and shrubs grown on forest and non-forest lands, including biomass derived from silvicultural activities (i.e. thinning, pruning) and from harvesting and logging (i.e. tops, roots, branches), as well as industrial by-products derived from primary and secondary forest industries which are used as fuel.

According to this definition, the wood energy resource system encompasses the activities related to sustainable production and management of all types of woodfuel resources, including woody biomass obtained from silvicultural activities, from harvesting and logging of trees and shrubs from forests and non-forest lands (including TOF), as well as in the form of industrial by-products and residues.

For sustainable production and supply (flow) of woodfuels, including fuelwood needed for charcoal making, scientific management of national forests and forest plantations either by government agencies or forest user groups (local communities), or by private industries and individuals, would be essential together with the management of all types of tree plantations (including non-industrial plantations and fruit orchards). Similarly, management of trees and shrubs integrated into the land and tree based production systems, including scattered trees on farms, homesteads and home gardens, farm and agro-forests, linear and blocks tree plantations and scrub lands, under public, private or community ownership would be essential to ensure a sustainable supply of woodfuels. Depending on local conditions, one or many sources could play important roles in the supply of fuelwood and charcoal for trade.

Woodfuels production and supply (flow) Systems

Fuelwood production sources

In Nepal, the most important production sources of woodfuels are the national forest under different systems of management (by government, local community, leaseholders, etc). Besides, private forests and trees on non-forest lands (TOF) also contribute to woodfuel supply in many areas. The priority of any forest owner, manager or developer would be to dispose of their forest and tree products at highest possible price in the market, whether the products are from private, community or public sources. So the Nepalese producers could not be any exception to this universal practice.

From the volume of consumption basis, fuelwood stands first amongst the different types of woodfuels. Until recently, the use of charcoal for domestic energy has also remained insignificant.

According to MFSC-DoF (1999), the legal definition of forest includes all fully or partly covered areas by trees. All forests, excluding private forests, whether marked or unmarked with forest boundary markers are treated as national forests, including waste or uncultivated lands, unregistered lands surrounded by or adjoining to forests, as well as paths, ponds, lakes, rivers or streams and riverine lands within forests.

The national forests are classified into:

- *Government Managed Forest* (a national forest managed by the government)
- *Protected Forest* (a national forest declared as a protected forest by the government, considering its special environmental, scientific or cultural significance)
- *Community Forest* (a national forest handed over to an users' group by the government for its development, conservation and utilization for collective benefit)
- *Leasehold Forest* (a national forest handed over to any registered institution under the current law, forest product-based industries or communities by the government)
- *Buffer Zone Community Forest* (a national forest around national park or wildlife reserve, which is handed over to the local buffer zone user committee for biodiversity conservation and forestry development, for fulfilling the needs of forest products of local communities)
- *Religious Forest* (a national forest handed over to any religious body, group or community by the government for its development, conservation and utilization)

The different types of national forests listed above, together with government-owned tree plantations established on national forest lands are the main supply sources of direct woodfuels. These forests are governed with specific legislative arrangements under the broad framework of Forest Act 1993 and Forest Rule 1995. These sources are important for supplying the wood, woodfuels and other forest products to local communities for self-use, as well as some for trade in commercial markets. But these resources are not distributed equitably to meet the total forest products needs of the people in every part of the country.

Depending on availability and accessibility, alternative sources such as private forests (a forest planted, nurtured or conserved in any private land owned by an individual under the current law) and scattered trees on farms, homesteads and non-forest lands (TOF) play a significant role in the supply of direct woodfuels locally. However, the crucial role of each of these sources in both locally consumed and market traded woodfuel supply remains not fully understood due to lack of information. And information is lacking not only regarding production by source, but also regarding consumption in specific end uses by type of woodfuels. This information would have been desirable for understanding the long-term sustainability of production for sustaining the traditional uses of wood energy, not to mention for assessing the potentials of modern bioenergy applications in the future.

Without reliable information about production and consumption (in both volume and value), including supply sources of direct, indirect and recovered woodfuels by types (commodities: fuelwood, charcoal, etc.) and also due to absence of any systematic mechanism for a periodic collection and updating of woodfuels related data, it was difficult to visualize clearly the specific role of each components of the wood energy systems prevailing in the country. Besides, available information shows a wide variation in the contribution of forests and non-forest lands (TOF) in total woodfuels supply, which remained site specific. Bhattarai (in WEN: Vol.15 No.1, 2000) cites

earlier two sources and presents the share of forests between 73–82% and of non-forest lands 17–27% in total supply of woodfuels in Nepal.

People in different parts of Nepal adopt their site-specific woodfuel supply strategies that best suit local conditions, which depend on availability and accessibility of natural forests under the public domain. It is not true that only the remaining natural forests under the public domain are important supply sources of woodfuels to everyone living in different parts of the country. Only in areas endowed with large tracts of natural forests and/or forest plantations, owned either by the government or local communities as CF, including village and community woodlots, these public resources play a significant role in the supply of locally consumed woodfuels. But in areas with limited or non-existence of the public supply sources, trees on private, institutional and community lands play a crucial role in supplying the locally used woodfuels. Recently, community forests have started to contribute significantly to woodfuel supplies in the villages of middle hills of Nepal.

But in the *terai* plain most villagers rely more and more on private woodfuel supply sources, such as private forests and trees on non-forest lands, also known as TOF. It has been noted that the role of forest and non-forest lands change significantly from one place to another, not only between the districts but also within a district, depending upon local woodfuel demand and supply situations. It is observed that the people, rich or poor living in a close proximity to woodfuel resources rely mostly on the free, self-collected direct woodfuels from public supply sources.

Wherever these sources are in short supply, the people have been forced to switchover to other inferior biomass fuels (i.e. agricultural crop and animal residues) for energy because the remaining natural forests and shrub lands under public domain have been pushed farther away over the years due to various reasons (i.e. forest encroachment, conversion of forest for other uses, including infrastructure development, deforestation etc). On the other hand, even the poor living in urban areas have to use the purchased, indirect or recovered woodfuels for meeting its energy needs. The direct woodfuels sold in the markets are usually expensive compared with the price of indirect and recovered woodfuels, so out of reach to them.

In many rural areas, mostly in the *terai*, government or community established scattered tree plantations tend to complement the supply of direct woodfuels to local people. In other areas, the small patches of naturally grown trees on private farms bridge the domestic woodfuel supply gaps of the better-off farmers. Besides, the linear tree plantations established under different schemes, for greening, for protection of river and canal banks, as avenue trees along sides of road and railroad, contribute also to local supply of direct woodfuels to the people. In addition, the different types of trees planted under multiple objectives (e.g. for fruits, nuts, oil, spices, windbreaks, shade) on private lands, including in home gardens, homesteads, farm boundaries, or as linear tree plantations, fruit orchards, cash crops (including tea and coffee bushes, etc), contribute significantly to direct and indirect woodfuel supply.

Therefore, the wood energy resources in Nepal include all accessible natural forests, block, linear and scattered tree plantations on public, community and private lands, as well as scrubs and wastelands. And depending on local conditions, one or many sources play an important role in supplying the direct, indirect and recovered woodfuels to the people in different parts of the country. Therefore, whichever of the

many woodfuel supply sources plays a crucial role in meeting the demand is very much site specific and depend on the physical, social, economic and environmental conditions of the specific area.

Balla *et al.* (in RWEDP, 1991) identifies the livestock yards as a secondary source of fuelwood for some households who own livestock. The small twigs left over after feeding fodders are used as fuelwood for household cooking on the outskirts of Pokhara town in Western Nepal. This woodfuel recovered as fuelwood from the fodder material after feeding the cattle may be placed under recovered woodfuels.

For the purpose of this case study the conceptual framework of wood energy systems of FAO (2004) has been adopted with some modifications to incorporate the different situations in Nepal. By doing so, it will try to identify and incorporate every component of the wood energy systems, including resources (i.e. forest and trees on non-forest lands), supply sources (i.e. nature, wood industries and society) and woodfuel type (or commodity like firewood, charcoal). The wood energy systems in Nepal have been shown separately by woodfuels supply sources, woodfuel types and commodities below in Figure 5(a), (b) and (c). The preferred species for fuelwood and charcoal as expressed by the producers and traders of woodfuels in Pokhara, Nepal (Bella *et al.* in RWEDP, 1991) is provided in Table 4.

All of the best species for fuelwood in the above list could be found in the natural forest of middle hills and most of it has been handed over to FUGs for management by the local community as CFs. Similarly, the best species for charcoal making could also be found in most of the CFs. Among the good species, Mango, Badahar and Jamun are found mostly on private lands raised by individuals with multiple objectives, i.e. for fruit, fodder, wood and firewood. And species is an important component of the integrated hill-farming systems in Nepal.

Fuelwood distribution

The present demand of woodfuel is primarily for traditional applications (for cooking and heating) and the types of fuels used for this purpose are mainly fuelwood and to a limited extent charcoal for specific end uses. Most of the woodfuel consumed by rural households are free-goods, which are self-produced, collected or harvested for free, sometimes by hired labour but invariably without payment of any stumpage fee or royalty. Therefore, a major share of the woodfuels consumed in the country does not pass through any formal or informal channels of commercial distribution or trade.

Fuelwood, sawdust and other woody residues produced in different shapes and sizes as by-products in wood-industries and charcoal is used for energy either by the producers or by others elsewhere. Most of these woodfuels are used in the rural domestic sector, but also many urban households and traditional industrial commercial activities rely on these fuels for energy. The practice of woodfuel distribution and use in Nepal, as in many other countries, vary according to distance from the sources of production to the consumption centres. Besides, accessibility and availability of wood fuel, socioeconomic conditions of the villagers and the amount to be transported also influence the distribution systems in specific areas.

The traditional woodfuel distribution system in rural households is simple. Often one actor does the complete task of producer (harvester/collector), transporter and consumer. The system becomes a bit complicated with rural industries and

commercial activities, in which hired labours often play the role of woodfuel producers and transporters. Similar situation can be observed with the better-off households who might also employ hired labours for the collection and transportation of fuelwood for them.

But in many densely populated district centres and small towns, existing wood energy resources have become insufficient to meet the demand of energy for various end uses, including domestic cooking and heating; for traditional industries; and for food and agro-processing for commercial markets. In such areas the supply of wood fuel to end users is managed through commercial channels, as both formal and informal supplies. An overview of schematic woodfuel flow is provided in Figure 6.

Table 4. Preferred Species for Fuelwood and Charcoal

Fuelwood Species		Charcoal Species	
Local name	Scientific name	Local name	Scientific name
<i>Best species</i>		<i>Best species</i>	
Sal	<i>Shorea robusta</i>	Sal	<i>Shorea robusta</i>
Chilaune	<i>Schima wallichii</i>	Khair	<i>Acacia catechu</i>
Karma	<i>Adina cordifolia</i>	Kafal	<i>Myrica esculanta</i>
Tinju	<i>Dyospyros spp.</i>		
Katus	<i>Castanopsis inidca</i>		
<i>Good species</i>		<i>Good species</i>	
Asna	<i>Terminalia tomentosa</i>	Chilaune	<i>Schima wallichii</i>
Mango	<i>Mangifera indica</i>	Katus	<i>Castanopsis indica</i>
Jamun	<i>Eugenia jambolana</i>	Angeri	<i>Lyomia ovalifolia</i>
Khanyu	<i>Ficus cunia</i>	Khanyo	<i>Ficus cunia</i>
Badahar	<i>Artocarpus lakoocha</i>	bothdhainro	<i>Lagerstroemia perviflora</i>
<i>Less (non) preferred species</i>			
Utis	<i>Alnus nepalensis</i>		
Phaledo	<i>Erythrina stricta</i>		
Simal	<i>Bombax ceiba</i>		
Pipal	<i>Ficus religiosa</i>		
Khirro	<i>Sapium insigne</i>		
Pakhuri	<i>Ficus glaberrima</i>		
Bar	<i>Ficus bengalensis</i>		

Source: Bella et al. (in RWEDP, 1991)

Figure 5 (a). Wood energy systems: nature as a source of direct woodfuels in Nepal

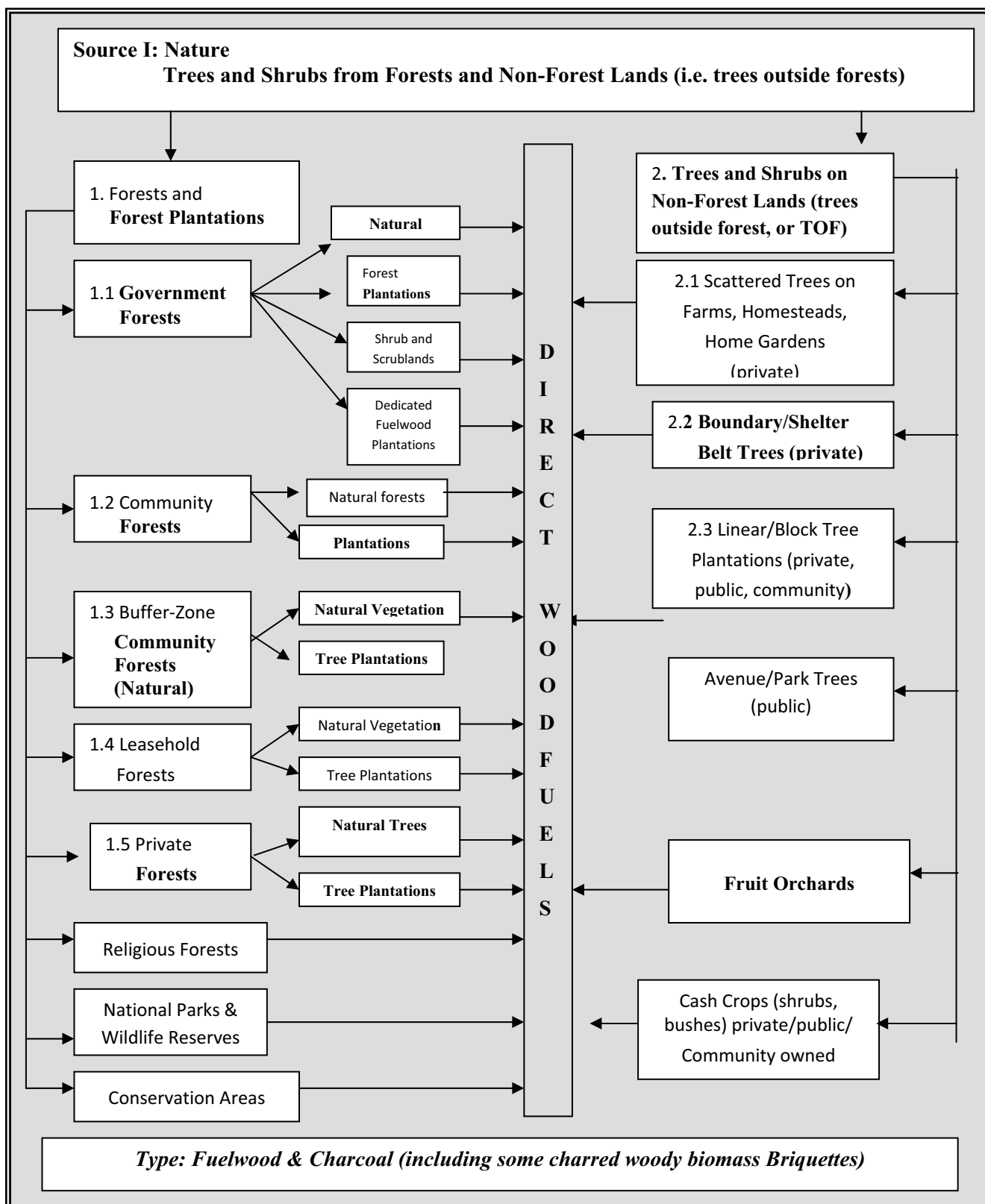


Figure 5 (b). Wood Energy Systems: Wood Industries as a Source of Indirect Woodfuels in Nepal

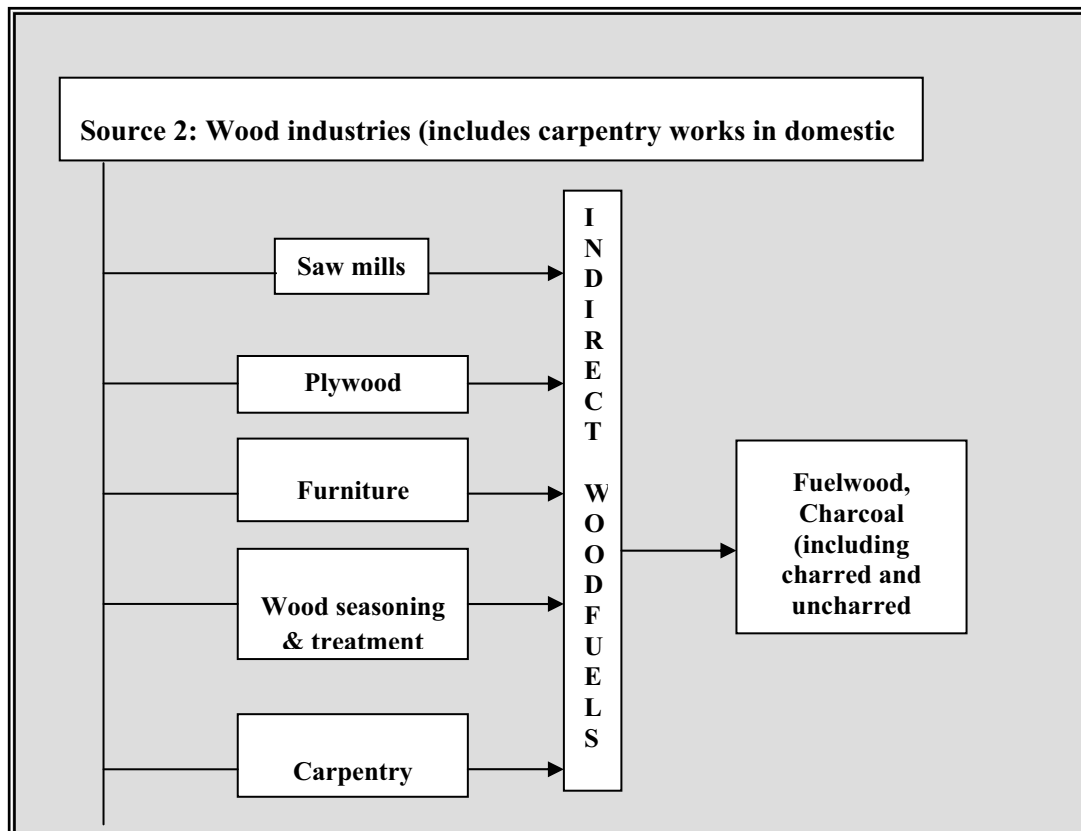


Figure 5 (c). An Overview of the Wood Energy Resources: Society as a Source of Recovered Woodfuels in Nepal

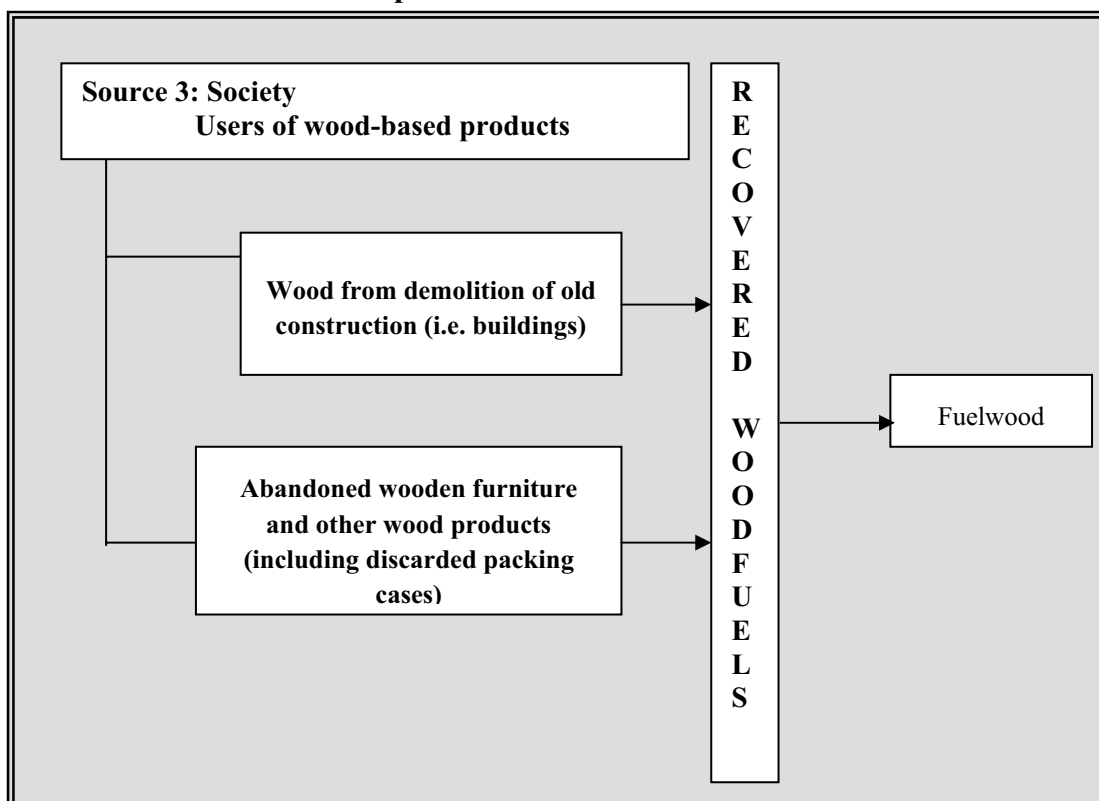
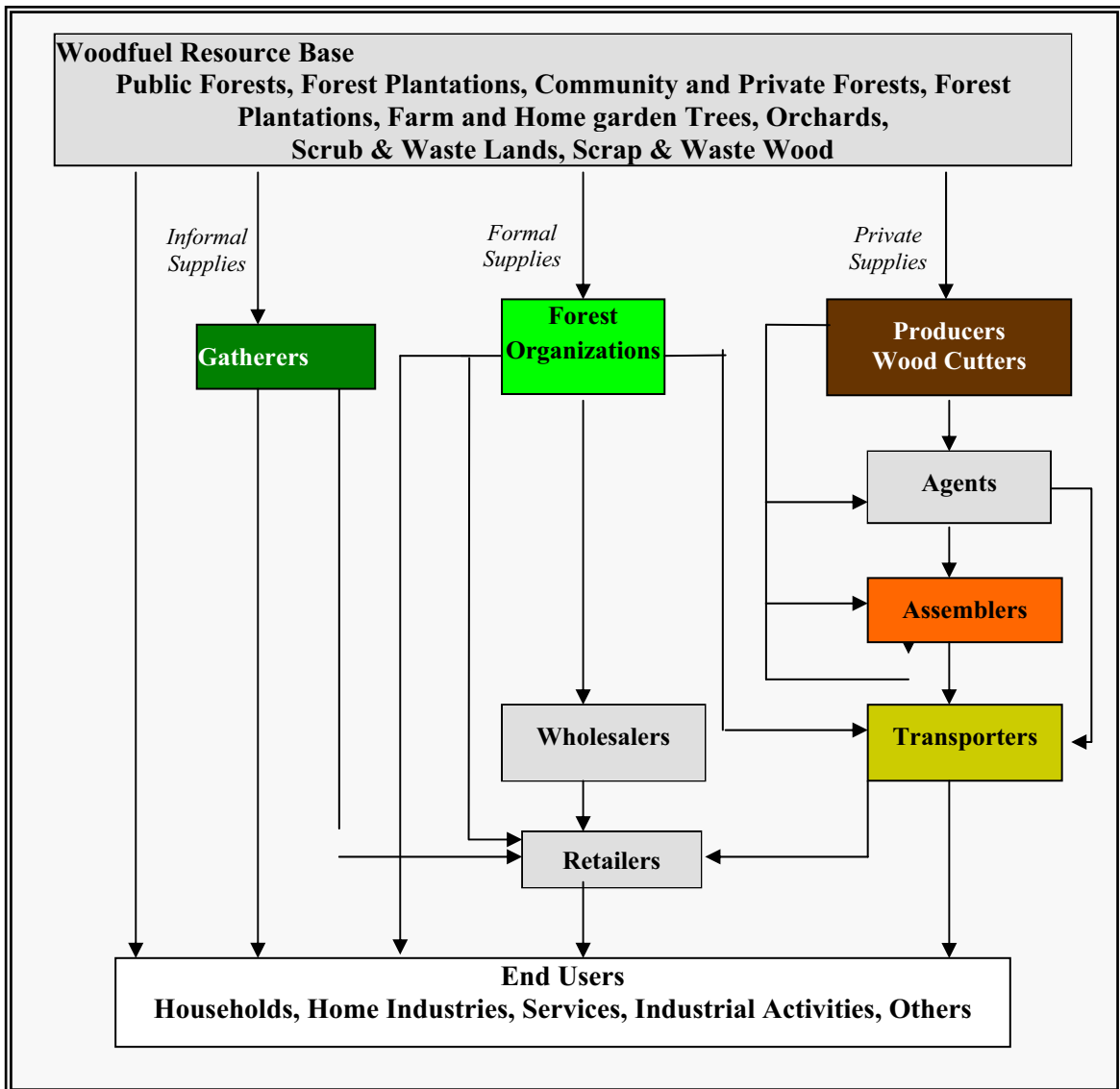


Figure 6. Overview of schematic woodfuel flow



Source: RWEDP (1996)

Kanel (1998) cites two fuelwood marketing-related studies conducted in the past. The first study (by Shaikh *et al.*) analyzed the fuelwood marketing and trade in Kathmandu valley in 1989 and other study (by Delucia and Associates) on energy pricing in 1994. The policy study analyzed also the existing situation of woodfuel in the country and the implications of current and reformed policy on the demand and supply. Kanel further states that the marketing chain of commercial woodfuel obtained through informal or illegal collection from the national forests is different. No official permit is issued to these informal/illegal collectors. Individual household members enter the national forests, harvest the fuelwood and bring it in head-load, bicycle-loads, and shoulder-loads to the nearest road side and sell either to a local trader or to an end user. Based on the proportion of fuelwood used as a commercial commodity, the estimated number of people employed in the collection and trade of fuelwood was estimated at least 100 000 in Nepal.

Another area-based study by Gautam and Pokharel (in IAAS Research Reports 1994–1995) tries to identify the existing marketing system of fuelwood in Chitwan district. The findings suggest that majority of the fuelwood collectors and sellers were either landless or marginal farmers who were mostly from the ethnic minority groups and did not have other job opportunities in the area. Most of these collectors had direct link with local hotels and restaurants to sell the fuelwood, but others had to go to the market and find the buyers.

Charcoal production and supply

Charcoal is not a common fuel used for household purposes. But it is a preferred fuel by specific occupational groups such as traditional metal workers, as it produces high temperature in a very short period of time. Charcoal has a relatively high thermal value on equal weight basis and can be transported to a longer distance at fairly low costs compared with fuelwood. Irrespective of this advantage, this fuel has not been a commonly desired energy source for domestic cooking and heating even in urban areas of Nepal.

From the point of view of fuelwood supply for charcoal making, all natural woodfuel resources including public and private forests, tree plantations and TOF, as well as any community-owned or -managed woodfuel resources are important sources. Sometimes charcoal makers might also be paying nominal prices to, or make barter arrangements with, private tree owners to procure the fuelwood needed for making charcoal. However, none of the available information suggests the use of indirect woodfuels (woody residues and by-products from wood-industries) and recovered woodfuels for charcoal making in the country.

Production of charcoal for trade is not a common activity in the country. As past efforts of charcoal production and trade with the primary objective of utilizing logging wastes in the forest after forest clearing did not succeed due to many reasons, the prevailing forestry legislation is not specific about production and movement of charcoal. Currently, there is not a single governmental organization producing or trading in charcoal. Therefore, any charcoal producer to day even if the wood used for charcoal making by them came from purchased sources such as national forests (including CF), private forests and TOF, could not legally bring the charcoal they produce for trade in commercial markets. They may however make charcoal for own use at local areas without requiring formal official approval/permit. Any private tree owner wishing to harvest the trees grown in private lands must first acquire a felling permit from the local DFO's office, which is usually a complicated process of verifying the private ownership of not only the trees but also the land on which these trees grow. Trees cut with formal approval could be converted into charcoal and used locally without any restriction, but its transportation to market for trade is not permitted under the prevailing forestry legislation.

Balla *et al.* (in RWEDP, 1991) states that participants in the charcoal production system are from low income or low caste groups. Mostly people from the blacksmith (*Kami*) and Goldsmith (*Sunar*) castes, especially landless workers and smallholders were involved in the production of charcoal around the town of Pokhara. These people produced charcoal to sell as well as for own use in their respective occupational tasks. The common charcoal making practice was based on dug-pits, but some large and regular consumers of fuelwood such as commercial establishments,

distilleries, bakeries often produced some of their own charcoal as a by-product of fuelwood burning. They further state that no agency or individual in Nepal seems to be authorized to produce or distribute charcoal to consumers on a commercial basis. Their conclusion about the charcoal that was available in the Pokhara urban area then was therefore, produced and distributed on a demand basis, and illegally, mostly by rural members of the blacksmith caste who lived in the surrounding hills.

Tamrakar and Singh (in RWEDP, 2000) identify a new possibility of charcoal production from community and leasehold forests. They categorically state that the prevailing charcoal-making practices are usually illegal operations taking place largely inside the government managed/protected national forests, mostly carried out by the specific occupational groups such as blacksmiths (*kami*) and goldsmiths (*sunar*). They were of the view that the higher carbon content and per unit of weight of charcoal allow it to sell at higher price compared with fuelwood by reducing the transportation cost. They present an old estimate of charcoal consumption in the industrial sector of Nepal as 11 000 metric tons, based on study report of the Industrial Services Center conducted during 1985–86.

Nienhuys (2003) in his report prepared for the Namche Bazaar Conference of May 2003, in conjunction with the celebration of the 50th anniversary of the first ascent of Mount Everest by Sir Edmund Hillary and Tenzing Norgay Sherpa on 29 May 1953, talks about the potential use of biomass charcoal briquettes and improved briquette stoves at high altitudes in Nepal. The report categorically states that with proper application of the available technology, biomass briquettes can be a means of providing a convenient source of energy for cooking and space heating. It could even substitute the use of imported kerosene, which is expensive, non-renewable and subsidized by the government to reduce the cost to consumers. Further, the need to improve the locally manufactured biomass charcoal briquettes has been also identified by various national and international agencies working for the development of mountain region in Nepal.

Institutions responsible for production and supply (flow) of woodfuels

In the public sector, three institutions: the District Forest Products Supply Committees (DFPSC) under Department of Forests (DoF), the Forest Products Development Board (FPDB) and the Timber Corporation of Nepal (TCN), both under Ministry of Forests and Soil Conservation (MFSC), are the key players in the production and supply of woodfuels in the markets. Currently, none of these institutions produce or trade charcoal in the country.

Department of Forests (DoF)

The main institution responsible for managing all affairs of forestry, including management of wood energy resources, is DoF. It was established in 1951 (2008 BS). The institutional reform in 1993, for decentralization of the activities of DoF, has established 74 district forestry offices (one short from the total 75 administrative districts in the country), 92 *Ilaka* (Sub-district) offices and 698 Range posts. The district of Mustang does not have a district forest office, where the District Soil Conservation Office has been assigned this role by MFSC (DoF, 2003).

For the distribution of wood and fuelwood to the local people at concession rates, 33 District Forest Products Supply Committees (DFPSCs) have been set up in the country

under the Forest Rule 1995 (2051 BS). Currently, the local District Forest officer (DFO) serves as chairperson and the Attached Officer of concerned district forest office as member secretary in the DFPSC. The other members in the committee include the District Account Comptroller and the local level nominees of MFSC. DFOs are the main actors in the disposal of forest products from the government-managed national forests, either through the DFPSCs or TCN or FPDB in these districts.

In districts where part(s) of existing national forests/forest plantations have been handed over as CF to local FUGs, their respective Forest Users Committee (FUC) distributes the needed forest products to eligible FUG members. The FUCs are registered legal entities and they have to follow the prescriptions of approved working plans while harvesting of forest products from their respective CFs. Actually, the role of FUCs in distribution of forest products, particularly in hill districts have increasingly come into limelight, as suppliers of forest products at concession rates to local communities, as well as for supplying the market with surplus forest products for trade. The FUCs are responsible for development and conservation of handed over national forests together with utilization of the benefits of CFs at equitable basis. Kanel (2004) reports that more than 14 300 FUGs were managing over one million hectares (or 25 percent of the country's forests) in which about 1.5 million households (or 35 percent of the population) were involved, and generated about NRs 913 million from the sale of forest products, including saw logs, fuelwood, grasses and other products.

The other important actors in woodfuel production and trade include the private forest and tree owners and forest entrepreneurs. They are involved in the production (including TOF) and trade of forest products as informal undertakings. But all the producers and suppliers of market traded wood and woodfuels have to follow the complex and cumbersome institutional hurdles, not necessarily legal, for completing the formalities needed to bring their products to markets. Although exact information about the extent of private forests and number of trees on private lands could not be estimated, the record of DoF suggests that about 13 471m³ (or 475 511cft) of saw logs were produced for trade from the private forests, including TOF (DoF, 2006).

Five Regional Forest Directors under the MFSC are responsible for monitoring of the forest working/operational plan implementation in national forests, including forest plantations (i.e. government-managed forests, community forests and leasehold forests), by the concerned DFO under their respective regions. In the case of protected areas, the concerned warden is responsible for assisting FUGs in buffer zone community forests.

Forest Products Development Board

The Forest Products Development Board (FPDB) was established in 1976 under DoF. Now it is placed directly under MFSC. The main reason behind setting up FPDB was to support the forest industries by providing raw materials on a regular basis, as well as for conducting research on forest utilization.

Currently, it has three operational forestry development projects: the Sagarnath Forestry Development Project in central plain, the Nepalganj Forestry Project in mid-western plain, and the Ratuwa-Mai Plantation Project in eastern plain. It has an executive committee comprising of three members. Currently, the Secretary of MFSC chairs it and other two members include the representative of Ministry of Finance (MoF) and the representative of DoF.

The Timber Corporation of Nepal

The Timber Corporation of Nepal (TCN) was established under the Company Act in 1960. Initially it comprised of a large sawmill located at Hetauda, Makawanpur district in central Nepal. The primary reason for setting up this sawmill was for a speedy clearing of the delineated forests for human settlement and for processing of the saw logs recovered from forest clearing into commercial timber, both for local sale and export. But its current activities are confined only to collection and conversion of dead, dried and fallen trees in forests with approval from the DFOs into saw logs and fuelwood. Its activities are mostly confined in the *Terai* forests. It sells the forest products harvested at auction after fixing a minimum floor price, which includes government royalty rate, plus harvesting, yarding, transportation and other associated costs, including a fixed share of mark-up as profit. The concerned DFOs assign the tasks to monitor the activities of TCN on behalf of DoF.

ANALYSIS OF WOODFUELS PRODUCTION AND SUPPLY (FLOW) SYSTEMS

Currently, most of the fuelwood consumed in the country is by rural households and traditional industries. It is totally a new scenario compared with the situation about two decades ago. Then, even the urban households depended on fuelwood for domestic cooking. In recent years, people in urban areas have rapidly switched over to commercial energy sources, primarily LPG and kerosene for cooking and heating and electricity for specific end uses. The cost of indigenously produced hydroelectricity is more expensive than the imported fossil fuels, the cost of which is supposed to be subsidized from the public sources, but at the same time there is also direct and indirect taxes on it at the time of import. And year after year, more and more people are switching over to imported commercial fuels for domestic energy, even in small towns and district centres having road access for transportation of these fuels. On the other hand, most rural households usually gather the fuelwood they need for domestic energy free of cost at the source by themselves because of their low economic conditions.

The people who live in emerging market places along sides of newly built roads, in small towns and district headquarters not yet connected with roads, depend on fuelwood or other biomass for energy, for cooking of food and cattle feed, for space and water heating, and for agro and food processing for self-consumption as well as for the market. Some use these fuels also for sustaining their traditional occupations. Most of them rely on traded fuelwood supplied through formal or informal channels of marketing.

However, the poor, as they could not pay for the fuelwood sold in the market, are forced to look for nearby free collection sources for meeting their cooking energy needs and some also for generating cash income for sustaining their livelihoods. The exact volume and value of the fuelwood traded in the country is not known, neither is the amount consumed as self-collected or free-supplied fuelwood. Generally the poor, both in urban and rural areas, have a tendency to search for free supply sources or depend on nearby natural forests, public lands etc. for free collection of fuelwood. In contrast to the users in large urban areas who purchased fuelwood for specific end uses, the poor in these areas, as far as possible searched for free or cheap fuelwood supply sources. Some of them used the waste or recovered wood available locally in different forms, if the free supply sources do not exist in the area, according to Bhattarai (2000).

Woodfuel marketing and trade

Supply of woodfuels to markets, in large urban centres, emerging market places along newly constructed roadsides and in small towns and district headquarters not yet connected with road, has evolved into a fuelwood business, mostly run in the informal sector. It has developed its own network between the tree growers and woodfuel producers, transporters and traders and consumers or end users. The non-traded wood fuel flow is a simple distribution system. There may be only one actor performing the task of fuelwood production and transportation up to the household where it will be consumed. The consumer may serve as the producer/gatherer, converter and transporter and no other actor may be involved in between.

The traded or commercial fuelwood flow systems may vary from place to place depending upon local conditions, not only between districts and towns but also between places within one district or a town. Many factors play a role in the design of a flow system in a particular area. The system may be a simple one, linking the producers with traders and consumers, or it may be a very complex one having many actors in between the producers and the consumers of fuelwood, i.e., contractors, labourers, transporters, middlepersons, wholesalers and retailers.

The price of informal sector supplied fuelwood is fixed by the market itself, which could fluctuate according to the supply-demand position at any specific time. In the case of formal sector supplied fuelwood, the DoF charges the fixed royalty rate of the government, which is based on per stack volume of specified size. The government could change the royalty rate of woodfuels from time to time taking into consideration the going market rates.

The DFPSCs supply saw logs and fuelwood for own use to the local people at fixed royalty rate of the government in specified districts. Any forest products procured under this system will not be allowed to sell. The TCN and FPDB sell saw logs and fuelwood by auction on or above the prefixed minimum floor prices which include the royalty rate plus the costs of harvesting, transportation, overhead, including predetermined percentage mark-up as profit. The total volume and value of saw logs and fuelwood trade through these official channels of the government, for past five years is provided in **Table 5**.

Table 5: Total volume and value of traded fuelwood and saw log

Financial Year	Fuelwood Stack volume (ft³)*	Saw log (ft³)	Amount (NRs) **
2005-06	1,970,500	1,405,858	416,586,107
2004-05	11,068,000	1,443,933	427,212,133
2003-04	3,378,000	2,191,964	545,549,749
2002-03	3,905,000	3,359,625	520,406,553
2001-02	3,479,000	2,326,669	406,863,552

*Source: Kalpa Briksha, Quarterly News letter of DoF, January 2007 for the latest data 2005-06; Hamro Ban, Progress Report of DoF for data from financial year 2001-02 to 2005-06. *1m³ = 35.31ft³; **1US\$ = 71.00 NRs (February 2007)*

Fuelwood production and supply (flow)

Woodfuel production and supply (flow) systems include the series of activities related to procurement, harvesting/collection, conversion/preparation, bundling, to transportation-transformation of woodfuels to consumption points. Therefore, in commercial flows, there will often be a large number of actors involved in the process as collectors, gatherers or hired labours, as harvesters, converters, charcoal makers, bundlers, loaders, transporters, traders (i.e. middle-persons, wholesalers, retailers) etc. The flow system may vary significantly from one place to another depending on local conditions. If the long-term objective is to promote sustainable wood energy utilization then the study of woodfuel production and supply (flows) systems must include both commercial and non-commercial woodfuel distribution systems.

A thorough understanding of the resources systems, which may include the public, community or privately owned/managed tree production systems of different kinds that may be based on forest or non-forest lands, will be essential to assess the woodfuel production potential, including the amount available for sustainable utilization. This information will also help to identify the different linkages that may prevail between the producers and consumers in the flow process, depending upon the type of the supply sources and the characteristics of the end users. The prevailing woodfuel flow system in a given area may have both vertical and horizontal linkages of variable nature, to link the different production systems with the diverse end users. A free or self-collected supply for own use may exhibit the closest link between the resources and the consumer of woodfuel. A self-collected supply partly for own use and partly for market trade may still have a shorter route, whereas a purchased supply for market trade could involve a much more complex chain of actors in the flow process.

In Figure 6 above, line one and two from the left show the directions of flows from wood energy resource base to end users, which represent the typical cases of non-commercial flow of both fuelwood and charcoal in rural Nepal whereas the next two lines on the right represent the commercial flows, including formal supplies through government organizations and private supplies through number of actors in the flow chain making the process more complex. Both of these flow models prevail in large towns and in industrial commercial centres where fuelwood and charcoal are sold as traded commodities in commercial markets.

Kanel (in RWEDP, 2000) states that the amount of fuelwood derived from private forests and trees is about the same in order of magnitude and as that obtained from the national forests. But the amount of fuelwood derived from community forests for trade was reported negligible. Only 4.7 to 7.4 percent of the total commercial fuelwood marketed in the country is legally harvested either from national or private forests. The marketing chain of commercial fuelwood obtained through informal or illegal collections from national forests is different. No official permits are issued to these collectors, as individuals and household members enter the national forests, harvest the fuelwood and bring it in head-loads, bicycle-loads and shoulder-loads to the nearest road side for sale to the local traders or to end users. Some of the bus or truck drivers are the major carriers of this fuelwood to the urban centres. They purchased the fuelwood stacked on the road, and eventually sell it to wholesale or retail merchants of the town. The proportion of commercial fuelwood supplied by these “silent travellers” is significant. It is reported that between 3–6% of the woodfuel supplied in Kathmandu valley was in the form of head- and back-loads; another considerable amount by occasional and non-professional traders as piggyback loads. Some of these carriers may also be receiving extra cash income from the woodfuel trade.

The prevailing formal traded fuelwood flow systems from government-managed (owned) forests, taken from RWEDP (2000), is provided below in Figure 7.

Figure 7. Formal fuelwood supply (flow) in Nepal

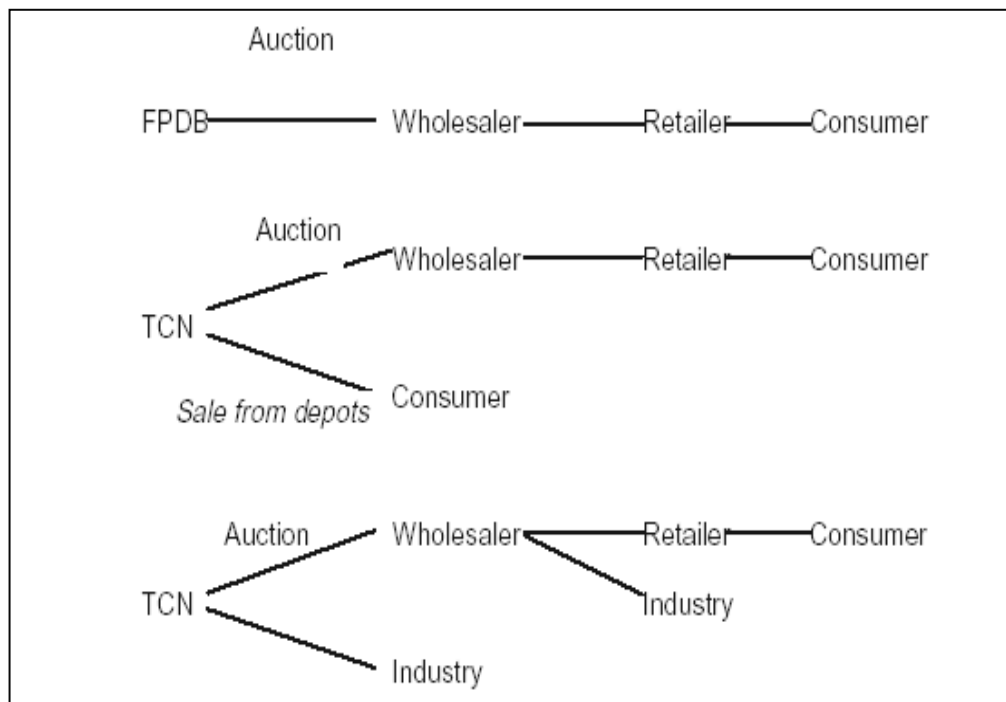
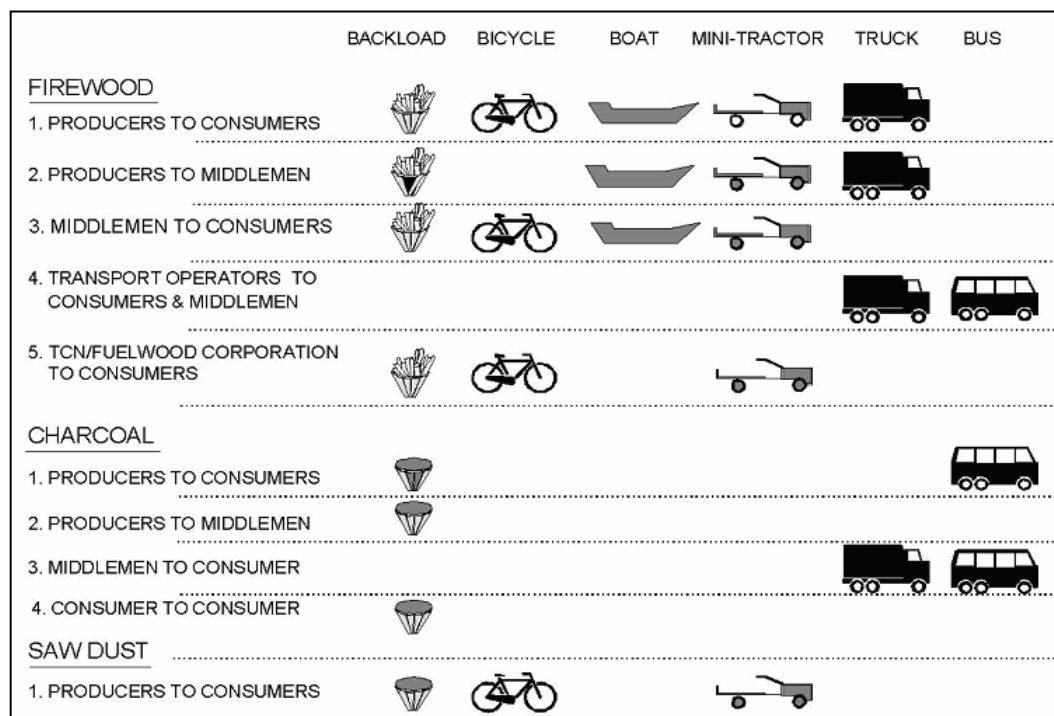


Figure 8. Distribution and transportation of wood energy in Pokhara, Nepal



Balla, *et. al.* (in RWEDP, 1991) present a more complicated wood energy distribution and transportation system that was exposed from their study in Pokhara as shown in **Figure 8**. RWEDP (2000), the recommendation of one of the groups in the National Workshop on Woodfuel Trade in Nepal, categorically states that due to the lack of management and fixed harvesting plans as well as the inaccessibility of hill forests, fuelwood production from government-managed forests is irregular and insufficient to meet the growing demand in other places. Community forests are managed mainly for protection purposes and due to non-existence of road access whatever surplus wood and fuelwood that could be available from community forests could not be brought to the commercial centres.

Private forests produce substantial amount of fuelwood for local markets but the amount produced and sold in the markets remains unrecorded. Fuelwood is considered a by-product of timber production in both public and private forests. People with small land holdings may have only a few scattered trees on their lands so the sustainability of such production systems could not be guaranteed.

The volume of traded fuelwood supplied through formal channels of the government is small compared with the volume consumed in the commercial markets. So, the amount and source of supply for the difference is generally unknown. Similarly, even if most of the fuelwood traded in the markets came currently through the informal sources, no data exist to explain the supply sources and production methods.

Charcoal production and supply (flow)

In most cases the charcoal making technologies in use are primitive. It is often a dug-pit that is very wasteful in terms of charcoal recovery. It was found that some forestry-related agencies had tried to produce charcoal in the past for promoting its commercial use, but these did not continue beyond their experimental phases due to various reasons. Some projects had even tried to produce charcoal for commercial trade on experimental basis using efficient imported charcoal kilns of portable nature, e.g. improved metallic Mark V Kiln, locally built brick and cement kilns, beehive kilns, etc. However, those efforts could not be sustained due primarily to economic and social reasons. Most of the charcoal produced under these projects could not be sold neither in the country, nor exported outside. Therefore, until recently there is not a single recognized (legally authorized) agency in the country that could produce charcoal for trade. So, whatever charcoal is being currently produced for trade must be supplied through the informal sector as an illegal venture. It has been noted that most of the fuelwood used for charcoal making at present is collected or harvested from nearby public forests without proper permits. Besides, making of charcoal inside the forest is also not allowed under the prevailing forestry legislation, even if the fuelwood used for charcoal making was from legally procured source, from government forestry agencies.

ISSUES AND PROBLEMS LIMITING WOODFUEL CERTIFICATION

Currently, only a limited amount of woodfuel is traded in the market for use by some urban households and in specific industrial and commercial activities. The prevailing market price of woodfuel is not fixed according to its cost of production and in most cases the market price is reported to be on the higher side. It may be because of the irregularity of production in the formal sector and a high dependency of the market on the informal supplies, including illegally collected/supplied stocks from the national forests as well as the private sources.

The misconception about fuelwood use and deforestation, which was perceived during the mid 1970s, has discouraged sustainable development and use of renewable woodfuel resources in virtually all developing countries in Asia including Nepal. The Forestry Sector Master Plan of 1988 proposes a three-prong strategy for managing the fuelwood supply-demand imbalance: by enhancing the fuelwood supply through better management of existing forests and establishment of fast growing fuelwood plantations, by reducing the fuelwood demand through improvement of combustion efficiency of burning devices and by promoting the use of commercial energy substitutes to overcome the fuelwood supply shortages. But the FSMP fails to acknowledge the renewable potential of wood energy resources for sustainable utilization in both traditional and modern bioenergy applications. Instead, the government has introduced a subsidy policy to encourage the use of imported fossil fuels like kerosene and LPG for substituting the energy need of the domestic sector for cooking and heating.

Until recently, not all national forests have been put under scientific management either under any forest working plans or under any operational plans. In the absence of such plans, it would not be possible to institutionalize any system of forest certification. Besides, the present forestry organization was set up in a traditional way. Many practicing foresters even today behave as controllers rather than managers/technical back-stoppers in matters related to national forest management for initiating SFM. Except for some limited initiatives of C&I development in the past, exclusively for the certification of sustainable CF management and the certification of sustainably produced NTFP for trade, a comprehensive national standards have not been developed as yet. Without which, the needed for certification of any forest product including woodfuels produced from any type of forests, whether government managed, CF, private or TOF, could not be considered for institutionalization.

Some discrepancies were observed between the provisions of the Forest Act 1993 and the Forest Rule 1995 from the point of view of assessing their compliance with the regional initiatives of C&I development under the aegis of FAO-APFC. The discrepancy was specifically on the issues related to biodiversity conservation in national forests: people's participation in national forest management; conversion ratio between standing volume, saw log and fuelwood volume (by species and tree size); sustainable level of forest products harvest; conditions for imposing ban on forest harvesting or harvesting of specific tree species (even that grown in private lands); monitoring of forest protection and management; transparency of forestry operations and records; compliance with the provisions of international conventions and protocols, etc.

The Buffer Zone Management Rule 1996, promulgated under the provision of National Park and Wild Life Conservation Act 1973, allows setting aside and handing over specified parts of a buffer zone to interested Buffer Zone User Committee (BZUC), for protection and management of these areas as Buffer Zone Community Forests (BZCFs). Before handing over of a BZCF to an interested BZUC, a tri-partite agreement must be signed between the concerned national park/wildlife reserve, the BZUC and the applying BZCF users committee. The concerned warden must assist the BZCF during preparation of an operation plan, if requested. Although the BZUCs are allowed to harvest and use the forest products within the boundary of the BZ, the surplus forest products are not allowed to be transported outside for trade. This condition could act as a disincentive for sustainable management of BZCF.

Similarly, this rule allows also to set-up a religious forest or private forest in the specified parts of a buffer zone and hands over to these areas to interested religious institution or private individual or to a business company (MFSC, 1996). But the conditions laid down under this rule seem biased towards wildlife conservation than overall biodiversity conservation.

However, representation of the minorities and ethnic groups has been reported minimum in both FUG and FUC that have been setup for managing and sharing of the benefits of CF and BZCFs. Besides, many stakeholders often questioned the long-term sustainability of these registered non-governmental organizations.

Similarly, there is ambiguity between the Forest Act 1993 (and Forest Rule 1995) and the Local Self-Governance Act (LSGA) 1998 regarding the definition of forest. According to the former, forest includes all fully or partly covered areas by trees that are not registered as private lands. Its protection and management, including harvesting and trade, therefore, lies under the jurisdiction of MFSC. But at the same time, the latter act allows the concerned Village Development Committee (VDC) to raise income from the sale of wood and fuelwood produced from the dead and dying trees, lops and tops and stumps, including the sale of thatch grass from sources within the VDC boundaries. VDCs are also allowed to raise taxes for the occupational use of natural resources that lie within their territories, including occupations based on the use of local forest products. Similarly, the District Development Committee (DDC) is allowed to impose taxes on the use of local products and services, including sale of fuelwood recovered from floating wood during rainy season and share of the income with concerned VDC and municipality (MLJ, 1999).

A coordinated woodfuel promotion programme is still lacking which would have been useful for linking and promoting the efforts of different development partners towards sustainable woodfuel utilization in the country. The prevailing legal procedures for collection/harvesting and transportation of forest products including woodfuels are complex and have been recommended by various studies for simplification in order to promote their trade.

RWEDP (2000) reports that due to small size of land holdings, there are few fuelwood trees on private land. Private forestry is further discouraged by the cumbersome bureaucratic procedure to obtain a permit to harvest and transport forest products.

The present system of fuelwood procurement for charcoal making, including its local use or trade has been commonly viewed as illegal in the absence of a clear cut rule governing its production and trade. In the recent past, there has been no activity related to sustainable woodfuel production for charcoal making, either for own use by occupational groups or for trade except the limited efforts of densification of loose biomass (woody or non-woody), either charred or un-charred, into biomass briquettes for supplementing the domestic energy supply mostly in rural areas and small towns. Besides, there does not exist any training manual or training programme for disseminating information related to efficient charcoal making techniques suitable to local charcoal dependant occupational groups.

NATURAL PRODUCTION SYSTEMS SUITABLE FOR FOREST CERTIFICATION

While preparing this case study, the term “forest certification” was viewed not solely in terms of the certification of specific forest products such as timber, woodfuels or NTFP, but for overall forest management systems. Which means, until and unless a forest is managed according to the principles of SFM and qualify for certification of sustainable management system, there could be no prospect for only certification of specific products from any forest.

Within these premises, the natural production sources of direct woodfuels (or the wood energy resources) could also not be considered only for the certification of woodfuels with the interest of promoting the trade of certified woodfuels. The natural sources of direct woodfuels production, which include government-managed national forests, forest plantations and CF, as well as private forests and TOF, therefore, all call for certification if the objective was to promote the trade of certified woodfuels in the country which would require a simultaneous move for the certification of both, production sources (i.e. forests or wood energy resources) as well as specific forest products (i.e. saw log, woodfuel, NTFP). This means that initiation of a dual certification process for both forests (which is the supply source) and important forest products like direct woodfuels, for promoting its trade in local and export markets, on the basis that these have been produced from sustainably managed sources and certified for trade.

Although private forests and TOF produce a substantial amount of direct woodfuels for trade, these forests and trees are not planted under any mandatory legislation or under a scientific land-use plan, i.e. land-use system based on land-zoning, topography, carrying capacity or under voluntary adoption of recommended technical land management prescriptions. Therefore, the private forests and TOF could not be included for the certification of specific products such as woodfuels. Besides, the long-term sustainability of these production systems also currently remains under question.

Further, whatever private forests exist today are basically in the form of scattered or limited number of naturally grown trees or small block plantations (in patches) on private lands. The total number of trees in any of these production systems would mostly be in hundreds and rarely in thousands which makes it impossible to think about introducing a system of forest certification for these resources. In addition, the present land-ownership ceiling in the country does not encourage any large-scale private forestry for commercial production. These production systems would, therefore, not be possible to cover through a standard set of principles, criteria and indicators as suggested for the certification of forests under government or community management, even if these sources contribute significantly to the traded direct woodfuels supply.

Similarly, certification of indirect woodfuels and recovered woodfuels that are produced in different shapes and sizes outside of forest areas, mostly in wood-industries and non-forest lands could not be considered suitable for certification by using the general principles, criteria and indicators of forest certification as suggested above. However, these products would require a monitoring system that could be based on the principle of product tracking and transformation under the chain of custody certification system.

Similarly, the certification of sustainable charcoal production for promoting the trade of certified charcoal could also be not considered with the generic set of principles, criteria and indicators and has been suggested for monitoring its production and trade by adopting the chain of custody monitoring system. The primary objective of the chain of custody monitoring system would be to prevent/avoid illegal harvesting and conversion of trees into charcoal from any potential direct woodfuels production sources with a legal document or a permit from the concerned authority managing the national forest including CF.

CRITERIA AND INDICATORS FOR CERTIFICATION OF WOODFUEL PRODUCTION SYSTEMS

The philosophy behind forest certification is that product is produced from sustainable forest management fulfilling economic, ecological and social concerns. So, it is a tool for verifying that forest management complies with a series of internationally accepted standards. The objective of forest certification is therefore to provide assurance to consumers that their purchases of forest products are not contributing to the destruction of the natural resources locally and the world's forest globally. And it is ensured by keeping a label in the product by which consumer identifies it as produced from sustainably managed forests (IHEP, 2004). Before deciding what parameters to consider for the certification of sustainable production of direct woodfuels from natural sources, from national forests of different kinds (including government-managed forests, community forests, leasehold forests and buffer zone community forests) and forest plantations, a thorough review was made of the past initiatives of forest certification.

Selection of principles, criteria and indicators for sustainable woodfuel production

At first, information about past forest certification initiatives under the aegis of different forestry development agencies, including bilateral and international forestry development partners, is collected and analyzed in order to form a broad idea about the current status of principles, criteria and indicators development at national, regional and international levels. After a thorough review of the collected information, an idea about the starting point of this case study was formed which is therefore limited to available secondary information to-date.

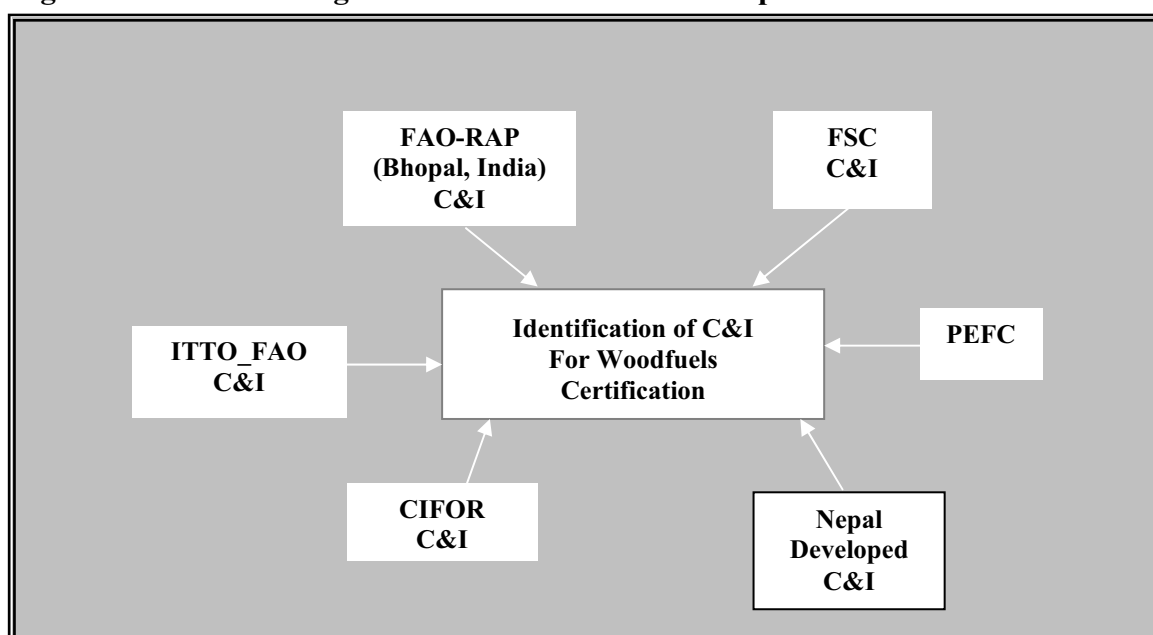
As a starting point, the ITTO-FAO (APFC) standard C&I set was reviewed, followed with the proposed C&I set at the regional workshop on "Development of National-Level Criteria and Indicators for the Sustainable Management of Dry Forests of Asia", in Bhopal, India in 1999, more specifically the proposal by Zhu, *et al.* in the background paper (FAO-RAP, 2000b). This proposal remained within the framework of ITTO-FAO (APFC) and proposed seven criteria and 52 indicators for promoting SFM in the dry forests in Bhutan, China, Mongolia and Nepal, Appendix 1. This set of C&I was later reformulated by the participants from Bangladesh, Bhutan, China, India, Mongolia, Myanmar, Thailand and Sri Lanka which now comprises of eight criteria and 48 indicators, Appendix 2. It was found that there was no major difference in the content of these two sets of criteria with that of ITTO-FAO (APFC) set, except the fact that the latter set of criteria tried to make it more specific to the dry forests of Asia by slightly amending the proposed set by Zhu, *et al.* at the Bhopal workshop. And the latter set of reformulated indicators has reduced the number of indicators from the point of view of making it specific to the issues of dry forests to be addressed. The above sets of C&I provided invaluable clue for the formulation of

principles, criteria and indicators for the certification of sustainable woodfuel production system for this study.

In the next step, important known principles, criteria and indicators of SFM developed and adopted at local level under different donor assisted projects, including ANSAB-FECOFUN; UNDP-IHEP; and CIFOR in Nepal, were reviewed. These initiatives, during their formulation stage, seem to have taken into consideration the long-term social, economic and ecological perspectives of SFM in Nepal. Their C&I parameters follow either the standards in Forest Stewardship Council (FSC) system or the former Pan European Forest Certification system and now the Programme for Endorsement of Forest Certification (PEFC). These systems are primarily intended for certification of forest management at FMU level, mostly for community-managed portion of the national forests and also for the certification of sustainably produced NTFP for trade.

Therefore, after a thorough review of and taking into consideration the relevant parameters of past FMU level C&I development initiatives in the country, an effort was made to identify appropriate principles, criteria and indicators for the certification of sustainably produced woodfuel for trade. The process that guided identification of the principles, criteria and indicators is shown through a schematic diagram in Figure 9.

Figure 9. Schematic diagram of the C&I identification process



Principles, criteria and indicators for sustainable management of woodfuel resources

Six principles, 24 criteria and 84 indicators have been identified for initiating sustainable management of the productive national forests under public domain including government managed forests and forest plantations, as well as CFs. The long-term sustainability of these important woodfuels supply sources, for both traded and locally consumed woodfuels, including fuelwood and charcoal, could not be ensured unless and until the country moves towards forest certification. This means, for promoting SFM. These principles, criteria and indicators have been suggested for certification of the sustainable woodfuel production systems and the trade of certified

woodfuels being managed in the public sector[§]. One additional principle, four criteria and 12 indicators have been suggested for consideration exclusively for promoting the production and trade of certified charcoal. These parameters are expected to enhance the charcoal production efficiency as well as to contribute to the social, economic and environmental betterments, both locally and globally. But for the certification of woodfuels produced from private sources, primarily from private forests and from trees on private and non- forest lands (or TOF), a separate monitoring mechanism based on the product tracking and transformation process under the chain of custody certification method has been suggested for consideration.

PRINCIPLE 1: POLICY, PLANNING AND INSTITUTIONAL FRAMEWORK IS IN LINE WITH NATIONAL AND INTERNATIONAL LAWS AND CONDUCTIVE TO SUSTAINABLE PRODUCTION OF WOOD, WOODFUELS AND NTFP FOR TRADE.

C.1.1 Policy formulation is carried out in a participatory manner.

Indicators:

- *Existence of mechanisms for enhancing participation in policy formulation.*
- *Existence of a multi-sector forum at vertical level (national, district, and local level).*
- *Representation and participation of stakeholders (FUG, FECOFUN, DDC, VDC, NGOs, etc) in forum meetings (records and minutes of meetings).*
- *Regularity of meetings, discussions and other interaction in forums (records).*

C.1.2 Existence of non-contradictory rules and regulations that are in line with national and international laws and promote the production of woodfuels for trade.

Indicators:

- *Forestry policy, rules and regulations acknowledge the international conventions such as CITES, CBS, UNFCCC, etc.*
- *Government directives and departmental circulars do not contradict with the provisions of forest acts and rules and endorse production of woodfuels for trade.*

C.1.3 Non-forestry policies (i.e. energy, environment, agriculture sector policies) do not distort commercial production of woodfuels for trade.

Indicators:

- *Absence of distorting policies in relevant sectors that discourage the production of woodfuels for trade, including export.*
- *Existence of subsidies on imported commercial fuels (fossil fuels).*
- *Alternative energy promotion policy does not undermine the importance of woodfuels for both traditional and modern energy applications with payment of set royalty fees, taxes and other charges required under the prevailing law.*

C.1.4 Legal provisions do not restrict tree growing/raising, planting in private, community and institutional lands under multiple objectives, including harvesting of mature trees (at rotation age) for the production of woodfuels for trade.

[§] Includes all types of natural forests under public domain, including forests and forest plantations managed by the government, local communities, forest leases and others.

Indicators:

- *Acknowledgement of tree ownership right of private land owners, plantation developers, forest lease, FUGs, etc for the trees and forest products grown/raised or planted by them on lands that are legally owned or entrusted for management to them.*
- *Filing of a number of complaints or court cases against the government organizations claiming ownership of trees, private forests and/or forest products declared restricted for harvesting and/or trade from lands and forests owned/managed by individuals, communities or institutions.*
- *Land use policy supports commercial growing/planting of trees and forests, including captive and dedicated woodfuel plantations on lands outside of the forestry sector.*
- *Recognition of indigenous practices of local people that do not hinder sustainable forest management for socio-economic reasons.*

C.1.5 Effective structure is in place for the promotion of private forestry and integration of trees into the farming and landscape systems.**Indicators:**

- *Effective central and local level institutions for supporting commercial production of woodfuels from all natural sources, including private forests and TOF.*
- *Provision of support and services to individuals, institutions and agencies involved in commercial production of woodfuels in private non-forest lands for trade.*
- *Absence of overlap/duplication of responsibilities between different institutions.*
- *Existence of inter-sectoral coordination mechanisms for relevant institutions in forestry, agriculture and energy sectors.*

C.1.6 Boundaries of the public wood energy resources are known, clear and respected.**Indicators:**

- *Local users and other stakeholders recognize and respect the boundaries of public wood energy resources (existence of boundary markers and conditions).*
- *No evidence of forest encroachment (visual observation and records).*

PRINCIPLE 2: CONSERVATION OF BIODIVERSITY AND MAINTENANCE OF ECOSYSTEM INTEGRITY IN THE PROCESS OF FOREST RESOURCE MANAGEMENT UNDER THE PUBLIC DOMAIN.**C.2.1 Conservation of biodiversity, including natural growth and artificial regeneration in managed national production forests, community forests, leasehold forests, buffer-zone community forests, etc.****Indicators:**

- *Landscape pattern is maintained (information on vegetation type etc).*
- *Diversity of habitat is maintained (vertical structure of the forest and size class distribution of tree species, etc).*
- *Species richness/diversity of selected groups is maintained (listing of trees, herbs, birds, mammals and identification of rare and endangered species).*
- *Population size and structures of selected plant species do not show significant change (due to lack of proper management or overexploitation for wood fuel).*

- *Population size and density of selected plant species are estimated (during forest management plan preparation) and maintained (through appropriate management prescriptions).*

C.2.2 Ecosystem function is maintained.

Indicators:

- *Ecologically sensitive areas (buffer-zone along water courses) and other ecologically important areas are identified and protected with appropriate measures.*
- *Erosion and landslides are minimized (sensitive areas identified, appropriate control measure applied).*

PRINCIPLE 3: FOREST (WOOD ENERGY) RESOURCE MANAGEMENT INCREASES BENEFITS THROUGH BETTER FOREST MANAGEMENT.

C.3.1 Effective local management is in place for maintaining and assessing the forest (wood energy) resources.

Indicators:

- *Ownership and use rights to resources are clear and respected.*
- *Rules and norms of resources use are successfully enforced and monitored (existence of rules and norms, patrolling, incidences of violation of rules, number of forest offence cases registered, etc).*
- *Effective and accepted conflict management mechanisms are in place (number of cases resolved).*
- *Access to forest (wood energy) resources is perceived locally to be fair (deprived and poor users get fair concession, access to woodfuel and NTFP, evidence of discussion in meetings on access to resources, attendance of gender, class, caste, and ethnicity in meetings).*
- *Local people feel secure about their access to forest resources, including woodfuels.*

C.3.2 Stakeholders get equitable share from the benefits of forest (wood energy) resource management.

Indicators:

- *Mechanisms for equitable benefit sharing are developed and implemented (local people express satisfaction on the benefits received).*
- *Employment opportunities exist for poor and deprived users (number of such people involved in carpentry works, livestock rearing, fuelwood collection for trade, charcoal making and other income raising activities).*

C.3.3 All production forests under different systems of management are considered as means of livelihood by the poor and deprived group of people (including ethnicity, individuals and women) as long as their actions do not go against the spirit of SFM.

Indicators:

- *The above people invest significant amount of time and efforts in wood energy resource management.*
- *Destruction of natural resources by the local people is rare.*

- *Maximum utilization of the productive national forests (all types) by local forestry stakeholders.*

**PRINCIPLE 4: CONCERNED STAKEHOLDERS HAVE
ACKNOWLEDGED RIGHTS AND MEANS TO MANAGE
FORESTS COOPERATIVELY AND EQUITABLY**

(Additional principle applicable solely for FUG managed community forests, leasehold forests and buffer-zone community forests)

C.4.1 Forest Users Groups are institutionally developed.

Indicators:

- *Users and committee members are fully aware of their rights and responsibilities and perform accordingly (aware of functions, perform assigned role, participate in discussions, acknowledge the issues of gender, deprived and poor).*
- *Effective leadership is developed within community (evidence of mechanism for leadership transfer).*
- *Documentation system is well maintained.*
- *Funds are managed in a transparent way and are properly utilized (existence of financial record, accessibility of financial records, activities in which the fund was spent, misuse of fund, etc).*
- *Information flow to members is maintained (evidence of information exchange between FUG members, awareness of FUG members, etc).*
- *Mechanisms for shared learning exist (events and mechanisms for sharing of knowledge and lessons learnt from training, observation tours between FUG members).*

C.4.2 Effective two-way communication related to forest resource management exists among stakeholders.

Indicators:

- *Local stakeholders meet and interact with satisfactory frequency, representation of local diversity and quality of interaction (regularity of and participation of different class, castes, gender and ethnicity in meetings, no evidence domination by certain individuals or groups).*
- *Stakeholders' contributions are respected and valued.*

C.4.3 Local stakeholders have detailed, reciprocal knowledge pertaining to forest resources use as well as forest management plans prior to implementation.

Indicators:

- *Plans/maps showing integration of uses by different stakeholders exist.*
- *Updated plans, baseline information on socioeconomic conditions of the people, forest conditions and maps are widely available to stakeholders.*
- *FUG and Forest User Committee (FUC) recognize the legitimate interests and rights of other stakeholders.*
- *Management of woodfuel and NTFP reflect the interests and rights of local stakeholders.*
- *Stakeholders are aware of related community forestry acts, regulations, and guidelines.*

C.4.4 Agreement exists on rights and responsibilities of relevant stakeholders

Indicators:

- *FUGs make agreements with relevant stakeholders in forests and forest resources related activities, including woodfuel distribution systems.*
- *Effective conflict resolution mechanism in place (conflict remains at acceptable level to stakeholders).*

PRINCIPLE 5: THE RELATIONSHIP BETWEEN FORES MANAGEMENT, ENVIRONMENT, AND LOCAL CULTURE IS ACKNOWLEDGED BY RELATED STAKEHOLDERS.

C.5.1 Human activities and the environmental conditions are in balance.

Indicators:

- *Environmental conditions affected by human activities are stable or improving.*
- *There is a balance between forest resources and population growth/migration.*

C.5.2 Relationship between human culture and forest management is recognized.

Indicators:

- *Local stakeholders can describe the relationship between human culture and forest management*
- *Forest Working Plan/Operational Plan reflects local human culture*
- *Absence of activities that disintegrate human culture.*

C.5.3 Institutionalization of formal and informal education on forest (wood energy) resource management.

Indicators:

- *Increased awareness on forests and forest resource management.*
- *Establishment of mechanisms to enhance people's awareness on wood energy resource management (training and education programmes/materials).*

PRINCIPLE 6: YIELD AND QUALITY OF DESIRED FORESTRY GOODS AND SERVICES ARE SUSTAINABLE.

C.6.1 Forest management unit is implemented on the basis of legal title on the land, scientific Forest Working/Operational Plan and recognized customary rights.

Indicators:

- *Forest management takes place based on scientific basis and in consultation with the public in the case of government-managed national forests and in written agreements between the government and FUGs or private leases in the case of CF and LHF.*
- *Information on the identity, location and population of all indigenous and traditional people living in the vicinity of the government-managed forests and community forests and their customary rights exist.*
- *DFOs, FUGs and other concerned institutions have evidence and map about indigenous and traditional people, their territories and rights.*

C.6.2 Management plans is detailed and clearly documented.

Indicators:

- *Management objectives (both long- and short-term) are clearly stated reflecting the condition of forest, expressed public interest of the forestry goods and services and the local forest users needs.*
- *Forest Working Plan/Operation Plan is comprehensive (identifies boundaries, provide inventory of resources, protection, includes management and utilization plans, biodiversity hot spots and cultural and conservation areas, mechanism for handling emergency situations, etc).*
- *Appropriate involvement of stakeholders in management (including Forest Working/Operational Plan preparations) and takes into account all components and functions of the forest (i.e. timber, woodfuel, NTFP etc).*
- *Yield regulation by area and/or volume is prescribed in Forest Working/Operational Plan (allowable cuts, minimum exploitable diameter, number of trees or total volume to be harvested per year etc).*
- *Silvicultural systems are prescribed and are appropriate to forest types and produce growth (management practices, species level inventory, assessment of growth, planting plan and planting stocks).*
- *Prescribed harvesting systems and equipment match the condition of forest in order to reduce impact.*
- *Forest Working/Operational Plan is periodically revised and approved by appropriate authority.*
- *Programs and estimated costs of forest management activities are included in Working/Operational Plan on a priority basis.*
- *Programs and estimated costs of community development are included in Forest Working/Operational Plan on a priority basis.*

C.6.3 Implementation of Forest Working/Operational Plan is effective.**Indicators:**

- *Management as defined in the objectives.*
- *Implementation of Operational Plan as per the prescriptions, including record keeping.*
- *Low residual stand damage (skilled labours, sound logging plans, etc).*
- *Rehabilitation of degraded and impacted forest.*
- *Absence of significant off-site impacts.*
- *System of forest products harvesting and transformation are efficient.*

C.6.4 Effective monitoring system is implemented.**Indicators:**

- *Mechanisms for monitoring and evaluation are clearly described in the Forest Working/Operational Plan, including chain of custody monitoring of products.*
- *Documentation and record of all forest management and forest activities are kept in forms that enable monitoring, also for product tracking during transportation and transformation.*
- *Forest trial plots are established and monitored regularly.*

C.6.5 Costs and benefits from all types of national forests are properly accounted for, distributed and shared among relevant stakeholders.

Indicators:

- *Mechanisms for sale and/or equitable distribution of forest products (including woodfuels) to relevant stakeholders are clearly described in the Forest Working/Operational Plan.*
- *Re-investment of the benefits from forestry management for forestry development.*

C.6.6 Promotion of user and environment-friendly wood energy technologies, government initiatives of R&D on woody and non-woody biomass-based modern energy applications.**Indicators:**

- *List of environment-friendly modern wood energy technologies relevant to Nepal.*
- *Priority R&D areas in modern wood energy applications (i.e. technologies and end uses).*
- *Priority R&D areas in non-wood biomass based modern energy applications (i.e. technologies and end uses).*

Additional principle, criteria and indicators for sustainable charcoal production**PRINCIPLE 7: TECHNOLOGIES USED FOR CHARCOAL MAKING ARE EFFICIENT (PRODUCE HIGHER OUTPUT), NON-HAZARDOUS TO CHARCOAL MAKERS AND LEAST POLLUTING TO THE ENVIRONMENT.****C.7.1 Fuelwood supply sources are sustainable and the supply is legal.****Indicators:**

- *Supply sources (national forests) are under sustainable management.*
- *Fuelwood procurement system for charcoal making is legal, pays full royalty fees, and taxes etc., on fuelwood harvested/collected (from national forests).*
- *Record of every batch of fuelwood purchase, charcoal production and trade maintained, including number of people employed by gender and ethnic group.*

C.7.2 Inventory of charcoal making technologies currently in use, assessment of their average efficiency and selection of efficient models.**Indicators:**

- *List of prevailing charcoal making technologies.*
- *Average efficiency of common technologies assessed (record/report, fuelwood input to charcoal output ratio).*
- *List of tested efficient models for promotion.*

C.7.3 Assessment of health and the environmental impacts of common charcoal making technologies.**Indicators:**

- *Health-related complaint and cost of medication to the charcoal makers, transporters and traders.*
- *Analysis of chemical constituents of the smoke emitted out of the chimney/exhaust pipe of charcoal kilns/pits, including green house gases (GHG) such as carbon dioxide and methane and health damaging emissions (HDE) such as particulates and sulphur dioxide).*

C.7.4 Field-testing, demonstration and extension of efficient charcoal making technology to directly relevant occupational group(s).

Indicators:

- *Different types of models tested and demonstrated in the field.*
- *Selection of accepted models and efficiency.*
- *Extension program for dissemination and training.*
- *Continuation of R&D for further improvement.*

Description of the principles, criteria and indicators

The above sets of principles, criteria and indicators will be suitable for the certification of sustainable fuelwood production from different types of productive national forests and forest plantations. But these will not be applicable to private forests and trees on private and other lands including public and institutional land-based TOF. While identifying suitable parameters for the certification of sustainable woodfuel production systems and the trade in certified woodfuels, the past initiatives of criteria and indicators development at both national and international levels were taken into consideration. A straight forward set of C&I could not be conceived exclusively for the certification of sustainable woodfuel production for trade, as woodfuels in most cases were not the main (or final) product but produced as residues or by-products of forest resource management, during tree harvesting, thinning, pruning etc.

Similarly, no specific set of principles, criteria and indicators could be suggested/prescribed for the certification of woodfuels produced from private forests and TOF on different types of lands owned and managed by non-forestry sectors. For these additional sources of woodfuel production, as well as for certification of the production systems of indirect woodfuels and recovered woodfuels, the only logical method that seems suitable for adoption for certification would be the chain of custody monitoring during transportation and transformation. For certification of the fuelwood supplied for charcoal making from government managed forests and CF, the above set of principles, criteria and indicators could be applied. But for certification of the sustainable charcoal production systems and trade in certified charcoal a combined system of monitoring will be needed to monitor the charcoal making practices (transformation process: technology, conversion ratio, etc), as well as any misdoings during transportation and trade.

As far as possible, attempt was made to bring the suggested principles, criteria and indicators within the broad framework suggested by ITTO-FAO (during the workshop on “Development of National-Level Criteria and Indicators for the Sustainable Management of Dry Forests of Asia”, in Bhopal, India in 1999) in Appendix 1, and the reformulate set of C&I by the participants of that workshop in Appendix 2.

In fact, the suggested principle 1 reflects the concerns of C.7 in Annex 1a and C.8 in Annex 1b. Similarly, principle 2 takes care of the concerns of C.2 in Annex 1a and C.2 and C.3 in Annex 1 b. Both of these principles will be applicable at national and FMU levels. Principle 3 incorporates the concerns of C.6 in Annex 1a and C.7 in Annex 1b, which will be relevant for application at FMU level. The next one, principle 4 takes care of the concerns of C.6 and C.7 in Annex 1a and C.7 and C.8 in Annex b, at FMU level. Principle 5 reflects the concerns of C.5 in Annex 1a and C.4 and C.7 in Annex 1b, also at FMU level. The last one, principle 6 incorporates the

concerns of C.C.3 and C.3 in Annex 1a and C.5 in Annex 1b. The additional principle suggested for sustainable charcoal production reflects the concern of C.5 in Annex 1a and C.4 in Annex 1b.

Besides, the suggested principles, criteria and indicators are also in line with the six fundamental principles and 24 criteria and 83 indicators developed earlier (by CIFOR in 1999) but not yet approved by the government for implementation, for certification of sustainably managed community forests and NTFP trade. The six principles include: (a) policy, planning and institutional framework, (b) maintenance of ecosystem integrity, (c) increased benefits to local communities from better forest management, (d) rights and means to cooperative and equitable management, e) relationship between forest, environment and local culture, and (f) sustainable production of goods and services.

Besides the managed national forests under public domain, the other sources of direct woodfuels production are private forests and TOF, but these forests and TOF could not be included for the certification of specific products as the long-term sustainability of production system itself remained under question. Therefore, these production systems were found not possible to cover through the standard set of principles, criteria and indicators suggested for the certification of the production sources of direct woodfuels. Similarly, certification of indirect woodfuels and recovered woodfuels produced in different shapes and sizes outside of forest areas, mostly in wood-industries and non-forest lands were also found not possible to include for certification under the straight forward principles, criteria and indicators of forest certification.

Therefore, these products would require monitoring by following the product tracking and transformation process under the chain of custody certification method. The primary objective of such monitoring system would be to avoid addition of the illegally harvested direct woodfuels from national forests during transportation and transformation for trade.

The certification of sustainable charcoal production for trade will be further complicated, as it has to look also into the social, economic and environmental aspects of the common technologies adopted for charcoal making in Nepal. Besides, identification of main fuelwood production sources (nature, wood industries and society); production methods (direct, indirect and recovered woodfuels) for charcoal making; assessment of average recovery ratio between fuelwood to charcoal (between average weight of air dry fuelwood as input and average weight of charcoal as output); specific charcoal making technologies; and information about transportation and trade in charcoal, make the study more difficult to present a comprehensive scenario. As such information is lacking and this study was not expected to generate primary data, therefore attempt was made to explore and analyze the prevailing situation based on whatever information was available in different sources.

Since charcoal has not been the main energy, its consumption has been restricted to specific end uses; the question of certification of charcoal itself looks irrelevant in the case of Nepal. However, whatever amount of charcoal is being produced and consumed in the country, it would still be worthwhile to monitor through tracking of product transformation and trade under the chain of custody certification, primarily for promoting SFM in different types of national forests. Smith, K.R. *et al.* (1998)

have studied the airborne emissions from charcoal-making kilns that are commonly used in the developing world. Their study was conducted in Thailand, which took into consideration five types of charcoal-making kilns for testing of their emission factors, for greenhouse gases such as carbon dioxide, methane and nitrous oxide, for indirect greenhouse gases like carbon monoxide and total non-methane hydrocarbons, as well as for total suspended particulates. Based on their study findings, one additional principal, four criteria and 12 indicators have been suggested for consideration under this study for certification of the sustainable charcoal production and trade of certified charcoal, primarily to minimize the health and environment related adverse impacts of charcoal making.

Chain of custody monitoring criteria for fuelwood

Direct woodfuels from private supply sources and TOF

In the case of direct woodfuels produced from private sources such as private forests and TOF, it would not be possible to apply standard set of principles, criteria and indicators of SFM suggested for national forests. Due reasons are already explained in preceding paragraphs. However, these alternative fuelwood supply sources are crucial in meeting the market demands of traded woodfuels. Besides, it will be necessary to ensure an unhindered flow of this complementary supply in the market that will help relieve the pressure off the national forests for illegal fuelwood harvesting leading to deforestation. Nevertheless, some kinds of monitoring system could be devised and implemented for avoiding illegal collection and/or mixing of illegally harvested/stolen woodfuels from the national forests when the fuelwood from private sources become necessary to transport to distant places for trade in commercial markets.

Monitoring parameters:

- Notification/application to the concerned local authority (i.e. DFO, DDC, VDC, etc) informing/seeking permission for harvesting, including details such as species, number and size of trees to be harvested for trade.
- Verification of the number of trees applied for felling, estimation of volume of wood and direct woodfuels that are likely to be produced by tree species.
- Public notification of the estimated amount of wood and fuelwood that would be harvested by particular individuals or institutions for own use or for the purpose of trade (posting information and/or maintaining records in concerned offices such as DFO, DDC and other local level public institutions/agencies including VDC, FUG, NGOs and schools).
- Recording of actual amount of construction wood and woodfuels harvested by species and source.
- Informing the offices of relevant local agencies and other stakeholders about the amount of wood and woodfuels approved and authorized for transportation and trade.
- Maintenance of records of tax or royalty amount, if subjected to any, in relevant offices.
- Issuance of formal permit and informing relevant checkpoints about total amount harvested by product type and by species in each consignment during transportation and the depot where the products are to be transported for sale.
- Every depot that sells privately produced woodfuels must maintain information on record showing the sources of origin, total volume by species procured from particular producers, whole-sellers, transporters, etc.

- The checkpoints en-route must also compile information showing the sources of origin (including place and name of producer) total volume by species for particular producers, transporters and the destination of each consignment

Indirect/recovered woodfuels from industries and society

Currently, no system exists for monitoring the indirect woodfuels production from forest industries. Similar is the situation regarding the recovered woodfuels produced by the society. In the case of indirect woodfuels produced as a by-product in wood-industry, as long as the materials are consumed for in-house energy supply by the producing industry itself, then institutionalization of a simple record-keeping system that indicates the quantity of such woodfuels produced and consumed by commodity type would be desirable for monitoring of production and consumption. Besides, submission of a summary report of indirect woodfuels production and consumption by commodity type and quantity by specific industry to relevant local level offices under the ministry of industry and MFSC, as well as the concerned DDC seems adequate.

If the commodity is also to be transported from the production source to other place for trade, either for straight-forward use as fuel or for transforming into other energy forms, then, institutionalization of a record-keeping system at the production source, as well as in forestry check-points along the transportation route and at the delivery points or consumption centre, would be desirable. Such record-keeping system could assist in monitoring of the production of indirect woodfuels, if trade in certified product becomes the objective to ensure SFM in the future. But, it would be difficult even if desired to certify the scattered production of recovered woodfuels, which in most cases, is consumed within the vicinity of production sources, mostly in rural households and by the poor in urban areas. Whenever it requires transportation to some market centres, it would be advisable to maintain at least some kinds of record in local level offices of the concerned line ministries that show the quantity, source of origin and the identity of traders and transporters.

Chain of custody monitoring criteria for charcoal

Charcoal is not a main fuel in the domestic sector and it is currently used mostly for specific end uses. Still there have been numerous actors playing specific roles in the production and trade of charcoal, whether legally or illegally, in the country. Therefore, by following the stages considered for this case study in Figure 3, at least four different phases have been identified from charcoal making to charcoal trading phases. Which means, the chain of custody monitoring system for the certification of sustainable charcoal production and trade of certified charcoal if at all intended for introduction in the future, would be desirable to include all phases of charcoaling. This means it would include standing tree procurement to fuelwood preparation (including harvesting/collection/preparation) phase; transportation of fuelwood from production sources to loading of charcoal kilns/pits for transformation (including unloading and packing) phase; transportation of charcoal to consumption points or markets (including loading, unloading) phase; and, trading (selling) phase.

Fuelwood procurement phase

The important concern at this phase will be to ascertain the fuelwood supply sources for charcoal making, primarily to ensure that it came from managed sources and through legal means. The principles, criteria and indicators suggested for certification

of forest and direct woodfuels production from different types of national forests and forest plantations will also be suitable for certification of sustainable fuelwood supply for charcoal making for trade. But these variables will not be relevant for the indirect and recovered woodfuels used for charcoal making and separate criteria under the chain of custody certification method would be needed to apply, following the suggestions made under relevant paragraph of section 8.3.1, above.

Transformation phase

Monitoring of the origin and methods of procurement of fuelwood used for charcoal making would be crucial at this phase, as charcoal makers could easily add illegally acquired fuelwood to their legally acquired fuelwood from adjoining forests. Such possibilities would be more if the charcoal making sites remain close to or within the boundary of national forests and forests plantations. So, the concerned agencies (DFOs and FUGs) could think of institutionalization of a simple monitoring system that would help identify the sources of fuelwood supply for charcoal making, primarily to discourage mixing of illegally procured fuelwood. Besides, determination of average ratios of fuelwood input to charcoal output by kiln type would be desirable for the chain of custody certification system for traded charcoal.

In addition, the following parameters for monitoring could be considered:

- Discourage the use of illegally produced fuelwood for charcoal making.
- Discourage the use of illegally produced charcoal.
- Promote the use of efficient charcoal making devices instead of traditional dug-pits.
- Promote the utilization of all sizes of available fuelwood for charcoaling.

Transportation phase

So far, no agency has registered for transporting charcoal in the country. As the production and trade is in the informal sector, mostly as an illegal activity, its transportation and trade is therefore not done openly. However, if FUGs are allowed to use the surplus fuelwood available from CF for charcoal making for trade, then they may consider the following parameters for monitoring in order to promote SFM.

- Issue certificate of legal charcoal production from managed CF, indicating fuelwood supply sources, amount of charcoal produced for trade etc.
- Maintain record and make it transparent to interested stakeholders.
- Issue permit for transportation and trade, indicating origin, amount etc.

Trading (selling) phase

Currently, no formal agency or company exists for trade in charcoal. The present volume of trade and the size of charcoal market remain unknown. It would be therefore difficult, if at all possible to monitor its trade in a closed market, often sold in small amount (about 1–2 kg) in dark poly bags to hide the content inside. If FUGs would like to get involved in charcoal production and trade in the future, then they could think of the following:

- Register local traders and their annual volume and value of charcoal trade.
- Issue certificate indicating registered charcoal traders for particular FUG.
- Institutionalize record-keeping systems at both ends, in production sites as well as in trading places.
- Discourage registered charcoal traders to buy and sell illegally produced charcoal.

REVIEW OF FINDINGS

In the context of Nepal, the wood energy resources for production of direct woodfuels are national forests under different management systems, including natural growths as well as forest plantations. It was noted that direct woodfuels derived from national forests, including government-managed forests and CF for trade, remained in the same order of magnitude as that obtained and sold from the TOF (including private forests). These woodfuels were derived mostly in the form of by-products of forest logging (i.e. lops and tops, deformed and decayed wood) and woody residues produced during implementation of forest management prescriptions (i.e. pruning, thinning) in national forests and forest plantations.

Therefore production of direct woodfuels from these sources cannot be treated as an independent activity and must be treated as part and parcel of implementation of the management prescriptions under approved Forest Working/Operation Plans of these forests. Such plans in principle, must take into consideration the social, economic and environmental perspectives at national and FMU levels; maintain the record of product harvesting, product flow and financial transactions; develop criteria and indicators for the certification of SFM.

Modern application of bioenergy is still insignificant. The future development scope of modern bioenergy also remains not adequately known or acknowledged. However, its use in specific sector (i.e. domestic and transport sectors) has been talked about as a possibility for the future. Therefore, production of woody biomass for trade as a marketable commodity for modern bioenergy production remains still uncertain. As the imported fossil fuels have not been a part of the national programme in the energy sector and its management is done by the Ministry of Commerce and Supplies, primarily for meeting the energy needs in the transport and industry sectors, there seems no coordination between these two sectors. Besides, the forestry sector which is the important contributor of primary energy for meeting the cooking and heating energy needs in the domestic sector seems to be completely ignored while planning a long-term strategy in the energy sector. Although the country is endowed with enormous hydropower generation potential, the amount of power harnessed so far has remained only limited. Therefore its use for cooking and heating in the domestic sector remains only as a distant possibility.

In many areas of Nepal, head loading of woodfuel and charcoal making for trade do act as a survival safety net to the rural poor and under-privileged members of the society. But such acts are generally illegal, despite the fact that markets for trade of locally produced woodfuels clearly exist. That is why the people dare risk to benefit from this opportunity. In Pokhara, Nepal a shop owner reported having made a significant profit from illegal charcoal making and trade within few months only (RWEDP, 1991).

Most forests under the government management lacked satisfactory forest working or operation plans for their sustainable management. Currently, the tree harvesting system is based mainly on felling or collection of dead and dying trees. Besides, the allocated development fund in the forestry sector was also considered insufficient for implementing scientific forest management plans.

The average size of private land-holdings is very small. It is considered insufficient for sustaining even the livelihoods of the farming families, which limit the scope for

additional tree planting on private lands. In some areas, the current contribution of private sources in traded wood and fuelwood supply is significant, but there is no central system of record-keeping of the total volume and value of traded fuelwood from these sources.

Although, the prevailing law of the land does not restrict or limit production and trade of legally allowed forestry and agricultural crops, including specified wild animal rearing for own consumption and trade, transportation and trade of certain crops and tree products (including fuelwood and charcoal) for trade outside of the production source (from the village of production to other villages within the district or to commercial markets) call for observance of the specified procedures (i.e. land and tree ownership verification, approval of the number and species of the trees to be felled, permit for tree felling, conversion, transportation for movement and/or trade, verification of the volume of production by product type and species) under the prevailing legislation. Therefore, whatever new initiatives are to be introduced for promoting the certification of privately produced direct woodfuels for trade, the mechanism must be within the above stated limitations, where the chain of custody certification method seems the likely mechanism.

Khanal (1998) identifies transportation as a major constraint on the trade of woodfuels in this mountainous country. The prevailing high transportation costs and low sale prices both posed hurdles to transport woodfuels from areas of surplus to deficit areas for trade. It suggests simplifying the woodfuel trade process and leaving the task to the private entrepreneurs and FUGs. For enhancing the production and trade of woodfuel related products, RWEDP (2000) categorically suggests to simplify the present cumbersome procedures of private tree harvesting for trade. It also suggests for initiating a special fuelwood plantation programme for private lands, as well as to offer training and extension programme focusing on the fast growing, high yielding fuelwood species.

The marketing chain of commercial woodfuels obtained through informal or illegal collection (primarily from national forests) is reported different from the legally obtained supplies. The prevailing administrative and legislative hurdles seem affecting the registration of private forests, as well as for harvesting, processing and transportation of wood and fuelwood from the private sources for trade.

It was noted that the prevailing rules and regulations governing land ownership and holdings, tree tenure, tree planting and harvesting in privately owned and/or community-managed lands often adversely affected the woodfuel production in non-forest lands as well as the participation and investment by the people.

It seems suggestion was already made some time ago to encourage the fairly large-size private land owners in commercial tree plantations, but without the absence of any direct or indirect incentive offer to the private land owners progress to date has been only limited. Besides, the frequently changing policies and staff placement seem to hamper the technical backstopping of forestry development in the field. Currently, there is no plantation development scheme to promote the fast growing tree species, neither under the government nor under the private sector. Therefore, introduction of some kind of incentive systems for promoting private tree plantations, including waiver on land revenue, tax subsidy, buy-back guarantee of plantation wood,

simplification of felling and transportation rules, provision of technical support, etc was proposed during various occasions.

The volume of fuelwood traded from community forests is not significant as protection has been their main objective until recently. The production has remained localized; however the production could be enhanced through intensive management, including simplification of legal provisions to encourage the FUGs for initiating trade in all types of surplus forest products (including woodfuel) outside of their respective districts.

RWEDP (2000) suggests identifying the village development committees (VDCs) as possible local level agencies for maintaining the wood and woodfuel production data of private lands for overcoming the present data gap. The woodfuel flow system was characterized by frequent policy changes, limited access to the private sector, lack of adequate networks, uncertain supplies, cumbersome harvesting and transportation procedures, etc. It was reported that due to unemployment or underemployment, the rural people misused the one head-load of fuelwood for self-use privilege by selling the collected fuelwood under this privilege to the middle persons for some cash earnings.

Most of the charcoal traded in local markets was illegally made in government-managed forests. Legal provisions and operational guidelines did not exist for managing the production and marketing of charcoal from different sources for commercial trade. Recently, production of charred biomass briquettes in the form of Beehive briquettes and development of cook stoves for using these briquettes are being promoted under different development projects. The use of thorny bush like *Banmara (Eupatorium sp)* that has so far been considered as a menace to the forest posing fire hazard has been successfully used for converting into the Beehive briquettes. Beside, residues of crops in different sizes and forms have also been used for making charred Beehive briquettes, which have been recognized as a potential substitute to imported kerosene use in the mountainous areas.

The preferred species for fuelwood and charcoal making in Pokhara region calls for adequate consideration for their conservation as the tree species of higher preference is likely to be over exploited in the absence of scientific forest management plans that governed fuelwood harvest in already handed-over CF and other government forests in the vicinity. It would be essential to take into consideration the maintenance of species richness and species diversity in the forest management plan of the area for maintaining their overall biological diversity.

CONCLUSIONS AND RECOMMENDATIONS

This study suggests that the term “certification” should not be viewed solely as certification of the tree products such as timber, woodfuels or NTFP, but certification of overall management of the forest. And it means, until and unless forests are managed according to the principles of SFM that qualify for certification of forest management system, certification of only the products of forests such as woodfuel will not be possible.

Certification of the sustainable woodfuel production systems and the trade of certified woodfuel, primarily the direct woodfuels produced as by-products of forest harvesting, thinning or pruning, from government-managed national forests and forest plantations,

as well as from FUG-managed community forests, seems possible to consider at the FMU level. But it will require a simultaneous certification of both production sources and the production process, which means the certification of forests (or wood energy resources) for initiation of sustainable management and the certification of important forest products, including direct woodfuels for its sustainable production for trade in local markets or for export.

In this regard the principles, criteria and indicators identified for certification of community forest management and the trade of certified NTFP from managed CF under CIFOR initiative in 1999 seems reasonable to consider as guide for identification of principles, criteria and indicators for the certification of sustainable woodfuels production for trade. However, these will be relevant only to government-managed national forests, forest plantations and CF and not to private forests and TOF, because of their uncertainty of existence in the long-term. Therefore, certification of private forests and TOF, including certification of sustainable production of the wood and non-wood products, including direct woodfuels from these sources for trade, pose additional challenges. Although these sources contribute numerous goods and services to the society, including forest products, aesthetic and recreational benefits, but these have not been fully acknowledged. Besides, sustainable management of private forests and TOF is more complex. For these resources, the C&I set proposed during the Bhopal workshop would neither be suitable nor practical to implement in totality for certification of sustainable woodfuel production for trade in the Nepalese context. Therefore, the present study has considered it unreasonable to attempt to recommend C&I for certification of these non-government sector owned/managed forestry (wood energy) resources. The suggested certification strategy is solely for direct woodfuels from government and community managed national forests and forest plantations, which is based on the premises of forest certification as a short-term action for initiating SFM in Nepal.

The standards (parameters) to be applied for certification of government-managed national forests and forest plantations and CF, and for certification of specific forest products produced from these sources, depend solely on the criteria and indicators (C&I) that will be developed and applied at the national and FMU levels. As achievement of SFM is a long-term commitment and takes considerable period of time, no productive function of forests can be halted indefinitely. Therefore, a rational strategy would be first to identify the parameters of SFM within the country, including principles of forest management, and criteria and indicators for monitoring the move towards it. But these parameters should incorporate all common elements of C&I developed at the regional and international levels for promoting SFM globally.

The principles, criteria and indicators developed for the certification of government-managed national forests and forest plantations and CF and for the certification of sustainable production of direct woodfuels produced from these sources for trade, would not be applicable for the certification of direct woodfuels produced from the private forests and TOF due to already stated reasons. Similarly, the stated principles, criteria and indicators would not be suitable for the certification of sustainable production of indirect woodfuels and recovered woodfuels from all sources, and also for the certification sustainable charcoal production for promoting the trade of certified charcoal. In order to certify these woodfuels for trade, a separate “chain of custody” monitoring system has been proposed for adoption. Under this process the

production and flow of these products will be tracked during transformation and transportation.

As no country could afford to stop its prescribed forest harvesting operations until a full fledged SFM system is in place, all routine forestry operations like thinning, pruning and logging; collection of woodfuel and non-timber forest products (NTFP) for trade, etc must continue side by side with the activities of SFM institutionalization. However, institutionalization of SFM practices in all productive national forests, forest plantations and CF demand a long-term commitment from directly relevant stakeholders, including researchers, academicians and individuals involved in the establishment, management, flow and trade of all types of forestry goods and services.

Experience from past initiatives within the country suggests that a cheap, practical, simple and feasible means of forest certification of international standard does not yet exist in Nepal. This makes it both difficult and unaffordable to initiate the FSC level of standards prerequisite for all government and community managed forests without outside financial and technical assistance.

So, national standards need to be developed first for sustainable management of important wood energy resources for ensuring sustainable supply of fuelwood and charcoal for trade. The wood energy resources in the case of Nepal are primarily the national production forests and forest plantations under different systems of management in the public domain. Development and institutionalization of national standards of SFM is a cumbersome process, which requires the participation of important stakeholders, as well as a consensus agreement applicable for a long time. But as a stopgap measure, until a full-flagged national forest certification standard is put into implementation, the development of principles, criteria and indicators only for monitoring sustainable production of specific forest products like fuelwood and charcoal from public production sources for trade, seem a reasonable short-term approach. So, in the succeeding paragraph, attempt was made to identify and suggest a set of tentative principles, criteria and indicators for the certification of sustainable woodfuel production systems and the trade of certified woodfuels in Nepal. Only after fulfilment of these prerequisites an accredited certifier could be requested for initiation of forest certification from the point of view of trade in certified woodfuels.

The international certifiers use the generically designed standards of FSC or PEFC so they could be immediately hired for initiating forest certification as and when required, provided financial resources should be no problem, which is rarely so for a developing country like Nepal and also for a least valued product such as woodfuels. A possible alternative to this expensive undertaking will be to develop a flexible set of national certification standards by the country itself. However, the development process must be under a formally established national working group, which includes the representation of important stakeholders. It may take a long time to complete the process.

But to continue production and trade of forest products, including woodfuels, until a full-fledged national standard comes into effect, a proper monitoring system for recording the volume and value of products during production/transformation and transportation would be essential, in order to avoid unwanted mixing or addition of illegally harvested and/or transformed products. This product tracking system must be implemented side-by-side with the principles, criteria and indicators identified for

direct woodfuels produced from government- and community-managed forests and forest plantation, for promoting SFM in Nepal.

In order to institutionalize SFM in Nepal, interested stakeholders have recently formed an ad hoc national working group under the umbrella of Nepal Foresters' Association (NFA), which will coordinate the national initiatives of forest certification. The ad hoc national working group was established with representation from relevant stakeholders from GOs, NGOs and private sectors. The primary thrust of this initiative is to devise and test a cheap, affordable and practical forest certification system that would be at par with the FSC standards. In this regard, NFA has so far organized an initiation workshop jointly with the SNV-Nepal (on 20 August 2004) and a national stakeholders' workshop on forest certification (on 24 March 2005). Recently (in September 2006), NFA has been successful to mobilize a nominal amount of financial assistance from the UNDP/GEF Small Grant Programme for carrying out this joint initiative further ahead. Side by side, agreement has been signed with different development partners for development and field-testing of forest certification standards applicable in their area of interest.

So, it is proposed to the ad hoc national working group to consider also the proposed principles, criteria and indicators for the certification of government-managed national forests and forest plantations and CF under this study. Similarly, the additional principle, criteria and indicators, suggested for the certification of sustainable production of direct woodfuels from private forests and TOF; for the certification of indirect and recovered woodfuels from all sources; and, for the certification of sustainable charcoal production for trade from woodfuels acquired under different methods of production, deserve the consideration of ad hoc national working group for implementation in Nepal.

In order to develop the national standards of SFM, it is now high time for Nepal to consider setting up a national authority of forest certification. It would not only help coordinate the initiatives of different actors within the country, but also fulfil the commitment made by the country at various regional and international agencies working for the cause of SFM in the world. After establishment of a national authority and formulation of a set of standard principles, criteria and indicators of SFM, Nepal may also consider applying to relevant international certifying agency for accreditation as a formal forest certifier in Nepal.

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APPENDICES

Appendix 1. Proposed Criteria And Indicators For Sustainable Forests Management In The Region (Bhutan, China, Mongolia And Nepal) Source: FAO-RAP (2000a)

Criteria 1 Extent of forest resources and the conditions

Indicator 1.1 Area and percentage of forests and other wooded (including plantations, agroforestry, shelterbelts) lands to the total land area

Indicator 1.2 Biomass, standing volume, growing stock and carbon storage of forests and other wood lands

Criteria 2 Conservation and enhancement of biological diversity

Indicator 2.1 Ecosystem diversity

2.1.1 Distribution of forest ecosystems (area and percentage of the forest types and other land types)

2.1.2 Areas of forest reserves and protected areas

2.1.3 Area lost annually of forest ecosystem containing endemic species

Indicator 2.2 Species diversity

2.2.1 Number of forest dependent species

2.2.2 The status (rare, endangered, threatened or extinct) of forest dependent species and the change population size of species at risk

Indicator 2.3 Genetic diversity

2.3.1 Number of forest species reduced distinctly in distribution range

2.3.2 Stand amount and area of tree seed orchard and seed reserve for conserving or improving forest genetic resources

2.3.3 Area and percentage of stand by plantations of exotic species

Criteria 3 Maintenance and enhancement of productive functions of forest and other wooded land

Indicator 3.1 Percentage of forest and other wooded lands managed according to an integrated management plan

Indicator 3.2 Total area of forest land and net area for timber production

Indicator 3.3 Area, standing volume and its annual increment of major forest types

Indicator 3.4 Periodical balance between growth and removal of wood products

Indicator 3.5 Managed and sustainable extraction of non-wood forest products (e.g. fodder, seed, fruits, fern, medicinal materials, consumptive wildlife utilization, etc.)

Criteria 4 Maintenance and enhancement of forest ecosystem health and vitality

Indicator 4.1 Area and percentage of forest types affected by diseases, pests, wild and domesticated animals, competition from introduced species

Indicator 4.2 Area and percentage of forest types affected by fire, storm, flood, drought, and wind erosion

Indicator 4.3 Area and percentage of forest types affected by human activities

Criteria 5 Maintenance and enhancement of forest protective and environmental functions

Indicator 5.1 Area and percentage of forests and other wooded lands managed mainly for protection purposes (e.g. for protection and/or rehabilitation of agricultural or range lands, and/or rehabilitation of degraded lands and/or areas prone to desertification and relevant important infrastructure works)

Indicator 5.2 Areas and percentage of forest and other wooded areas managed mainly for the water source conservation, protection of watersheds, river zones and flood control

Indicator 5.3 Area and percentage of forest land with significant soil erosion (different degree)

Indicator 5.4 Area and percentage of farmland above 25 degrees slope converted to forests

Indicator 5.5 Percentage and kilometres of stream in forest watershed in which stream flow and timing has significantly deviated from the historic of variation

Indicator 5.6 Sedimentation for the streams with significant variation from the historic range

Indicator 5.7 Area of sand dunes annually stabilized through tree/shrub planting

Indicator 5.8 Areas and efficiency of trees/shrubs planted in stabilizing sand dunes or rehabilitating eroded hillsides

Indicator 5.9 Effectiveness of plan formulated for managing trees/shrubs planted for desertification control

Criteria 6 Maintenance and enhancement of long-term multiple socio-economic benefits

Indicator 6.1 Indicators for economic benefits

6.1.1 Value of wood products

6.1.2 Value of non-wood forest products

6.1.3 Ecotourism (incl. hunting, recreation)

6.1.4 The output and value from the processing for wood products and non-wood products

6.1.5 Share of forest sector in GNP

6.1.6 Value from biomass energy

6.1.7 Forest sector trade balance

6.1.8 Investment in forests and forestry industries, incl. natural forest conservation, forest recreation and ecotourism

6.1.9 Investment in forest education, research and extension

6.1.10 Degree of recycling of forest products

6.2 Indicators of social benefits

6.2.1 Direct and indirect employment in the forestry sector and forestry sector employment as a proportion of total employment

6.2.2 Degree to which social, cultural and spiritual needs met

6.2.3 Benefits accruing to local communities (with particular emphasis on women and youth)

6.2.4 Contributions to food security

6.2.5 Area and percentage of forest land managed in relation to the total area of forest land to protect the range of cultural, social and spiritual needs and values

Criteria 7 Legal, institutional and policies framework for sustainable forest management

Indicator 7.1 Existence of a national forest policy in harmony with other sectoral policies

Indicator 7.2 Existence of multi-sectoral participation in establishing periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination

Indicator 7.3 Clarifies property right, security of tenure, incl. status of length, exclusivity, enforceability, transferability

Indicator 7.4 Provides opportunities for public participation in public policy and decision-making related to forest and public access to information

Indicator 7.5 Existence of a comprehensive legislative and regulatory framework providing, e.g. equitable access to resources, alternative forms of conflict resolution and consideration of land occupancy and cultural right of local populations

Indicator 7.6 Existence of institutional, human and financial capacity to implement the national forest policy, and relevant national and international laws, instruments and regulations

Indicator 7.7 Existence of research and development capacity

Indicator 7.8 Existence of incentives for investments in the forestry

Indicator 7.9 Existence of foundation and institution for forest resource and wild animal resource monitoring

Indicator 7.10 Existence and Implementation of a regional forest ecological compensation system

Appendix 2.Regional Initiative For The Development, Assessment And Measurement Of National-Level Criteria And Indicators For The Management Of Dry Forests In Asia

Criterion 1: Extent of Forest and Tree Cover

- Area of natural and man-made forests
- Area of dense, open and scrub forest
- Area under trees outside forest
- Forest area diverted for non-forestry use
- Extent of encroachment in forest areas

Criterion 2: Maintenance of Ecosystem Health and Vitality

- Extent of natural regeneration
- Extent of secondary forests
- Extent of forest area under
 - *obnoxious weeds &pests and diseases of epidemic proportions*
- Extent of forest area affected by
 - Grazing, fire, storms, floods, droughts ,wind

Criterion 3: Maintenance and Enhancement of Bio-diversity

- Extent of protected areas
- Number of threatened, keystone, flagship and endemic species of plants and animals
- List of flora and fauna
- Degree of non-destructive harvest
- Percentage of cover by forest type and/or species
- Existence of mechanisms for the conservation of genetic resources

Criterion 4: Conservation and Enhancement of Soil and Water Resources and other Environmental Functions

- Extent of watershed areas under management
- Area under shelter and green belts
- Duration of stream-flow and water yield
- Extent/degree of soil erosion
- Change in level of water table
- Change in sediment load

Criterion 5: Maintenance and Enhancement of Forest Productivity

- The extent of forest area under forest management plans
- Changes in growing stock of wood and NWFPs
- Difference between annual allowable and actual cuts
- Annual NWFP removable/extraction
- Degree of technological inputs

Contribution of forest to GDP through total economic value

Criterion 6: Extent of Forest Resource Utilization

- Per capita wood and non-wood forest produce consumption
- Import and export of wood and non-wood forest products
- Recorded and unrecorded removals of wood and NWFPs

- **Criterion 7: Socio-economic, Cultural and Spiritual Needs**
- The degree of contribution of forest management activities to food security including other livelihood needs
- Level of recreation, cultural, religious and aesthetic needs
- Gender related indices in forestry (GDI in HDR of UNDP)
- Degree of application of traditional knowledge
- Direct and indirect employment in forestry and forest industries
- Contribution of forest to the income of forest-dependent people

Criterion 8: Policy, Legal and Institutional Framework

- Existence of national forest policy and legal framework
- Extent of community, NGO and private sector participation in forestry activities
- Investment in forestry research and development
- Human resource capacity building mechanisms
- Existence of forest resource accounting mechanisms
- Monitoring and evaluation mechanisms
- Existence of mechanisms for information dissemination
- Existence of transfer of technology
- Fiscal and monetary incentives for investing in forestry activity
- Benefit sharing mechanism for stakeholders engaged in forest management activities
- Existence of conflict management mechanisms
- Changes in number of forest offences

¹ Developed by participants from India, Bangladesh, Bhutan, Nepal, Myanmar, Thailand, China, Mongolia and Sri Lanka during the “Workshop on National-Level Criteria and Indicators for Sustainable Management of Dry Forests in Asia” organized by FAO/UNEP/ITTO/HFM, Bhopal, India, 30 November – 3 December 1999.