Final Report

A Study

on

The Demand and Supply of Wood Products in Different Regions of Nepal

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Submitted to:

REDD – Forestry Climate Change Cell
Babarmahal, Kathmandu

Prepared by:

Keshav Raj Kanel, Ph.D.
Kumud Shrestha
Amulya Ratna Tuladhar
Mijan Raj Regmi and
Other Colleagues

Submitted by:

Nepal Foresters' Association
Babarmahal, Kathmandu

July 2012

Acknowledgements

We would like to appreciate the REDD – Forestry Climate Change Cell of the Ministry of Forests and Soil Conservation for assigning the responsibility for this undertaking this study to Nepal Foresters Association (NFA). The REDD team led by Mr. Resham Dangi were very helpful in providing suggestions and comments on our earlier draft of the study report. Dr. Jochen Statz, Dr. Narendra Bahadur Chand and Mr. Rabindra Maharjan were grateful in providing specific comments and suggestions on the Draft report. We are thankful to all of them.

We would also like to thank Dr. Keshav Raj Kanel, the team leader of this study for his contribution in analyzing the demand and supply of forestry products, and finalizing the report for submission. Mr. Kumud Shreshta, and Mr. Amulya Ratna Tuladhar contributed significantly in analysis and report writing. Two young foresters Mr. Mijan Raj Regmi, and Mr. Binod Badu spent their time in collecting information both from the field in the Terai and also from Kathmandu. Mr. Regmi also assisted significantly in the process of demand and supply analysis. Dr. Nav Raj Kanel helped in the finalization of this report. Mr. Resham Thapa provided some input in the analysis of forest product demand. We acknowledge their contribution in the finalization of this report.

Various institutions such as the Department of Forests, District Forest Offices of the Terai, Timber Corporation of Nepal, Forest Products Development Board, and many timber sales depots provided invaluable information relating to forest policies at the operational level, pricing, demand and supply of forest products and the difficulties of doing business in Nepal. We owe them a lot for providing important information and knowledge on these topics.

Many villagers in several districts of Terai provided data on fuelwood and timber consumption at household level. The information provided by them was used in the analysis of demand and supply of forest products. We sincerely thank them all for their help and assistance.

Nepals Foresters' Association

Babarmahal, Kathmandu

Executive Summary

Forests and Shrubland constitute significant proportion of land use in Nepal. They provide inputs to agriculture system, generate marketable products, harbor biodiversity, and provide environmental services such as carbon sequestration. Nepali people significantly depend on forest for fuelwood as a source of household energy, and timber as a raw material for house and building construction and for furniture making.

Global interest in forests as the cheapest means of mitigating carbon emission through Reduced Emission from Deforestation and Degradation (REDD) is emerging as the most important vehicle for sustained management. It will influence how forests would be managed and utilized in Nepal in the future. The government of Nepal through the Ministry of Forests and Soil Conservation is now preparing a plan to implement REDD in Nepal. Since harvesting and removal of wood from the forests for meeting the domestic needs of fuelwood and timber would affect the growing stock and the area of forests and hence the carbon storage in the forests, a robust analysis of demand and supply of forest product over a long period of time is necessary to project the forest carbon removal from or storage in the forest. This study is an initial endeavor to assess the future projection of demand and supply of wood (fuelwood and timber) in Nepal in a geographically disaggregated form.

Fuelwood is a derived demand for energy. Similarly, timber is also a derived demand for houses and building, and for furniture. Demand for these products like other products depends on their respective prices and substitutes such Kerosene and LPG for energy, and iron/aluminum/plastic for timber, income of the households, and their preferences. Since about 86 percent of Nepal's households use fuelwood and more than 75% of them collect their fuelwood, the opportunity cost of labor and ease of accessibility of forests also affect the consumption of fuelwood in Nepal. Nepal's economy is slowly transferring to cash economy due mainly to remittance and urbanization. Therefore, the composition of fuel as a source of households energy would slowly change over time as the proportion of households move from subsistence economy to market economy over time.

Timber is a significant input in the construction of residential houses, commercial and industrial buildings, livestock sheds, and for furniture. The sources of supply of timber are Community Forest, Collaborative Forest, Leasehold Forest, Government Managed Forest and Buffer Zones. A significant amount of fuelwood and timber is also derived from private farms and Non Cultivated Inclusions. The supply of wood also depends on management regimes, silvicultural systems (Technology) applied to enhance the productivity of these forests, farms and NCI. Wood supply also depends on physical and institutional accessibility and recovery factors. Obviously, the supply depends on area of Nepal used in different forest management regimes and other land uses.

The supply of forests depends on two sources of forests – one for the existing forests and the other from deforestation. We foresee that some of the Terai forests would still be prone to deforestation, while the rest of Nepal would not be vulnerable to deforestation at a macro level.

Fuelwood is the lowest valued wood everywhere in the world. Out of the total wood supplied, the best or the highly valued wood would be utilized as timber or poles for construction and for furniture. Therefore, fuelwood would be the largest share of total wood in Nepal. However, the allocation of total wood into fuelwood and timber used will vary depending on its production in different ecological zones of Nepal.

The demand and supply of forest products depends not only on biophysical factors inherent in different ecological regions of Nepal, but also on the policy regimes perused and implemented by the Government of Nepal. The most important policies that affect the supply and demand of forest products are the followings:

- Regulatory policies relevant to Forestry, Agriculture, Mining's, Road Construction and Maintenance, Hydropower, and other Energy related policies.

- Fiscal and monitory policies such as royalty fixation of forest products, subsidies and taxation on tree plantation, wood production, timber and fuelwood supply and trade, commercialization and processing of these products. Foreign currency exchange rate will also determine the substitutes of timber and fuelwood that are imported from other countries.

- Pricing policies also affect the demand and supply of wood products in Nepal. Excessive export tax on the export of sawn timber virtually acts as a ban on the export of timber to other countries. The de-facto ban on timber and fuelwood export will cause the forest product price to be lower in Nepal than in the adjacent parts of neighboring countries. Similarly, various pricing policies imposed on the sale of wood products through District Forest Products Supply committees, Timber Corporation of Nepal, and the dual prices on the wood products sold by the Community Forest Users' Group of Nepal (one for their own household consumption, and the other on sales outside the group members) affect the price of mainly timber in Nepal. Similarly, the floor price of logs (timber) set by the government on the sale of logs from the community forests and government managed forests affect the price of timber in Nepal. The price set by the Nepal Oil Corporation on the sale of LPG and kerosene affects the demand and supply of fuelwood. Nepal Electricity Authority also sets the price of electricity in Nepal. These pricing policies of the government or its para-statal corporations actually determine the amount of fuelwood mainly in the urban areas of Nepal. A comparative study of the pricing of various types of fuel in Kathmandu shows that effective price of fuelwood as a source of energy is the highest, and the cheapest source is the electricity.

- The government of Nepal is effectively the predominant supplier of wood products in Nepal. In other words, it has a monopoly market mainly in the timber market. Therefore, once the supply of timber is restricted from the national forests, the price of timber would increase in the market. This will increase timber substitution, and indirectly will promote illegal harvesting as well.

- Other policies such as transfer of forest staff, uncertainty of political environment, on-and-off administrative directives and guidelines and the rent seeking culture of Nepali society has drastically affected the demand and supply of mainly timber in urban and peri-urban areas of Nepal. This has led to high transaction cost in the supply of wood, that too of timber in the urban areas of Nepal.

- The economic growth of the country affects the purchasing power of its citizen and hence the demand and supply of wood products in Nepal.

Based on these policies, and the latest population and Nepal Living Standard Survey conducted by CBS, we have estimated the demand of fuelwood and timber for different regions of Nepal. Similarly, we have also estimated the demand of timber based on new households to be formed due to projected population growth and the types of houses to be constructed in the future. We have also estimated the supply of wood from various sources from the three ecological regions. It is to be noted that this is a meta-analysis of the demand and supply of wood products in Nepal, and should be viewed as a macro study rather than specific analysis of a small area. The followings are some of the highlights of the demand and supply of fuelwood and timber over years in Nepal:

- The population of Nepal was 26.6 million out of which 17 percent reside in urban areas in 2011. There were 5.66 million household in 2011. The population is estimated to increase to 28.2 million in 2015, to 30.2 million in 2020 and 34.5 million in 2030. Similarly, the total number of

household is estimated to increase to 6.41 million in 2015, to 7.35 million in 2020 and to 9.73 million in 2030. It is estimated that, in 2011, about 50, 43 and 7 percent of the total population of Nepal lives in the Terai, hills and the mountains respectively. The share would change to 52, 42 and 6 percent respectively in 2020. The proportion would change to 53, 41 and 6 percent respectively in 2030.

- In 2011, the demand of fuelwood is estimated to be 5.3 million tons, 4.4 million tons and 0.82 million tons in the Terai, hills and mountains respectively. It would change to 5.48 million tons, 4.27 million tons and 0.78 million tons for these regions in 2020. Similarly, the total fuelwood demand in 2030 would be 5.62 million tons, 4.05 million tons and 0.72 million tons in these three regions.

- The supply of fuelwood is estimated to be 2.58 million tons, 5.44 million tons and 0.94 million tons for Terai, hills and mountains respectively in 2011. The supply would increase to 3.72 million tons, 6.96 million tons and 1.13 million tons in 2020 and 5.07 million tons, 9.60 million tons and 1.51 million tons in 2030 for Terai, hills and mountains respectively.

- In 2011, the demand of timber is estimated to be 1.46 million m^3, 1.72 million m^3 and 0.19 million m^3 in the Terai, hills and mountains respectively. It would change to 1.67 million m^3, 1.87 million m^3 and 0.21 million m^3 for these regions in 2020. Similarly, the total fuelwood demand in 2030 will be 2.23 million m^3, 2.33 million m^3 and 0.25 million m^3 in these three regions.

- The supply of timber is estimated to be 1.15 million m^3, 1.81 million m^3 and 0.22 million m^3 for Terai, hills and mountains respectively in 2011. The supply would increase to 1.53 million m^3, 2.32 million m^3 and 0.27 million m^3 in 2020 and 2.13 million m^3, 3.20 million m^3 and 0.35 million m^3 in 2030 for Terai, hills and mountains respectively.

The demand and supply scenario for different years shows that there is a shortage of wood (both timber and fuelwood) in the Terai but surplus in the hills and mountains. However, because of the difficult terrain and the high cost of transportation, we cannot transport surplus wood from the hills to the Terai. In case of Nepal, there will be deficit of wood (both timber and fuelwood) in 2011 and 2015 at a decreasing rate. However, there will be surplus in the year 2020, 2025 and 2030. Thus, the quantity of wood supplied would increase as we move from 2011 to 2030.

Most of the Terai timber, sourced from community forests, government managed forests is also transported and sold in urban areas of hills such as Kathmandu and Pokhara. In fact, it is estimated that about 4.4 million cubic feet of timber is annually transported mainly from the Terai and sold in Kathmandu Valley. Thus, the pressure on Terai forest is high not only to meet the needs of the Terai, but also to cater to the demands of urban areas of hills as well. The pressure is further compounded due to migration of hill people to Terai and its pressure on land use conservation for farming and other public infrastructure. Thus, we foresee that there would be continued deforestation in the Terai for the foreseeable future.

REDD related policies would influence the level of forest products harvests if the mitigation related payment system is enforced in public forests such as community and government managed forests. There is also a pressure to conserve forests for biodiversity. This will provide incentives for private tree farmers to grow more trees on farms. In fact, the agriculture sample survey carried out by CBS in 1991 and 2001 shows that the number of trees on farms has significantly increased over time. The agriculture sample survey of 2001 showed that about 27,000 ha of farmland were under compact forest plantations in Nepal. However, the government of Nepal's record shows that only 2,360.85 ha of forest have been registered as private forests by 2,458 households.

Value chain analysis of timber of three important species (Sal, Asna and Sissoo) shows that the final price of sawn timber of these species has significantly increased over the last 17 years. In fact, the price increase for Sal has been more than 3.5 times over the past 17 years. Presently, the price of sawn timber per Cubic feet is about NRs 2,600 for Sal, NRs 3,600 for Sissoo, and NRs 1,200 for Asna (Saj) in Kathmandu. The market share of Sal is is about 56 percent, followed by Asna and Sissoo in Kathmandu. The price of these products in the Terai is about NRs 200 cheaper than in Kathmandu. The analysis also shows that government gets about 75 percent of the value of round timber for Sal and Sissoo but 50 percent for Asna. The transportation cost constitute about 10 percent of the final value of sawn Sal and Sissoo timber, but 24 percent for sawn Asna timber. The transaction cost constitutes about 8 to 9 percent of the total final value of round timber in Kathmandu. It is also reported that because of excessively high price of timber in Kathmandu, many commercial entities are switching to aluminum for their building construction.

Based on this demand and supply analysis, we can suggest the following reforms in policies:

- Although the forest act of 1993 and forest regulations of 1995 provide ample ground for tenure and governance reform in forestry, it has been handicapped by the on-and-off changes in forest policies and administrative orders. Policy needs to be consistent so that people can make decisions based on the written and formal legal provisions.

- The Department of Forests should announce the amount of forest products to be annually harvested from National Forests in advance in a transparent way so that loggers and timber traders can plan their activities accordingly. The price of timber bidding should also be published in a transparent way so that people know the difference in price between the round wood and the sawn timber sold in the market.

- Forest management needs to be enhanced mainly in the Terai in order to increase its productivity. There are ample scope and opportunity in the better management of forests in the Terai. This way, the supply wood products can be increased significantly. In order to do that, the following things should be immediately carried out on a priority basis:

    - More investment should be made in the forests. The money collected in the name of Forest Development Fund should be channelized towards forest investment (including more financial resource allocation in logistics);

    - The frequent transfer of the forestry staff should be stopped if not reduced drastically;

    - Training should be imparted to forestry staff both in the area of professional forestry as well as in soft programs such as public negotiation, public relations, conflict management etc.

    - Forest harvest plans should be made transparent so that everybody knows the amount of wood products to be sold through bidding process.

    - ICT should be used as an instrument of predictability in the supply of wood products and increase transparency in the sale of forest products

- The provision of sales and marketing of forest products by the government has not changed significantly even after the repeal of the Forest Act of 1961. The present provisions on the sales and marketing of forest products remains the same as that of the provisions of the Forest acts of

1961. In addition to overall governance in the country, this needs to be reformed to reduce the transaction cost of doing forestry business in Nepal.

- There is a scope of value addition of forest products in the hills. Veneer, fiber board and other reconstituted forest based industries could be established in the hills so that these value added products could be transported to the Terai and the urban areas of Nepal. This will also help in lowering the pressure of forest product demand in the Terai.

- Intensive tree plantation program can be promoted in the Terai through farm or agro-forestry. Rather than focusing on reduced land tax for intensive private plantations, mechanism could be devised through buy back guarantee of forest products, and reduced transaction cost in the harvest, logging, transportation, and processing of wood products derived from private forests.

- It is very difficult to get relevant and correct information both from official and individual sources. Many of the times, information recorded in official sources do not match and hence very difficult to analyze and synthesize the data and information. We recommend that data and information should be updated, recorded and disseminated correctly. Moreover, we suggest that price information at the main centres of timber trade should be made public. Dhangadhi, Butwal, Chitwan, Birganj, Biratnagar, Kathmandu and Pokhara could be such centres. Monthly information could be disseminated by Regional Forest Directors, Department of Forest and Ministry of Forest and Soil Conservation though publications such as *Hamro Ban* of the Department of Forests and Websites of Department and Ministry. Information and Communication technology (ICT) should be extensively used to increase transparency also to reduce transaction cost in forest marketing.

List of Acronyms

CBS	:	Central Bureau of Statistics
CF	:	Community Forests
CFD	:	Community Forest Division
CFM	:	Collaborative Forest Management
Cft	:	Cubic Feet
CFUGs	:	Community Forests Users Groups
CO_2	:	Carbon Dioxide
DFO	:	District Forest Office
DFPSC	:	District Forest Product Supply Committee
DFRS	:	Department of Forest Research and Survey
DoF	:	Department of Forest
EIA	:	Environmental Impact Assessment
FCPF	:	Forest Carbon Partnership Facility
FECOFUN	:	Federations of Community Forest Users Nepal
FINNIDA	:	Finnish International Development Assistance
FMUDP	:	Forest Management and Utilization Development Project
FPDB	:	Forest Products Development Board
FREL	:	Forest Reference Emission Level
FRIS	:	Forest Resources Information System
GDP	:	Gross Domestic Product
GHG	:	Green Gas House
GoN	:	Government of Nepal
Ha	:	Hectare
HH	:	Household
HMGN	:	His Majesty Government of Nepal

IEE	:	Initial Environmental Examination
JTRC	:	Joint Technical Review Committee
LPG	:	Liquefied Petroleum Gas
MPFS	:	Master Plan for the Forestry Sector
MRV	:	Monitoring, Reporting and Verification
NAPA	:	National Adaptation Program of Action
NCI	:	Non Cultivated Inclusions
NFA	:	Nepal Foresters' Association
NLSS	:	Nepal Living Standards Survey
NTFP	:	Non Timber Forests Products
OFMPs	:	Operational Forest Management Plans
PA	:	Protected Areas
REDD	:	Reduced Emission from Deforestation and Degradation
REDD+	:	Reduced Emission from Deforestation, and Degradation
SANDEE	:	South Asian Network Of Development and Environmental Economists
TCN	:	Timber Corporation of Nepal
UNFCCC	:	United Nations Framework Convention on Climate Change
VAT	:	Value Added Tax
VDC	:	Village Development Committee
WECS	:	Water Energy Commission Secretariat

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1. Introduction

Forests are both a problem and a solution for climate change. Deforestation alone accounts for about 18 per cent of the global Green Gas House (GHG) emissions. The Stern report (2006) made it clear that avoiding deforestation would be among the lowest cost mitigation options to avoid increasing CO2 emissions and possibly also increasing sinks. At the same time, other benefits like poverty reduction, biodiversity conservation, soil and water conservation, and climate change adaptation could be enhanced through better forest management.

'Reducing emissions from deforestation and forest degradation, and enhancing forest carbon stocks in developing countries' (REDD+) - a proposed forest-carbon offsetting mechanism emerging through ongoing United Nations Framework Convention on Climate Change (UNFCCC) negotiations - aims to mitigate climate change by curbing carbon dioxide emissions stemming from the destruction of forests. REDD is seen by proponents as an opportunity to deliver large cuts in emissions, at a low cost and within a short time frame, while contributing to poverty reduction and sustainable development. Realizing this potential, however, requires addressing a host of market and governance failures that plague the sector, as well as potential controversies on land and resource rights, and reducing food supply by limiting agricultural expansion.

The Government of Nepal has embraced the promises of REDD+ and is fast-tracking the process of policy development with financing from the World Bank's Forest Carbon Partnership Facility (FCPF). Various donors and civil society organizations are also involved in this process in different capacities. Five building blocks constitute the components of a good REDD+ readiness plan and its implementation:

- Effective targets based on baselines
- Robust monitoring and reporting
- Well-designed mechanism for linking forest abetment to carbon markets
- Strong governance and effective mechanisms for the distribution of finance
- Capacity building – Research/analysis/ sharing; Policy/institutional reforms; Demonstration activities

Deforestation and overexploitation of forest resources is the most important sources of carbon emission in Nepal. Nepal has been selected as a FCPF country to design a readiness plan to access external finances to reduce carbon emission and to enhance the carbon removal potentiality of the forests. The quick assessment of land use, forest policy and governance, which was prepared by the Nepal Foresters' Association (NFA) for the REDD Cell has identified the major drivers of deforestation and degradation in Nepal. The quick assessment has identified high consumption (demand) of forest products mainly fuelwood and timber for both subsistence and commercial use as one of the main drivers of deforestation and degradation in Nepal.

Nepal has about 40 percent of land area under forests and shrubland, which could be sustainably managed to meet the needs (demand) of the nation. However, geographical and accessibility constraints,

institutional problems, and high dependency on forest products has led to overexploitation of forests over time leading to significant gaps in the supply of and demand for forest products specifically fuelwood and timber where surpluses for these may exist in some places while there are shortages in others. Hence, the nature of this supply and demand gaps needs to be studied in detail in terms of wood commodities (fuelwood and timber), and magnitude in both spatial and temporal context.

1.1. Rational of the Study

More knowledge and information is required to inform the further advancement of the REDD readiness process, and also to formulate a broad national strategy framework. This new knowledge needs to be evidence based, scientifically robust, socially acceptable, financially feasible and practically useful for sustainable forest management as well.

The rational for carrying out this study stem from the following logic:

1. Removal of wood biomass leads to carbon emission and hence climate change. Human interventions to influence wood biomass stock, and its growth ultimately leads to carbon stock growth in the forests. Therefore, forest and external policies that influence forest area and condition positively or negatively should be assessed, formulated and implemented.

2. Wood products constitute one of the sources of government revenue in the forestry sector, although its magnitude is declining over time. The revenue is way below its potential due to low royalty rate, inefficient harvesting and extraction, manipulation in log measurement and grading, under reporting of harvested volume, illegal harvesting, recycling of transport permits, and other transaction costs. Therefore, efficient and effective market mechanism to capture the revenue from the sale of forest products should be examined in light of the changing conditions.

3. It is assumed that demand of timber and fuelwood from the Terai forest is way above the supply of these products mainly in the Terai (20 districts) region of Nepal. This has led to excessive pressure on the Terai forests resulting in the degradation of these forests. Although the Master Plan for the Forestry Sector (MPFS) has projected the demand and supply of timber and fuelwood for different regions of Nepal for 25 years in 1988, the plan period has recently expired. Therefore, a new projection of demand for and supply of wood products has to be estimated for a longer period based on primary and secondary information. The recently published Nepal Living Standards Survey (CBS 2011), the National Population Census data (CBS 2011), the Energy Sector Synopsis Report (WECS 2011), and other studies provide useful information on estimating the demand of forest products in Nepal. The supply of wood products can be estimated from forest areas under different management regimes such as Community Forests (Buffer Zone as well), Collaborative forests, Government Managed Forests, and Private forests/trees on farms.

4. Terai is still the bread basket of Nepal. Surplus food from the Terai is transported to hill/mountain districts. Yet, the number of districts of the Terai is also increasing in food deficit over time. Hill and Mountain people are also migrating to the Terai due to “pull” and “push” factors. Recent population census data indicate that about 50% of the total population of Nepal lives in the Terai districts. The productivity of the farm area in Nepal is the lowest in South Asia. Hence, food security in terms of price, accessibility and utilization is becoming a challenging issue in Nepal. Moreover, it is estimated that about 100,000 hectare of forest is estimated to be under human encroachment, leading to the reduction of area for wood production. On top of this, unplanned infrastructure development has further aggravated the deforestation problem in the Terai landscape. Sustainable management of forest could, thus, not only increase and stabilize the supply of forest products, but it would also help in contributing the livelihood of the local people, and national economy.

5. This study is important because its findings will be used as an input in estimating carbon emission factors, which is essential to estimate the national reference level, and also to construct the Monitoring, Reporting and Verification (MRV) system for Nepal. It will also be useful for the better management of forests.

1.2. Objectives of the Study

The broad objective of the study is to carry-out a critical assessment of the existing and future demand of fuelwood and timber and supply potential of these products in the Terai and Mid-hills of Nepal. The study will be focused on the Terai landscape from east to west (20 Terai districts). The purpose of the study is to feed the findings into establishing sub-national level forest reference emission level (FREL) and/or forest reference level (FRL) and MRV framework at the landscape level. This will be later integrated into the national FREL/FRL and MRV systems.

The specific objectives of this study are:

- To review the current regulatory and fiscal policies, and analyze the role of various stakeholders in the market chain of forest products in different regions of Nepal;
- To estimate the magnitude of current and future consumption of wood products (timber and fuelwood) in the Terai, and Mid-hills of Nepal for the next 20 years, and provide critical comments on the data challenges in such estimation;
- To estimate the magnitude of current and projected future supply potential of different forest management regimes for next 20 years to produce wood products in the Terai and Mid-hills and provide critical comments on the data challenges in such estimation;
- To develop scenario of future demand and supply of wood products for the Terai landscape under changing social, political, and economic environment – including but not limited to price, food security, economic growth, political restructuring, remittance, internal migration, and infrastructure development.
- To assess the existing value chain analysis in timber sales in Nepal and to provide the roles of different stakeholders in the marketing of the timber.

1.3. Specific Tasks of the Study

The following six tasks are identified to accomplish the objects stated above.

1.3.1. Review of policy and legal context

3.1.1. The policy and legal context which have positive influence on the production and market chain of these forest products.

- Analyze enabling elements of the environment for the sustainable production , supply, and sales under different forest ownership and management regimes;
- Map the stakeholders involved in production and market chain of these products in each region;
- Describe and analyze existing practices of harvesting, sales and revenue sharing; analyze tenure rights arrangement to harvest, and sell forest products in each region;

3.1.2. The policy and legal context that have negative influence on production and marketing chain of these products.

- Identify gaps in existing policies, legislation, directives and guidelines in creating an enabling environment for increasing the supply of wood products from different forest management regimes;
- Identify coordination barriers within government agency and outside.

1.3.2. Assessment of existing demand and supply of wood products

- Estimate the per capita consumption of fuelwood and round wood timber in the Terai and Mid-hills;
- Estimate the volume of wood products available from different forest types under different management regimes in the Terai and Mid-hills;
- Estimate aggregate demand and supply of fuelwood and sawn timber for next 20 years;
- Identify the data challenges for such study.

1.3.3. Critical analysis of demand and supply scenario for Terai Landscape

- Project future demand scenario (for 20 years) for fuelwood, industrial round-wood, and sawn timber;
- Estimate the supply potential of forests for now and by 2030;
- Analytically discuss about the potentiality of reversing converted land to private forestry

1.3.4. Review of pricing (value chain) mechanisms practiced in the Terai

- Critically review the existing practices used in fixing the royalty rate for standing timber and retail sales prices for logged timber of three high value timber species (Sal, Asna, and Sissoo) in the context of resource scarcity and existing market price.

1.3.5. Identify the capacity gaps in improving the supply systems

- Identify capacities required by various stakeholders to improve the existing supply systems and compare them with their actual capacities at Individual, Community, Organizational and at policy levels

1.3.6. Provide findings for the formulation of National REDD strategy

- Provide an analysis of the gaps in improving existing practices in wood product supply and sales;
- Recommend reforms required to improve production and sales at district forest management level

1.4. Methodology for the Study

These objectives and tasks are quite ambitious since they cover not only the present price and amount of forest products consumed and supplied mainly in two ecological regions of Nepal, but also require the future projections of the consumption and supply of these products in these regions, more particularly in the Terai Landscape. Given the paucity of data on factors that determine the consumption of these products in different regions of Nepal, and the governance mechanism under which the forests are

managed and forest products are traded, the methodology has to be simplified in order to complete it in the stated time period of about four months, and very scarce financial resources allocated to this study.

The following methodology has been adopted to carry out this study. However, the methodology was further refined and readjusted during field visit, as most part of the Terai and mid-hill districts were shutdown during most part of the study.

1.4.1. Desk Top Study and Literature Review

- On population, population growth, household size, household formation over time in the future in different regions of the country to estimate the demand of firewood and timber mainly from CBS census reports

- MPFS, and WECS reports on fuelwood and timber demand and supply. Various Operational Forest Management Plans (OFMPs) prepared to estimate the forest area, growing stock and supply potentials of forest products from Terai Districts

- The referenced literature and other literature to estimate the demand and supply of forest products in different regions of Nepal.

- Various publications on policies and other regulatory process, and fiscal (including royalty fixation) mechanism of forest management, utilization and sales was reviewed and discussed with key stakeholders to assess both positive and negative elements for sustainable forest management.

- Both government, civil society organizations, academic institutions, professional organizations and private entities involved in information generation or field implementation or business operations (logging, harvesting, processing, trade, and construction) were consulted to get a better picture of the forestry situation of Nepal in general and the Terai in particular.

1.4.2. Field Survey and Interaction

- Field survey was undertaken to estimate the household and commercial/industrial demand of forest products mainly in the Terai and Kathmandu valley, as significant amount of officially harvested and commercially traded timber was consumed in Kathmandu.

- Key informant and a Focus Group discussion were held with key stakeholders in the field to find out the demand, supply and royalty rate of forest products. Similarly, discussions were held with officials, and wood traders in Kathmandu to understand more about the working of forest policy and market chain of forest products.

1.4.3. Estimating the consumption of forest products in the Terai

- As per the latest CBS data 84% of households use fuelwood as a source of energy, and 76% of them collect the fuelwood themselves. Therefore, for majority of households or individuals, the cost of fuelwood is the opportunity cost of labor involved in collecting and carrying the fuelwood. Since fuelwood appears to be an inelastic commodity with respect to price and income within a certain limit (after which households may switch to other cleaner sources), we assume that price of fuelwood in the surrounding areas or the cost of collecting fuelwood would not significantly affect the quantity of fuelwood per household or per capita. Other parameter such as income could be associated with the amount of fuelwood consumed by households. CBS also provides analysis showing the relationship between income quintile and the percent of households using various types of fuel for household consumption.

- Timber demand is associated with house construction and repair, and for constructing furniture. It is also used for making reconstituted wood product such as plywood and block board. As the price of timber in the urban areas has increased over the last three years, some households/commercial entities are switching to aluminum for house construction at least in Kathmandu valley. Similarly, timber is now also imported from Malaysia and Burma as the timber from these countries is cheaper than the price of Sal timber in Kathmandu. Most of the timber officially harvested and traded is used in urban areas. Some even estimate that at least about half of this timber (mainly Sal) is consumed in Kathmandu valley alone.

  By comparing the number of households between two successive population census data, we can find out the annual number of households formed (per year population growth as well) in different regions of Nepal. By estimating the amount of wood needed to construct a house with its price and other important variables in consideration, and adding the total number of such houses, we can estimate the total amount of timber needed per year in each region. Through similar process, we can also estimate the amount of timber required for house repair and furniture. Field survey will be carried out to find out the amount of wood (including type) required to construct/repair different types of houses and furniture with different roofing materials.

1.4.4. Estimating the Supply of Forest Products

There are basically four types of forest management regimes in the Terai of Nepal – Community Forests, Collaborative Forests, Government Managed Forests, and Private Forests/Trees on Farm. The area in each type of management regime will be obtained from the Department of Forests or District Forest Office of the Terai. Forest Research and Survey Department is carrying out Forest Resource Assessment of Nepal with financial assistance from Finland. Since the forest areas under National Parks and Reserves are locked up for harvesting, the forest area under this management regime will not be considered for forest product supply.

Potential supply of forest products will be based on secondary literature mainly based on the Operational plans of Community and Collaborative forests, and management plans of government managed forests. The type and number of trees on farms are estimated by CBS once in every 10 years. Presently CBS is carrying out sample survey of agriculture, but it would take some time to analyze the data and publish the report. Therefore, 2001 data would be used to estimate the number of private trees and estimated volume of wood removed in the Terai Districts. Consultation will be held with CFUGs, Collaborative forest groups, buffer zone forest groups, private forest association, District Forest office and others to estimate the annual supply of forest products from Terai.

1.4.5. Future Projection of Demand and Supply

Simple simulation model will be used to estimate the demand and supply of fuelwood and timber for the Terai region of Nepal. This model is easy to use and very useful as it provides answer to simple questions such as what would be the balance between supply and demand of timber if say, forest productivity of the Terai forest is increased by say 10%.

This model was used in estimating the demand and supply of forest products in different regions of Nepal. Results will be presented at an interval of five years (2011, 2015, 2020, 2025, and 2030). Kanel (1994) used this model to project the supply of forest products from 30,000 hectares of forests in Bara district of the Terai under two scenarios – Doom's day scenario, and Optimistic scenario. However, for the present study, only one moderate trend (or realist) scenario will be projected for the three ecological regions of Nepal.

This model will consider the impact of migration, potential conversion of forest area for agriculture (food security, food price) and infrastructure in the Terai.

1.4.6. Value Chain Analysis of Timber of Three Species

Royalties of standing timber from the National forests are fixed by the government. The royalty rate of round-wood timber of a particular species is the same in all over Nepal. Since wood export is virtually impossible under the present legal mechanism, the wood harvested both from National and Private forest has to be used within Nepal. Theoretically, royalty rate is the stumpage price of timber standing in the forest. It is derived from backward calculation.

We use the following approach to carry out value chain analysis. First, estimate the market price of sawn timber in Kathmandu. Then deduct the cost of surveying, marking, harvesting, logging, transportation, grading, stacking in the depot, and a going rate of profit to carry out these operations. Once, we deduct these associated costs from the auction price of the logs in the depot, we get the stumpage price of timber of particular size and of particular species. We carry out the analysis for timber sales of three important species namely Sal, Asna and Sissoo.

1.5. Limitations of the Study

This study is very useful not only for the preparation and implementation of REDD readiness plan, but also for estimating the impact of population growth, economic development, labor movement outside the country for remittance, climate change on land use, and supply and demand of forest products over the next 20 years. Such an exhaustive analysis was carried out during the preparation of Master Plan for the Forestry Sector (MPFS). It took 3 years to finalize MPFS with significant inputs from many experts and consultants. However, the present study has to be completed within the stipulated time period of less than 5 months, and with a meager budget. So, the time and budget constraints compelled us to estimate the population growth, land use change, and finally the demand and supply of fuelwood and timber over 20 years period in a very crude manner.

Projection of Nepal's scenario over the future 20 years in itself is very complicated, as uncertainties and complexities in such a venture are exceedingly high. Therefore, we specify our assumptions in each of such projections for population growth, economic development, and demand and supply of forest products.

1.6. Organization of the Report

The report is organized into seven sections. After the introduction, the second sections deals with the land use change and economy of Nepal. The third section is devoted to the opportunities and constrains of present forest policy regimes in Nepal. The fourth section analyses the demand of fuelwood and timber, and their projection in Nepal for the next 20 years. Similarly, the next section analyzes the supply of fuelwood and timber and their projection in Nepal for the next 20 years. The sixth section relates to the value chain analysis of sawn timber (Sal, Sissoo, and Asna) in the commercial market of Nepal. The last section provides some suggestions (including capacity strengthening) on this topic.

2. Changing Structure of Nepali Economy and Ecology

This section deals with the present land use and forests of Nepal, the distribution of population over the three ecological regions, and the changing structure of Nepali economy. All of these factors affect the demand and supply of forest products in Nepal.

2.1. Land use and Forests of Nepal

As per the REDD Cell diary, out of the total area of 14.7 million hectares of Nepal, 17% is located in the Terai. Similarly, Mountain region has about 15 percent, and the major part (68%) of the country's land area lies in the Hills. However, if we consider the data from CBS (2008) and the Ministry of Agriculture and Cooperatives (2011), the distribution of the total area of Nepal into the Terai, Hills and Mountains is about 23, 42 and 35 percent. This anomaly of data is also reflected in the share of forest area into these three ecological regions. For example, as per the REDD Cell Diary out of the total forest and shrubland area (5.8 million hectares) of Nepal, only 7 percent lies in the Mountains, whereas the Hills and the Terai cover about 71 and 22 percent of the total forest (including shrubland) area of Nepal. We think that the forest (including shrubland) area in the Mountains is underestimated. We could not find CBS data which shows the area of forest and other land uses in each of these ecological regions. Therefore, we had to stick to the REDD Cell data.

Table 1: Land use in Nepal ('000 ha) in 2011

Land use		Mountains	Hills	Terai	Total	Percent
Agriculture		211	1,798	1,082	3,091	21
NCI		517	449	65	1,031	7
Forests	**CF/CFM**	166	1,191	322	1,679	11
	Forests under PA	200	100	300	600	4
	Leasehold Forests	18	18		36	0
	Gov Managed Forests	12	2,836	655	3,503	24
	Total Forests	396	4,145	1,287	5,828	40
Grasslands		138	1,592	36	1,766	12
Other		946	2,025	31	3,002	20
Total		2,208	10,009	2,501	14,718	100
Percent		15	68	17	100	1

The Non-Cultivated Inclusions (NCI) in the Mountains is reported to be 517,000 ha, whereas the area under agriculture is reported to be 211,000 ha. Thus, the ratio between the agriculture and NCI area is about 0.4 for the Mountain region. However, this ratio is about 4 and 17 for the Hills and the Terai. It is difficult to explain the low ratio for the Mountains.

As mentioned above, the total area of forests and shrubland in the Mountains is estimated to be 396,000 ha. However, as per the information from Community Forest Division, the Community Forest area for the Mountains is about 266 thousand hectares (as of 2012 April). This leaves a very little forest area for Protected area system in the mountain region.

Again, the total forest (including shrubland) area of the Terai is reported to be 1,287 thousand ha. However, the Forest Cover Change Analysis of the Terai Districts (2005) by the Department of Forests gives the total forest area of the Terai as 1,390 thousand ha. Therefore, we have assumed that the total forest area of the Terai is about 1,287 thousand ha even in 2011. This way, we can suggest that 103 thousand ha of forest was lost during the last 11 years (between 2001 and 2011). We think that there is no major change in the total forest (including shrubland) area of the hills and the mountains in between 2001 and 2011 and beyond. Some reports (Niraula et. al, 2011) suggest that the total area of forests in the hills under different regimes (Community Forests, Government Managed Forests and Private Forests) has

increased over time. However, we think that even if minor area of forests of the hills and mountains could have been lost due to road construction and urban encroachment, it is compensated by the conversion of other areas into forests. The total land use of Nepal in 2011 is estimated to be as shown in Table 1.

2.2. *The Changing Structure of Nepal's Economy*

The economy of Nepal is slowing transferring from subsistence farming to cash economy. For example, the share of non-agricultural sector in wage employment has increased from 47 to 65 percent over the last 15 years. Similarly, the share of farm income in total household income has declined by more than 33 percent over the last 15 years. People engaged in overseas employment have also significantly increased over time. For example, 23.4 percent of all households use to receive overseas remittance in 1995/96. However, it has increased to 55.8 percent in 2010/11. This has led to the per capita remittance injection of NRs 9,254 in 2010/11. It was just Nrs 625 about 15 years back (CBS, 2010). In terms of households receiving remittance, the amount of remittance per household has increased from NRs 15,160 to Nrs 80,436 within the last 15 years. Some even suggest that the contribution of remittance to Gross Domestic Product (GDP) is as much as that of agriculture sector or about 30 percent.

The transition to cash economy has led to increased per capita income of Nepali people as well. For the country as a whole, the per capita income has increased from NRs 7,690 in 1995/96 to Nrs 15,162 in 2003/04, and to Nrs 41, 659 in 2010/11. Officially, the amount of remittance received in 2010 is estimated to be Nrs 259 billion. This official figure appears to be way below the unofficial amount received by the households. However, the distribution of this income is quite uneven: the bottom 10 percent of the people earn only 1.5 percent of the total income of Nepal. On the other hand, the top 10 percent of the population capture about 40 percent of the total income (CBS, 2010).

The transition to cash economy and remittance income growth has led to significant changes in the growth and distribution of population, and consumption pattern of fuelwood and timber in Nepal. For example, the population growth of Nepal has significantly reduced from 2.4 percent in 2001 to only 1.4 percent in 2011. Presently, more than 50 percent of the total population of Nepal lives in the Terai, and the rest of other 50 percent is distributed in between the Hills and the Mountain regions of Nepal.

The four factors – increased income, slow population growth in the hills and mountains, forest tenure reform, and the demographic shift from the hills to the Terai and increased urbanization (now about 20 percent) has led to a marked change in the collection and gathering activities affecting the demand and supply of forest products in Nepal.

The forests of Terai are increasingly vulnerable to population growth, infrastructure development, and illegal harvesting for commerce and trade. Significant amount of timber is also transported to urban areas of hills such as Kathmandu and Pokhara valley from the Terai to meet the demand for house and other building construction and for furniture. Currently, it is estimated that about 30 percent of the total forests of Nepal is managed by communities. However, it is mainly concentrated in the hills.

Growing stock (m^3/ha) and volume increment (m^3/ha/yr) by forest type (1994-2008)

	All types	Sal forest	Katus-chilaune forest	Pine forest
1994	150	149	143	158
2008	178	155	175	200
Mean volume increment m^3/ha/year	2.0	0.4	2.3	3.0

Conclusions:
- On average community forests are gaining 2m^3/ha annually

Source: Livelihood and Forestry Programme

Figure I: Growing Stock and Volume Increment between 1994 and 2008

Several reports suggests that that the growing stock and annual growth of the Community Forests has significantly increased due to forest tenure reform and increased assurance of forest rights to the communities by the government. A study by the Livelihood and Forestry Program provides information on the increased amount of growing stock and annual growth in different forest types of the hills of Nepal.

2.3. Population and Households in Nepal, Their Projection and Wood Demand

The present population of Nepal is estimated to be about 26.6 million as shown in Table 2. Similarly, about 5.7 million households are reported to be living in Nepal. The members in a household are declining over time. This means that for the same number of population, the number of houses to be constricted will increase, as the members of a household declines over time. Presently, about 83 percent of people use fuelwood as a source of household energy. The percent of people using LPG has increased from about 8 percent in 2001 to 17 percent in 2010. It appears that income has a significant effect on the type of energy used in a household. For example, about 95 percent of the poorest households use fuelwood as a source of household energy. But 58 percent of the richest (quintile) household use fuelwood, and about 59 percent of them somehow use LPG as a source of household energy.

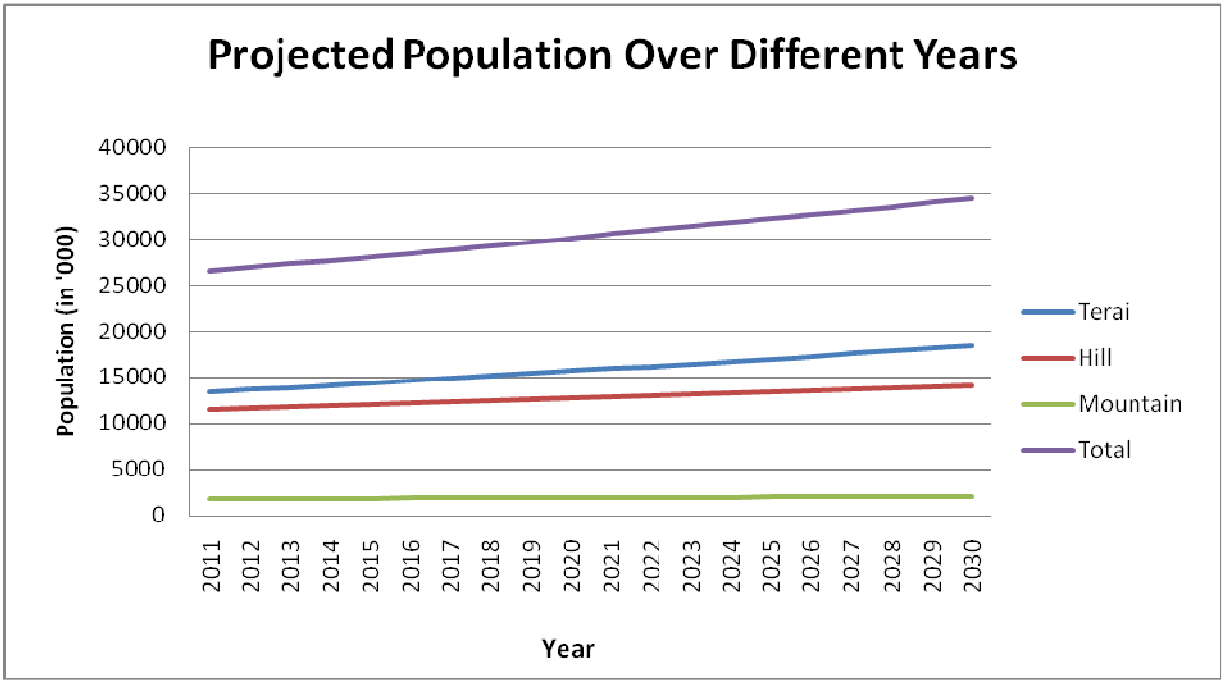

Figure II: Projected Number of Population Over Different Years

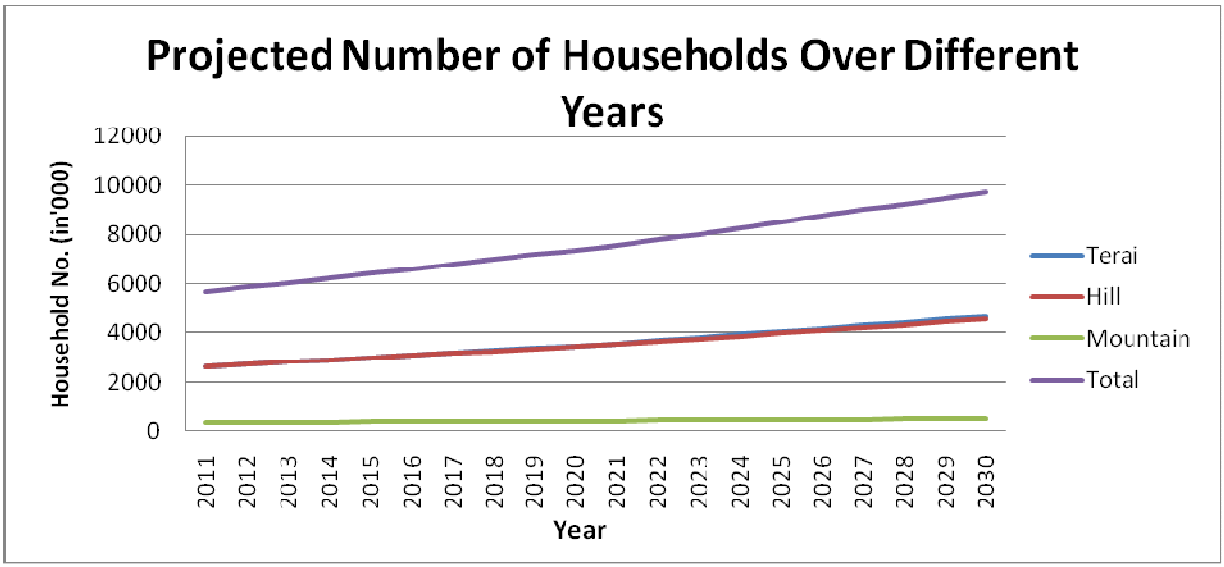

Figure III: Projected Number of Households Over Different Years

Table 2: Population Projection for Nepal

Year	Population				Total Household
	Terai	Hill	Mountain	Total	
2011	13,350,454	11,475,001	1,795,354	26,620,809	5,659,984
2012	13,584,087	11,604,669	1,806,485	26,995,241	5,847,956
2013	13,821,808	11,735,801	1,817,685	27,375,295	6,035,929
2014	14,063,690	11,868,416	1,828,955	27,761,061	6,223,901
2015	14,309,805	12,002,529	1,840,295	28,152,628	6,411,873
2016	14,560,226	12,138,157	1,851,704	28,550,088	6,599,846
2017	14,815,030	12,275,319	1,863,185	28,953,534	6,787,818
2018	15,074,293	12,414,030	1,874,737	29,363,060	6,975,790
2019	15,338,093	12,554,308	1,886,360	29,778,762	7,163,763
2020	15,606,510	12,696,172	1,898,056	30,200,738	7,351,735
2021	15,879,624	12,839,639	1,909,823	30,629,086	7,539,707
2022	16,141,638	12,971,887	1,919,755	31,033,279	7,783,489
2023	16,407,975	13,105,497	1,929,737	31,443,209	8,027,272
2024	16,678,706	13,240,484	1,939,772	31,858,962	8,271,054
2025	16,953,905	13,376,861	1,949,859	32,280,625	8,514,836
2026	17,233,644	13,514,643	1,959,998	32,708,285	8,758,618
2027	17,518,000	13,653,844	1,970,190	33,142,033	9,002,400
2028	17,807,047	13,794,478	1,980,435	33,581,960	9,246,182
2029	18,100,863	13,936,561	1,990,733	34,028,157	9,489,964
2030	18,399,527	14,080,108	2,001,085	34,480,720	9,733,746

It is estimated that about 17 percent of the total population resides in urban areas. Most of the timber and fuelwood used in the urban areas of Nepal is transacted through market mechanism. As Nepal's population is increasingly urbanized, fuelwood would be increasingly substituted by alternative energy sources such as LPG and electricity.

A study by WECs (2010) and updated on price of energy sources by the authors to reflect on current prices shows that fuelwood use is the costliest energy in terms of its effectiveness in Kathmandu valley.

The price difference may be the same for fuelwood users who bye it in the market. Table 3 provides the effective prices of various fuel types used for cooking in Kathmandu.

Table 3: Market Price, efficiency and effective price of the major fuel types in Nepal

Fuel Type	Natural Unit	Market Price (NRs/Unit)	Market Price(NRs/GJ)	Average Efficiency	Effective Price (NRs/GJ)
Fuelwood	Kg	10.00	597.01	15%	3,980.07
LPG	Cylinder	1,415.00	2,033.63	75%	2,711.50
Electricity	Unit	7.50	2,083.33	80%	2,604.17
Kerosene	Litre	80.00	2,122.01	60%	3,536.60

Source: WECs (2010), Market price of fuel types in Kathmandu in 2012 June

This also indicates that as the income of people increases, more and more people will substitute for cleaner and cheaper energy. It is to be noted that this study does not include the cost of stoves used at the household level. For the poorer households, the price of stoves and other accessories such as LPG cylinder, and the uncertainty in the availability of these other energy sources will also affect the adoption of fuel type.

CBS (2011) has estimated that type of houses constructed in each of the ecological regions. It has also estimated the type of houses for different income quintiles. Table 4 provides the type of houses constructed in different regions and income quintiles. Similarly, the Table also provides types of fuel used by different income groups and different regions of Nepal.

Table 4: Type of fuel used and houses constructed in different regions and Income quintiles

Regions and Income Quintiles		**Per Capita Income (NRs)**	**Percent of HH Using**		**Percent of HH with cemented home**	**Percent of HH with homes of wood and branches**
			Fuelwood	LPG		
Region	Mountains	34,633	94.5	5.1	8.3	3.2
	Mid- Hills	46,224	79.5	23.9	23.5	6.1
	Terai	38,549	86.4	13.1	31.5	45.0
	Nepal	**41,659**	**83.7**	**17.7**	**26.1**	**23.7**
Quintiles	Poorest	15,888	95.2	0.1	4.5	36.9
	Second	23,341	93.1	0.5	10.2	32.2
	Third	32,791	93.6	2.8	14.6	29.1
	Fourth	42,797	89.1	12.1	25.7	20.7
	Richest	94,149	58.1	55.8	59.0	8.3

Source: CBS (2011)

The above Table shows that about 45 percent of houses in the Terai are made from the woods and branches. Similarly, about 31 percent of the Terai households have houses made of cement concrete walls. Both of these types of houses are higher in the Terai than in the hills and mountains of Nepal. This may suggest that income inequality is higher in the Terai than in the rest of the country.

The other important characteristics of the pattern of housing in the country is that as the income increases, the percent of people having cemented homes increases, and the percentage of households having houses made of woody materials declines.

We consider that cemented houses require lot more sawn timber than the houses made of log/poles and branches. However, we generally estimate that a new residential house in Nepal requires 300 Cft[1] timber out of which 200 Cft is used for construction, and 100 Cft is used for furniture. Likewise, additional 100 Cft is used to for commercial and public purposes. This amount is slightly lower than the estimates projected by the Master Plan for the Forestry Sector (1988). A house lasts for 25 years after which it has to be reconstructed. Half of the timber of the old house will be used for this new house, and the other half i.e, 100 Cft will be used as new timber. A house needs repair after every 10 year. 30 Cft of timber is estimated to be required for repair. The timber volume is estimated in terms of round wood. Timber is substituted by iron, and aluminum for house or building construction, and plastic furniture is substituted for wooden furniture. We estimate that the rate of substitution will be 2.5% in 2011, by 5% in 2015, by 7.5% in 2020, by 10% in 2025 and by 12.5% in 2030. This substitution applies only to the Terai and hilly regions. No timber substitution is assumed for the mountains.

1 One cubic meter of timber is equal to 35.3 cubic feet (Cft) of timber

3. Opportunities and Constraints in Policy Regimes in the Terai

Forest Protection in Terai is a serious problem. Because timber and land in Terai has higher financial values, many are motivated to illegally harvest maximum volume for timber sale and land grabbing. Almost all forest related committees and commissions constituted by the government have focused their recommendations on using for land for settlement. Recently, a parliamentary committee was constituted to investigate the rampant deforestation in the Terai. Some of the major findings of that committee are given below (Forest Conservation Problems Report, Natural Resource Committee, Parliament of Nepal, January 2011).

- All service sectors like drinking water, electricity, telephone, school, health posts etc are improving their service in encroached forest area. Even government programs like "home for people" are making permanent houses in encroached forest area. Influential people of various organizations, associations and parties exert pressure not to take actions against forest encroachers and forest product smuggling. All parties try to gain by cutting trees. Staffs of District Forest Office are de-motivated in the work. Therefore, protection of Terai forests has multi-dimensional problems like humanitarian, moral and security problems.

- Forestry in Terai also has governance problem. Initial Environmental Examination (EII) is a legal mechanism even to hand over more than 200 hectares (Ha) National Forest to Community Forest. However, to overcome this provision, lower area of forests is handed over as community forests in large numbers, e.g, 196 ha of forest was handed over to 36 households in Singha Bahini CF of Banke district.

- In addition, people do not get forest products (timber and firewood), even in the area where good forests exists. So, people are not motivated for protection, and forest fire is also wide spread in Terai.

- CF in Terai has mixed results. Some CFUGs are managing forests and support poor households. But, even those CFUGs are not spending 25% of the fund on forest development and 35% of the fund on livelihood improvement programs. Bad CFUFs cut the trees from next day of forest handover. Forest officials also have been onlookers in enforcing the legal rules and regulations.

- CF is popular in the hills, but on the contrary to it, in Terai, CF is not accessible to people and is creating negative feelings. Collaborative Forest Management (CFM) is proposed as an alternative to CF. CFM has a policy to involve all in forest management, and then protect traditional rights of distant users. (Page 10-14, Parliamentary Committee Report, January 2011)

All of these statements of the parliamentary committee on natural resources show that forest protection in Terai is very difficult and forests in Terai can not be protected without serious commitments from all sectors and stakeholders, even if government says it will put full effort for forest conservation in Nepal.

3.1. Enabling Policies

There are also some good policies which can facilitate better management of forests in Nepal. There are also policy constraints which are hindering the achievement of these policy objectives. On the basis of these information, policy recommendations are also suggested.

- **Preamble and Objective of Forest Act 1993**

The preamble of Forest Act 1993 clearly identifies meeting basic needs of the people to attain social and economic development and promoting healthy environment and ensuring development and conservation of forests and proper utilization of forest products and extending cooperation in the conservation and development of private forest by managing national forests in the form of government managed forest, protected forests, community forests and leasehold forests. Thus, this act specifically mention that forest tenure and governance reform is a precondition for the sustainable management and use of forests in Nepal.

However, the preamble of Forest Act 1961 has identified forest as national property for earning income. During the time of this act, a lot of Sal timber from Nepal was sold to India for railway sleepers at a nominal price.

- **Commitment for 40 percent of land under forest**

Government of Nepal has declared its commitment to have 40% of the country's land area as forests. This commitment has been enshrined in various documents including the various recommendations of recently expired Constitutional Assembly.

- **Highly educated forestry staff**

Mid-level and management level staffs of the Department of Forests are highly educated in various disciplinary areas from different countries of the world. If they could be mobilized in a better way, forests can be better managed. Previously, all the forestry projects had a component of providing short and long trainings forestry and management related courses. However, of late these trainings have not been imparted.

- **Forest Tenure and Governance Reform**

Nepal is the leader not only in forming policies and acts to reform forest tenure and governance reform, it actually implemented tenure and governance. Presently, about one third of the total forest area of Nepal in under so form community management. Though some problems are emerging due to political uncertainly and lax in rule enforcement, community forestry has been presented as the most successful forestry program not only in Nepal but also in the world.

- **Commitment for forest and community development**

The forestry in Nepal has the objective of not only managing forests but also using the services and income from forests for the betterment of local people and national economy. This has called for the wider participation of local people in the management of forests and funds derived from the forests. The policy identifies that minimum of 25% of CFUG fund has to be spent for forest development activities and 35% on livelihood promotion.

- **Independence to fix rate for timber**

CFUGs may sell the timber outside user groups and they can fix the price depending upon the prevailing market as per approved operational plan.

- **Self operating management model:**

Community forestry is also self operating model of forest management. It provides management and forest product use rights to the community forest user groups in Terai. As a result, 54% of

annual sal timber sold in Kathmandu (source: Study information, March, 2012) is presently coming from community forests of Terai. But there are also ongoing discussions on whether community forests in Terai should be promoted as it is. Several problems are also identified in some CFUGs in Terai such as the case of Jogbudha CFUG in Dedeldhura district, where 12 officials of the Department of Forests including District Forest Officer and 48 persons from local community are in the process of inquiry (Source: Field information, March, 2012).

- **Collaborative Forest Management**

As the preamble of the present forest act requires forest tenure and governance reform the government has prepared a guideline to pilot Collaborative Forest Management (CFM) in the Terai. It provides opportunities to involve and generate benefits from forest management even for the people who are living far from the forests, especially people living several kilometers far from the existing forest area.

- **Industrial Leasehold Forests**

According to Forest Act 1993, the forest area can be handed over to forest based industries for the production of industrial raw material and also for livelihood sustenance of poor households. Industrial lease is also a good policy to use the forest land for the promotion of forest leased industries which really want to manage the forest in a sustainable way. The leasee can get the product benefit at the same time the nation also gets some ecological benefits.

- **Infrastructure/ Facilities**

Terai districts have second class District Forest officers in almost all of the districts. The districts are supported with large number of forestry staff for forest protection and management. There is also a provision of armed forest guards to protect the forest, but using weapons for forest protection was stopped during the insurgency period, which is still continued even today.

- **Decentralization of the Forestry Program**

The District Forest Officer has almost all the authority of better managing the forests. S/he can hand over CF, sell forest products of the Government Managed Forests, and take legal action forest offenders. Moreover, CFUGs can managed their forests, sell their forest products, use the fund for forest and community development. Such legal provisions are very influential in promoting forestry in Nepal.

- **Forest Development Fund**

Timber traders and forest industry representatives and the Ministry of Forests and Soil Conservation has agreed to have the Forest Development Fund. This fund is created by depositing NRs 5 per Cft of timber by the timber traders and another NRs 5 per Cft by the government. More than NRs 10 million has been deposited in the fund. The fund can be used for tree plantations and forest management activities. However, this money has not been used so far due to some legal problems.

- **Proposed Federal Structure**

All the major political parties have agreed to transform Nepal form a unitary system of governance to federal structure. The interim constitution of Nepal has also a provision of federal structure. However, the details of levels of governance and their jurisdictions on natural resources

including forestry have not been agreed yet. Once, the system of federal structure is constituted, further decentralization will happen. It would help in devolving more power to local authority and hence the promotion of better forest management in Nepal.

- **Monetary and Fiscal Policies**

Depreciation of Nepali Currency versus the foreign currency has positive role in the use of forest products in comparison to the imported items such as aluminum. Appreciation of the local currency has the opposite effect. Thus, the monetary policy of the government has an influencing factor on the way forest products are used in Nepal.

The taxation and subsidy policy of the government also influence the use of forest product within Nepal. High taxation of the imported items such as aluminum and LPG will hinder their utilization within Nepal, and their substitutes such as timber and fuelwood would have higher share of market.

Excessive high royalty rate of timber may or may not increase the revenue of the government. If the government has capacity of enforce rule against illegal theft of timber, the government revenue may increase. But since most of timber in Nepal is not transacted in market, higher price of timber may also increase illegal theft, in which case, the revenue to the government may sometimes decline.

3.2. Policy Constraints

There are also some policy constraints for sustainable forest management in Terai. These are explained as below.

- **Too much market regulation on forest products sale**

Although the present forest act is very progressive in terms of tenure and governance reform, not much reform has been made in the sale, distribution and transport of forest products in Nepal. The provisions of the forest products marketing are still the legacy of the Forest Act of 1961. A series of clumsy permits and sanctions are still required in harvest, logging, processing, and transport of wood within Nepal. The permit regimes are really increasing the transaction cost of wood products in Nepal.

Forest regulations on the sale and transport of wood even from private forests are very high. Relaxing these cumbersome regulations alone would provide significant incentives for private tree growers to expand forestry in their private land.

- **On-and-off changes in forest policy and administrative orders**

The Ministry of Forests and Soil Conservation makes erratic changes in forest policy in terms of forest handover, forest product harvest, sales of the wood from the forests, harvesting of trees both from private and national forests. For example, about 2 years ago, the government stopped the sale and even the transport of purchased wood from the Terai. This change also led to sky rocketing of commercial timber price in urban areas of Nepal. Timber traders imported wood from Malaysia and Burma to meet this scarcity.

Presently, the government is also sanctioning small amount of timber for sale. This also has led to decrease in the supply and increase in the price of timber in urban areas of Nepal. Many households are now switching to aluminum from timber as a raw material to construct houses and office building. This has caused a large siphoning of foreign currency from Nepal, reduced

employment opportunity in Nepal and also increase in carbon emission in the production of aluminum overseas.

Except for the timber coming from the private forests, all the timber in Nepal comes from the National Forests, which are regulated by the government of Nepal. Thus, the government of Nepal has a monopoly on the supply of wood products. The government does not have long term and transparent way of selling timber neither from its forests nor from the community forests. This also create uncertainty in the supply and hence the price of timber in Nepal.

- **Frequent transfer of forestry staff**

Although there is provision of not transforming government staff within 2 years of assignments, frequent changes of Minister and Secretaries at the Ministry of Forests and Soil Conservation have led to too frequent transfer of forestry staff. Thus, there is not motivation for the field staff to plan forest planning and harvesting schedules. They have to be worried about their own family issues such as getting their kid's education etc.

A major study carried out in Police Service reform in Gujarat state of India shows that various types of training imparted to the police and their assurance of post in a certain location have a significant outcome in the delivery of service to the people. This has implications on the forestry profession as well.

- **Conflicting policies on Forests, mining, roads, Local Governance etc**

Regulatory policies of forestry, mining and roads and other sectors conflict among others. Sub-soil mining lies under the jurisdiction of the Mining Department. Road Department has an authority of spanning over some width of the road. Moreover, resettlement policies (such as that of Free Kamaiya) have an adverse impact on forests.

Expanded road construction by using forests has reduced the area of forests. Many communities and local bodies prefer to divert roads through forest even though it may be long instead of constructing them through private land. This is due to the fact that if the road is constructed through private land, the private owners will demand compensation. However, if the road is made through the forest, there is no need to compensate the government.

- **Non-Utilization of Forest Development Fund**

More than 90 percent of the total annual government budget (About $50 million) allocated to the Ministry of Forests and Soil Conservation is spent on operation and recurring cost. So, there is very little amount which is spent on forest investment. Low level of forest investment has constrained enhanced forest management especially in the Terai.

In order to mitigate this shortfall in forest financing, the Ministry of Forests and Soil Conservation has created the Forest Development Fund. However, the money deposited in this fund has not been utilized so far. The Ministry needs to take up this matter seriously and utilize the fund to enhance forest management especially in the Terai region.

- **Rights to Leasehold forest vs right to community forest**

Section 30 of the Forest Act 1993 has given priority to community forest against leasehold forests. However, due to clarity in household level input in work and household level benefits, there is more direct incentive in leasehold forests in terms of benefit sharing. But, according to the forest act, once local communities demand for community forest, the area cannot be handed

over as leasehold forests. This is also a constraint to promote leasehold forests in Terai, which is also important model of forest management in Terai, especially industrial lease and leasehold for poor people.

- **Debate on Section 27**

Section 27 of Forest Act 1993 has a provision to take community forest back by the government if user groups do not operate their functions according to approved operational plan pursuant to section 25 of the act. The forest may also be taken back if as user group operates any activity which may cause significant adverse effect in the environment or if the user group does not comply with the terms and conditions pursuant to this act and rules made under the act.

Organizations like Federations of Community Forest Users Nepal (FECOFUN), have been advocating for cancelling this section of the act arguing that the act is against assuring long term tenure security for community forest user groups.

In addition, so far this provision has never been implemented for the last 19 years, and this section has always been blamed as a instrument against community forests, so this act could be abolished.

- **Fixing timber price very low**

CFUGs have right to fix the rate of timber. Some CFUGs fix the timber price at very rate, and sell them illegally to the contractors so that contractors get maximum benefits.

- **Ban on Harvesting and sales**

In Nepal, some times ban are made for important NTFPs like panch aule, yarsa gumba and even Sal timber. These bans cause scarcity of the products in legal market. This has led to the increase of price of Sal timber to reach up to Rs 6000/cft. Again high price motivates peoples working in forest products value chain to transfer the product to the market. This high price of its scarcity led to import timber from Burma and Malaysia. When Sal timber was banned in 2011, this created its high price in Kathmandu. As a result, timber was and is imported to Nepal from countries like Burma. In addition, people also use aluminum frame for doors and windows. Thus, bans are negative to sustainable forest management.

- **EIA/IEE for implementation of forest management plan**

According to the present Environment Protection Regulation, community forests with area more than 200 hectares have to go through initial environmental examination, and those with more than 500 hectares have to go through environmental impact assessment. As a result, many genuine CFUGs which do not have income or which do not have to sell their products to the market, are not able to do IEE. There by the user groups can not harvest the forest products in legal manner. However, in practice local users are also extracting their need of livelihood such as fuelwood and grasses from their forests.

- **Opposition from Terai based parties**

Implementation of CF in Terai is strongly opposed by major Terai based political parties. They have been demanding for stopping handing over of national forests in Terai as community forests. This is also their one of the strong political agenda. They prefer CFM instead of CF in the Teari.

- **Local government's right versus users' right**

  In the context of restructuring the nation, most of the political parties have agreed that Nepal will have federal government, regional government, local government and also federally governed areas (Kendra sasit chhetra). The idea of government at community level has been almost rejected during the discussion of restructuring the country. So, if the local governments in Terai do not acknowledge community level governance of the community forest user groups, the principles of community forestry may be jeopardized especially in Terai. This could be big hindrance to implement community forest in Nepal, especially in Terai.

3.3. Policy Gaps

The Ministry of Forests and Soil Conservation itself has identified gaps in present policy implementation of community forests and has proposed amendment in the present forest act (Sunam et al, Practical Action, 2011), which include:

- Providing joint responsibility to DFO staff and user groups in preparing, implementing, harvesting and selling of CF products.
- Optimum area per household in allocatting CF
- Depositing 50% of minimum sale price in District Forest Development Fund, when forest products are sold outside the user groups
- Implementation of timber collection, sales and transport guidelines for CF

The ministry has proposed to address those issues in the amendment of Forest Act 1993. From the perspectives of sustainable forest management, those issues will be discussed in gaps as well as in recommendations.

- **Sub leasing of community forest area:**

  Still many CF are bigger than 100 hectares in average and those CFs also have very poor members. At the same time, it is possible to allocate some areas for income generation through plantation of NTFP, grasses and medicinal plants in those CFs. Clear policy needs to be formulated to promote such involvement of poor, women and indigenous people in community forest management.

- **Integrating equity in CFUG organization**

  According to Forest Act 1993, CFUGs should be autonomous and corporate body. In the present context, rights of women, disadvantage groups and indigenous peoples have to be ensured. Therefore, the gaps in relation to equity and democracy should be rectified (JTRC, 2001).

- **Increasing Productivity of community forests**

  According to the forest act 1993, the objectives of community forestry is to develop, conserve, utilize the forests for the collective interest of the user group members. In the context of sustainable forest management, community forests should promote increases in the productivity of community forests so that sustainable harvest can satisfy the basic needs of forest products for its members.

- **Better management of forest resources**

Forests are less intensively managed in the past. Thus, they need to be intensively managed in the coming days. This requires high commitment in terms of finances (including the one from Forest Development Fund), human resources (less frequent transfer, staff training), logistic support and retraining of the forestry staff.

- **Awareness rising among CFUG members**

Many CFUGs are facing the problems of illegal harvest. This is a serious problems for the staff of District Forest Office, and user group themselves. Therefore, awareness raising in the communities around the forests is crucial so that bad forest management practices such as illegal harvest etc are defended by local communities themselves.

- **Internalizing equity in the operational plan**

There are more than 17 thousand community forest user groups in Nepal. They all need to prepare management plan. Presently, equity issues are highly emphasized in relation to benefit sharing especially for poor, women, indigenous peoples and dalits. To some context, these issues are also incorporated in operational plans, but internalization of those issues is still inadequate. As a result, even if they are included in the plans, they not implemented in practice.

- **Gaps in Technical forest management**

There are now 17,685 CFs and CFUGs, having area of 1.65 million ha, and 2.18 million households involved in community forest management (DoF, 2012). They are protecting community forests and doing pruning, thinning and other silvicultural operations as they understand. But, technical forestry is also the science which is taught in many colleges and universities. Therefore, there is gap between the knowledge which is available in educational institutions and the knowledge which is available in the villages of Nepal.

- **Providing trainings on practical forestry to the local communities**

There is a lack of active forest management in Nepal including community and government managed forests. They are also documented in many studies. Lack of adequate management is hindering good practices of forest management, which are taught in different universities. So, there is big gap of that knowledge, which is hindering active forest management in the field.

- **Establishing rights of distant users**

There are no simple and practical mechanisms to use the distant users in community forest in Terai. In most of the Terai, CF is handed over to the people around the forests. Generally, distant users often blame them as “forest encroachers”. There are no practical mechanisms to bring distant users and people living near forest in harmony and make them work jointly for community forest development in Terai.

- **Climate change: water vs biomass paradox**

One negative consequences of climate change is also less availability of water in dry season such as March –May. Many studies have documented water shortage during the season. (NAPA, 2010, Practical Action, 2010, etc). Normally, water is scarce during the dry seasons. In addition, when local communities maintain high density forests and high crown cover forest to maintain greenery in the area, evapo-transpiration increases as it is directly proportional to leaf area index. This will

consume high amount water by the vegetation from the ground. As a result, this will contribute to more shortage of water in locality in the dry season when water is precious. Therefore, maintenance of high biomass reduces water which would be otherwise available in locality in the form of stream and well etc. Thus, many user groups who have high density forests claim that their water availability is reduced when they have more forest biomass.

3.4. Policy recommendations

We had suggested some policy suggestions while discussing the constraints and gaps above. We therefore, shortly present some important yet broad policy recommendations for action as listed below:

- **Eliminate on-and-off policy revisions and administrative orders**

Frequent revisions of forest policies, acts, rules and orders create unnecessary uncertainty in the management of forests and utilization of forest products. Therefore, such practices should be stopped. If reforms are required, prior consultation process should be initiated by the government by involving all the relevant stakeholders concerned. Such unpredictable events create tensions and conflicts among the stakeholders and adversely affect the management of forests.

- **Congruence between regulatory and fiscal policies**

Forest regulatory policies on tenure and governance reform are reasonable well balanced. However, the forest products harvesting, sale and transport is overly regulated even in private forests. This has increased transaction costs and leading to increased price of timber in the urban areas of Nepal.

Liberalizing regulatory policy but too much intervention on pricing policy without due consultation with private operators and consumer groups would dampen the very objective of better forest management, affordable price of forest products and optimum revenue to the government.

Recent initiative to control timber supply through the creation of so called “Authority” would embolden the reincarnation of TCN, and reduce the entrepreneurship in forest trade and industry.

- **Further reform in forest tenure and governance**

The forest act of 1993 is an innovation in forest tenure and governance in Nepal. However, the sales and marketing of the forest products are still the legacy of old forest act of 1961. The permit regimes from forest product harvesting to transport to sales are some regulated that the price of doing business in forestry is significantly higher than in other sectors. Even in private forests, the permit regime is full-blown. These permit regimes have increased the rent seeking behavior of staff and hooligans. These transaction cost enhancing mechanisms without any benefits of efficiency, equity and sustainability should be quickly eliminated.

- **Ensuring predictability and transparency in wood sales**

Prior notice or information should be published and disseminated on how much total timber would be offered for sale in different districts both from government managed forests and community forests. Based on these information, timber traders and forest industries can made proper decisions. This is of further importance as government has created monopoly market of timber through its National Forest System. So far, there is no credible future information on forest products sale is supplied by the Department of Forests or its District Forest Offices. Predictability

of the supply of forest products sales from the National Forests should be improved and its reliability and transparency should be ensured.

The government can use ICT to increase its transparency in the sale and distribution of forest products.

- **Increased investment on forests and Forestry staff**

The government should immediately use the money locked up in Forest Development Fund to increase logistic support to forestry staff mainly in the Terai and also to increased forestry investment so that forest productivity is enhanced. Similarly, the forestry staff needs to be given trainings on better forest management and on soft programs such as conflict management, public relations etc.

- **Expansion of Private Forests and their Commercialization**

There is a great scope of expanding private forests both in the Terai and accessible areas of hills. An analysis of Kathmandu timber supply over the last three years shows that the market share of private trees is about 19 percent. The total supply of timber or wood from private forests can be significantly improved if regulatory practices on tree utilization for commerce and trade are drastically reduced, if good quality seedlings are supplied and market information is widely disseminated.

The following recommendations are more specific and mostly apply to community forestry program implementation.

- **Making CFUG operate on the principles of equity**

For this purpose, entire CFUGs have to develop awareness programs and run them through CFUG meeting, discussion, training, workshops etc so that they can function under the principles of equity and democracy.

- **Internalization of equity**

Government and NGOs are involved in supporting community based forest management. Presently, there are many new provisions which have been incorporated in operational plan such as equity, public auditing etc. All facilitators of the community forest management should try to make the crucial provisions of the management plan achievable by all stakeholders especially those who will be affected by those provisions.

- **Joint responsibility**

In the present social and economic context where community members are also with high educational background, it will not be possible for a ranger to dictate all operations to the members of CFUGs. So, this mechanism of joint responsibility by the DFO staff and CFUGs is very difficult to implement.

- **Area per household**

Main intention of the Department of Forests should be sustainable forest management not area occupied by the CFUGs. In this context, all forests area should be managed and DoF should not leave any area unmanaged in the name of large area per households. So, there should not be such limitations, but it should be ensured that all households around the area are incorporated in the

user groups. In addition, it also should be ascertained that forest encroachers should not get any area in the name of community forests.

- **Deposition of 50% of income**:

We know that CFUGs are also doing many development activities in and around community forests. Because CFUGs themselves are involved in community development, it may not be necessary to collect 50% of the income from users to Forestry Development Fund.

- **Timber sales Guidelines and transparency for user**

It will not be possible to prepare timber sales guidelines for users by the government without the involvement of CFUG members. However, users should be encouraged to prepare and implement timber sale guidelines by themselves. However, CFUGs need to be transparent in selling the timber and both in terms of volume of timber sold and the its unit price of sales.

- **Subleasing CF**

Subleasing of Community Forests to interested sub-groups within the community should be promoted so that one of the main objectives of poverty reduction is also achieved from CF through involvement of its members in farming medicinal plants, NTFPs and grasses. There should also be agreement between whole user group and sub user group on the issues such as how much lease rent is to be paid to user group by such sub user group. This could be decided locally adopted based on local norms and practices ranging from zero percent of the income to higher up.

- **Increasing productivity**

National stakeholders like DoF and CFUGs should increase productivity of forests so that sustainable harvest leads to (i) income generations (ii) meet demand of forest products .

- **Developing forest management as ethno-technology**

Community forests are very wide spread reaching to remote parts of Nepal. To achieve the results of better management, forestry institutions should develop a package of forest management in simple form so that it will be easy to transfer the learning for common people who live in many villages of Nepal.

- **Forest Management Demonstration**

Practical forest management operations are demonstrated in large scale by the good community forest user group; so that the technical knowledge is transformed to local communities or user groups who are expected to manage their forest. So, government and NGOs should jointly promote this technical knowledge up to the community who need to apply it.

- **Awareness raising to reduce illegal harvest**

Majority of members in community forest user groups have to be made aware on the issues such as how much will be harvested from where, which species are to be harvested when etc. They also need to be aware of their rights and duties as well as rights and duties of poor user group members. Once they are aware of these issues and are capable to outside infraction, then only forests should be handed over to them.

- **Resolving bans**

Ban on forest products such as timber and NTFPs has always negative effect in sustainable forest management as well as for the people who have to depend on those products. But, the government sees the ban as the easiest most instrument of conservation. If the ban is really needed for conservation, then a multi-stakeholders consensus on ban is necessary which will justify its need.

- **Developing forest management as ethno-technology**

Community forests are wide spread reaching to remote part of Nepal. To achieve the results of better management, forestry institutions should develop a package of forest management in such a simple form so that common people living in remote villages of Nepal can also easily learn and adopt those practices.

- **Estimating area needed as CF**

In many places large CF area is also provided to small user groups or to groups with few households. Depending upon the potential forests, the Department of Forests should make criteria explaining how much CF can be handed over in Terai.

- **Guidelines for fixing price**

Many CFUGs are blamed for fixing timber price much less than market price. Thus, some suggest that government should formulate some guidelines to fix the minimum price of timber for the user groups. But, such mechanisms have to be developed and used by the users themselves. This will provide ownership of the mechanism to them.

- **Morale boosting of conservationist**

It is very difficult to protect the forests of the Terai. Some foresters were killed by encroachers. Logistic and moral support should be provided to those people who are protecting government and community forests in the Terai.

- **Need of high level commitment**

Forests protection and removing encroachment are very difficult tasks. So, we need high political commitment for the protection of forest otherwise forests in Terai will disappear slowly.

- **Making communities aware of water versus biomass paradox**

Maintaining high density forest is negative from the perspectives of water shortage in dry season. Thus, the issue of high water consumption through evapo-transpiration by high density forest has to be communicated to local communities. Then, they have to decide: what is more useful for them - water vs dense forest or balance between them. The issue has to be communicated to the people living in remote villages, because normal conception among common people is that forests conserve water.

- **Relaxing the need for environmental assessment**

Community forest management is also a part of environment conservation. It can support for better environment. Therefore, such environmental assessment should not be made necessary for the implementation of community forest operational plan. In the past, such provisions were not

there. At that time, there were no significant complains made against CFUG on the grounds of environmental assessment. Environmental conservation can be made a part of the operational plan.

4. Demand Analysis for Fuelwood and Timber in Nepal

The demand for woody products such as fuelwood and timber is the derived demand for energy and house/building construction. Therefore, the demand for fuelwood is directly related to household fuel consumption. There are alternatives to fuelwood as a source of energy. But for the majority of households, fuelwood is the cheapest and most easily affordable source of energy since majority of fuelwood users also collects their own fuelwood. Therefore, the opportunity cost of labor is the price of the fuelwood for them. In economic terminology, fuelwood is an "inferior" commodity and for most of the rural household, it is also "price inelastic". The "inferior" commodity means that if the income of a household increases significantly, that household will eventually switch to other cleaner sources of energy such as LPG. The "price inelasticity' also means that within a range, even if the price or the opportunity cost of labor increases, a household who is using fuelwood as a source of energy, will continue to use it since the price increase would not affect the amount of fuelwood used by a household.

The demand for timber depends on the number of houses/buildings annually constructed and the amount of timber used for furniture. Of course, it also depends on product prices and their substitutes. House or building construction also depends on the economic growth or income growth of a nation. If the economic growth accelerates, the number of houses to be constructed also increases and the demand for furniture also increases. It is also true that the amount of timber used also depends on the prices of its substitution. The price of timber has significantly increased over the last three years. Hence, people mainly in urban areas that too in Kathmandu are now slowing switching to iron and aluminum as a substitute of timber for building/house construction.

4.1. Fuelwood Demand

Fuelwood consumption or demand is a function of percentage of households using fuelwood times per capita use of fuelwood times the number of people in a household.

Demand = f (No. of HH, percentage HH using fuelwood, per capita consumption)

Per capita fuelwood consumption in Terai is estimated to be 456 Kg per annum (from field survey). Per capita fuelwood consumption in the hills and mountains is assumed to be the same (480 Kg per Capita per annum) as specified in the Master plan for the forestry sector. The percentage of fuelwood users for 2011 is estimated to be the same as specified in NLSS – III (2011). The percentage of households using fuelwood is assumed to decline by 1% within every 5 years due to wealth and income effect. 0.8 % of the total household fuelwood consumption is added to account for the fuelwood used in commerce and industries as specified in WECS, 2010. Based on these assumptions and the population distribution in different regions as specified in Table 1 above, we project the fuelwood demand for the next 20 years as shown below.

Table 5: Projected Total Demand of Fuelwood in Nepal

Year	Fuelwood Requirement ('000 Ton per Year)			
	Terai	Hill	Mountain	Total
2011	5,302	4,414	821	10,537
2015	5,626	4,571	833	11,030
2020	6,074	4,786	850	11,710
2025	6,531	4,991	865	12,387
2030	7,015	5,199	878	13,092

As shown in the above Table, the demand for fuelwood would continue to increase significantly due mainly to population growth in the Terai. It is estimated to increase from 5.3 million tons to 7 million tons over a period of 20 years. The fuelwood demand in the hills and the mountains would also increase but at a slower rate. For the hills, the total demand would increase from 4.4 million tons to 5.2 million tons within the coming 20 years. Since the share of the total population in the mountains is very small, the total demand of fuelwood in the mountains is also small. Presently, the demand of fuelwood in the mountain is estimated to be about 0.8 million tons, but would increase to about 0.9 million tons in 2030.

The total fuelwood demand of Nepal is presently estimated to be about 10.5 million tons, about half of which is consumed in the Terai. The demand would increase to 11.7 million tons in 2020, and to about 13 million tons by 2030.

4.2. Timber Demand

As mentioned before, the demand for timber depends on the number of houses constructed and repaired over time. It also depends on the amount of furniture used per household or per building. As the population increases over time, new households are formed; they require new housing and public infrastructures such as schools, banks, government offices etc. Timber is an important material for house or building construction. Based on the assumptions specified in section 2, we have projected the new houses to be constructed over 20 years at an interval of 5 years.

Table 6: Projected Number of New Houses to be Constructed in Nepal Over Different Years

Year	House to be Re-constructed and New House ('000)			
	Terai	Hill	Mountain	Total
2011	146	141	15	301
2015	153	148	15	316
2020	162	157	16	335
2025	203	194	17	414
2030	215	205	18	438

Table 6 shows the projected number of new houses to be constructed during various years in different ecological regions and in Nepal. The new house are constructed either for new household and for this totally new house is needed to be constructed, or it may be constructed after dismantling the old house. The above Table reveals that the number of new house construction in Terai in the year 2011 is 0.15 million. It would be 0.16 million in 2020. It will further increase to 0.22 million in the year 2030. In comparison to Terai, the number of house construction is lower in hills but doesn't vary significantly. In the hills, the number of new house construction in 2011 was about 0.14 million followed by 0.16 million in 2020 and 0.21 million in 2030. The number of house construction in mountains differs significantly and it is 0.015 millions in 2011, 0.016 million in 2020 and 0.018 million in 2030. The total house construction in Nepal in the year 2011 is 0.30 million and in the years 2020 and 2030, it will be 0.34 and 0.44 million respectively

Table 7: Projection of Total Timber Demanded in Various Years (in '000 m^3)

Year	Required Amount ('000 m^3)			
	Terai	**Hill**	**Mountain**	**Total**
2011	1,456	1,721	194	3,371
2015	1,548	1,783	203	3,534
2020	1,671	1,866	214	3,750
2025	2,073	2,230	235	4,538
2030	2,225	2,328	248	4,801

It is estimated that a house made of branches, bamboos and wood requires about half (200 Cft) of the total timber (400 Cft) as required for the construction of cemented and concrete house. The percentage of households having a house made of branches, bamboos and wood is given in annex-3.

From the analysis of the data, it was found that the timber demand is the highest in the Terai, and the lowest in the mountain during all the periods for which the projection is done. In 2011, the demand of timber in Terai is 1.46 million m^3 which is expected to rise to 2.23million m^3 during the year 2030 (Table 7). In case of Hill, the demand is found to be 1.72 million m^3 in the year 2011 and it is projected to rise to 2.33 million m^3 in the year 2030. The above Table shows that there is smaller difference in the demand between Terai and Hill as compared to Terai and mountain or hill and mountain. The demand of timber projected for Mountain region is found to differ significantly from that of Terai and Hill regions, and it is expected to rise from 0.19 million m^3 in 2011 to 0.25 million m^3 in 2030. As shown in Table-7, the total demand of timber is 3.37 million m^3 in 2011, 3.75 million m^3 in 2020 and 4.80 million m^3 in 2030.

5. Supply Analysis for Fuelwood and Timber in Nepal

The sources of supply of woody materials are: the national forests (different forest regimes such as Community Forest, Collaborative Forest, Leasehold Forest, Government Managed Forests) and trees on farm and on Non-Cultivated Inclusion (NCI). Some woody material is also derived from the Buffer Zone forests surrounding the National Parks and Reserves. Buffer Zone regulations have certain restrictions on the sale of forest products outside the Buffer Zone.

Fuelwood and logs from the Government Managed Forests are sold through various entities – District Forest Product Supply Committees (DFPSC), Timber Corporation of Nepal (TCN), and District Forest Office (DFO). Some poles and fuelwood is also supplied by the Forest Products Development Board (FPDB) from the eucalyptus and Sissoo plantations raised mainly in the Sagarnath area in the Terai.

Logs are sold by the DFPSCs for agriculture implements to the rural households and for people affected by natural calamities such as fire and flooding mainly in the Terai districts. They are supplied at 10% of the royalty rate for these two purposes. DFPSCs also sell timber at a royalty rate for district based development work. We do not have any data on the volume of logs sold for these purposes. But our estimate is that it is insignificant in terms of total timber consumed in Nepal.

TCN and FPDB are both para-statal organizations, and are heavily influenced by the decision of the government. TCN gets timber and fuelwood from the government managed forests at royalty rates, sells logs, sawn timber, and fuelwood at rates fixed by its board and the Ministry of Forests and Soil Conservation. The amount of timber sold by TCN now ranges from about 4 to 8 hundred thousand Cft in terms of round wood equivalent. The royalty rate of logs of various species and fuelwood as fixed by the government of Nepal is given in Annex 1. The selling price of logs, sawn timber and fuelwood by TCN at various districts of Nepal is given in Annex 2. Both the royalty rates and the TCN price of logs, sawn timber, and fuelwood are below the market price.

The timber and fuelwood that remains after providing them to DFPSCs and TCN is auctioned by the DFO at various lots located in various districts. The floor price of these logs and fuelwood is based on the royalty rates plus the cost of harvesting, logging and transporting them to sales depot (lot).

Annual sales of logs, fuelwood and other forest products sold by the Department of Forests and its districts (through DFO) are reported in HAMRO BAN, an annual report of the Department of Forests. As per this publication, the annual amount of logs sold by the government from the government managed forests is about 1.2 to 1.4 million Cft, the revenue from which is about NRs 600 million per year, more than 80 percent of which is derived from the sale of round wood (timber).

As discussed before, about 30 percent of total forests (including shrubland) of Nepal is managed by local people as Community Forests (CF). About 40% total households are the members of CF. These households obtain the forest products at a nominal price (set by the Community Forest Users' Group) for their own consumption. The amount of timber (logs) and fuelwood sold to community household through such a process is not officially known, but we can estimate that significant amount of timber and fuelwood is used by these rural households for their own use. The surplus timber and fuelwood from CF has to be sold though auction but not below the royalty rates fixed by the government. As per the records of Community Forest Division (CFD), about 2.5 million Cft of logs of various species was sold by CFUGs through auction in the fiscal year 2007/2008. It was about 5.8 million Cft of logs in 2009/10.

The other major source of timber and fuelwood derived from the compact plantations and trees grown on farm (agriculture area and NCI) by rural households. Official record on the amount of timber and fuelwood supplied through this source to rural households for their own consumption and for sale to outside market are difficult to get. But one estimate suggests that about 2.8 million Cft of timber (log) is

sold in the commercial market. We think that the proportion of timber and fuelwood supplied from this source is significant. MPFS estimates that it is more than 30 percent of the total supply in Nepal.

The Terai forests are also vulnerable to deforestation due mainly to expanding farming areas, and building up of public infrastructures. We estimate that forest area of the Terai equivalent to about 400 hactares will be annually deforested to meet these demands. The supply of fuelwood and timber from these deforested area would be equivalent to the total growing stock of wood in these areas discounted by the accessible and recovery factors of the Terai.

5.1. Wood Supply from Deforestation

From the analysis of forest data of 1991/92 and 2001/02, the rate of deforestation was projected to be about 2,000 ha of Government Managed Forests (GMF) in every 5 years in the Terai. This also means that annually about 400 ha of GMF would be converted to other land uses. As a consequence, there will be additional supply of fuelwood and timber from the Terai forest including the one from sustained management. However, we estimate that there will not be deforestation in hills and mountains. It should be mentioned that our study is a meta-analysis or at macro level. If at all certain deforestation occurs along the roads and urban centers that would be compensated by the conversion of other lands into forests. Out of the total wood obtained from deforestation, it is estimated that 75% will be in terms of fuelwood, and 25% as timber. The accessibility of the forest prone to deforestation is assumed to be 100%, and recovery factor of the wood from these deforested would be 70%. Furthermore, the growing stock per hectare of these forests is estimated to be 179.42 m^3/ha which is obtained by averaging the growing stock of the forests of the Terai districts. Thus, by taking above things into consideration, the total wood supply from Terai deforestation in every five years is estimated to be 251.19 thousand m^3 out of which 188.39 thousand m^3 i.e., 141.29 thousand Metric Tons is fuelwood and 62.80 thousand m^3 is timber. This implies that 50.24 thousand m^3 of wood (37.68 thousand m^3 fuelwood and 12.56 thousand m3 timber) is obtained each year through deforestation.

Details of Supply of Wood Products from 2011 to 2030 by different regimes, timber and fuel wood products are provided in Annex 3.

5.2. Wood Supply from Different Forest Regimes

The following table 8 provides the sources of wood supply in Nepal. It is to be noted that wood products are not only obtained from forests, but also from other land uses such as farming and Non-Cultivated Inclusions (NCI). Similarly, we have not included wood harvests from protected areas. The table below also provides the supply of wood products from different sources of Nepal in different years.

Table 8-A: Projected Effective Supply (Yield) of Wood during Various Years (in '000 Metric Tons)

Land use		Year 2011				Year 2015			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		206.25	1,757.55	535.59	2,499.39	206.25	1,757.55	536.38	2,500.18
NCI		505.37	438.90	32.18	976.44	505.37	438.90	32.37	976.64
Forests	CF and CFM	373.50	2,679.75	1,593.60	4,646.85	373.5	3,161.25	2,035.2	5,569.95
	Forests under PA	0	0	0	0	0	0	0	0
	Leasehold Forests	20.25	20.25	-	40.50	20.25	31.5	0	51.75
	Government Managed Forests	5.76	1,871.76	1,283.80	3,161.32	5.76	1,723.92	1,137.24	2,866.92
Grassland		0	28.66	0.78	29.43	0	28.66	0.78	29.43
Others		0	0	0	0	0	0	0	0
Total		1,111.13	6,796.86	3,445.94	11,353.93	1,111.13	7,141.77	3,741.97	11,994.87

Table 8-B: Projected Effective Supply (Yield) of Wood during Various Years (in '000 Metric Tons)

Land use		Year 2020				Year 2025			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		257.07	2,190.56	683.68	3,131.31	307.88	2,623.58	831.40	3,762.87
NCI		629.88	547.03	41.45	1,218.36	754.39	655.17	50.64	1,460.20
Forests	CF and CFM	415	4,047.5	2,757.33	7,219.83	456.5	5,040.75	3,572.8	9,070.05
	Forests under PA	0	0	0	0				0
	Leasehold Forests	22.5	47.5	0	70	24.75	66	0	90.75
	Government Managed Forests	6.72	1,838.76	1,103.26	2,948.74	7.68	1,904.32	1,009.84	2,921.84
Grassland		0	28.66	0.78	29.43	0	28.66	0.78	29.43
Others		0	0	0	0	0	0	0	0
Total		1,331.17	8,700.01	4,586.51	14,617.68	1,551.20	1,0318.47	5,465.46	17,335.14

Table 8-C: Projected Effective Supply (Yield) of Wood during Various Years (in '000 Metric Tons)

Land use		Year 2030			
		Mountain	Hills	Terai	Total
Agriculture		358.70	3,056.60	979.56	4,394.86
NCI		878.90	763.30	59.94	1,702.14
Forests	CF and CFM	498.00	6,141.00	4,486.40	11,125.40
	Forests under PA	0	0	0	0
	Leasehold Forests	27.00	87.00	-	114.00
	Government Managed Forests	8.64	1,920.60	855.00	2,784.24
Grassland		-	28.66	0.78	29.43
Other					
Total		1,771.24	11,997.16	6,381.68	20,150.07

Out of the total wood produced from different land uses, we have to allocate this wood into fuelwood and timber. This allocation depends on how scarce timber is in a given area. Therefore, scarcity or the price of timber determines the residual use of wood. For our analysis, we estimate that about 85 percent of the total wood is used as fuelwood in mountains, and the rest is used as timber. In the hills, we estimate the fuelwood proportion to be about 80 percent. In the Terai, the value of wood is higher and hence we estimate that about 75 percent of wood is used as fuelwood and the remaining 25 percent is used a timber.

5.3. Timber Supply from Different Forest Regimes

Timber supply from different land use and forest management regimes is given in 9-A, 9-B and 9-C. As is shown below, about half of the total supply is from Community and collaborative forest management. The largest share of the total supply is from the hills, and lowest share is from the mountain.

Table 9-A: Projected Effective Supply (Yield) of Timber in Various Years (in '000 m^3)

Land use		Year 2011				Year 2015			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		41.25	468.68	178.53	688.46	41.25	468.68	178.79	688.72
NCI		101.07	117.04	10.73	228.84	101.07	117.04	10.79	228.90
Forests	CF and CFM	74.70	714.60	531.20	1,320.50	74.70	843.00	678.40	1,596.10
	Forests under PA	-	-	-	-	-	-	-	-
	Leasehold Forests	4.05	5.40	-	9.45	4.05	8.40	-	12.45
	Government Managed Forests	1.15	499.14	427.93	928.22	1.15	459.71	379.08	839.94
Grassland		-	7.64	0.26	7.90	-	7.64	0.26	7.90
Other		-	-	-	-	-	-	-	-
Total		222.23	1,812.50	1,148.65	3,183.37	222.23	1,904.47	1,247.32	3,374.02

Table 9-B: Projected Effective Supply (Yield) of Timber in Various Years (in '000 m^3)

Land use		Year 2020				Year 2025			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		51.41	584.15	227.89	863.46	61.58	699.62	277.13	1,038.33
NCI		125.98	145.88	13.82	285.67	150.88	174.71	16.88	342.47
Forests	CF and CFM	83.00	1,079.33	919.11	2,081.44	91.30	1,344.20	1,190.93	2,626.43
	Forests under PA	-	-	-	-	-	-	-	-
	Leasehold Forests	4.50	12.67	-	17.17	4.95	17.60	-	22.55
	Government Managed Forests	1.34	490.34	367.75	859.43	1.54	507.82	336.61	845.97
Grassland		-	7.64	0.26	7.90	-	7.64	0.26	7.90
Other		-	-	-	-	-	-	-	-
Total		266.23	2,320.00	1528.84	4115.07	310.24	2,751.59	1821.82	4883.65

Table 9-C: Projected Effective Supply (Yield) of Timber in Various Years (in '000 m^3)

Land use		Year 2030			
		Mountain	Hills	Terai	Total
Agriculture		71.74	815.09	326.52	1,213.35
NCI		175.78	203.55	19.98	399.31
Forests	CF and CFM	99.60	1,637.60	1,495.47	3,232.67
	Forests under PA	-	-	-	-
	Leasehold Forests	5.40	23.20	-	28.60
	Government Managed Forests	1.73	512.16	285.00	798.89
Grassland		-	7.64	0.26	7.90
Other		-	-	-	-
Total		354.25	3,199.24	2127.23	5680.71

The supply of timber would also increase over time in all the regions. It would further increase, if forest management is intensified and the forest tenure reform is further enhanced and implemented.

5.4. Fuelwood Supply from Different Forest Regimes

Table 10-A, 10-B and 10-C provides details of fuelwood supply over years in the three ecological regions of Nepal. It is shown below that fuelwood supply would be the highest in the hills, because the largest area of community forests is located in the hills, and they are better managed than government managed forests.

Table 10-A: Projected Effective Supply (Yield) of Fuelwood in Various Years (in '000 Metric Tons)

Land use		Year 2011				Year 2015			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		175.31	1,406.04	401.69	1,983.04	175.31	1,406.04	402.29	1,983.64
NCI		429.56	351.12	24.13	804.81	429.56	351.12	24.28	804.96
Forests	CF and CFM	317.48	2,143.80	1,195.20	3,656.48	317.48	2,529.00	1,526.40	4,372.88
	Forests under PA	-	-	-	-	-	-	-	-
	Leasehold Forests	17.21	16.20	-	33.41	17.21	25.20	-	42.41
	Government Managed Forests	4.90	1,497.41	962.85	2,465.15	4.90	1,379.14	852.93	2,236.96
Grassland		-	22.92	0.58	23.51	-	22.92	0.58	23.51
Other					-				
Total		944.46	5,437.49	2,584.46	8,966.40	944.46	5,713.41	2,806.48	9,464.35

Table 10-B: Projected Effective Supply (Yield) of Fuelwood in Various Years (in '000 Metric Tons)

Land use		Year 2020				Year 2025			
		Mountain	Hills	Terai	Total	Mountain	Hills	Terai	Total
Agriculture		218.51	1,752.45	512.76	2,483.72	261.70	2,098.87	623.55	2,984.12
NCI		535.40	437.63	31.09	1,004.11	641.23	524.13	37.98	1,203.35
Forests	CF and CFM	352.75	3,238.00	2,068.00	5,658.75	388.03	4,032.60	2,679.60	7,100.23
	Forests under PA	-	-	-	-	-	-	-	-
	Leasehold Forests	19.13	38.00	-	57.13	21.04	52.80	-	73.84
	Government Managed Forests	5.71	1,471.01	827.45	2,304.17	6.53	1,523.46	757.38	2,287.36
Grassland		-	22.92	0.58	23.51	-	22.92	0.58	23.51
Other									
Total		1,131.49	6,960.01	3,439.88	11,531.38	1,318.52	8,254.78	4,099.10	13,672.40

Table 10-C: Projected Effective Supply (Yield) of Fuelwood in Various Years (in '000 Metric Tons)

Land use		Year 2030			
		Mountain	Hills	Terai	Total
Agriculture		304.90	2,445.28	734.67	3,484.85
NCI		747.07	610.64	44.96	1,402.66
Forests	CF and CFM	423.30	4,912.80	3,364.80	8,700.90
	Forests under PA	-	-	-	-
	Leasehold Forests	22.95	69.60	-	92.55
	Government Managed Forests	7.34	1,536.48	641.25	2,185.07
Grassland		-	22.92	0.58	23.51
Other					
Total		1,505.55	9,597.72	4,786.26	15,889.54

5.5. Timber Supply Analysis in Kathmandu Valley

The forest office at Thankot, the entry road to Kathmandu keeps all the records of forest products entering Kathmandu. We requested the Kathmandu District Forest Office (DFO) to provide data on timber and fuelwood entering Kathmandu for the last three fiscal years (2008/09, 2009/10, and 2010/11). The records provide information on amount of fuelwood, strip, and timber (both round and sawn wood), the type of species (Sal, Sissoo, Asna, Pine, and others), and their sources (Community Forests, Government managed Forests, and Private forests or trees on farm).

We did an analysis of this data. We found that about 13.3 million Cft (converting sawn wood into round wood) of round wood equivalent entered Kathmandu during these three years, or about 4.4 million Cft of round wood equivalent per year. If we breakdown this amount by sources, then it shows the following share:

Community Forests	54.15%
Government managed Forests	27.10%
Trees on Private land (private Forest)	18.75%

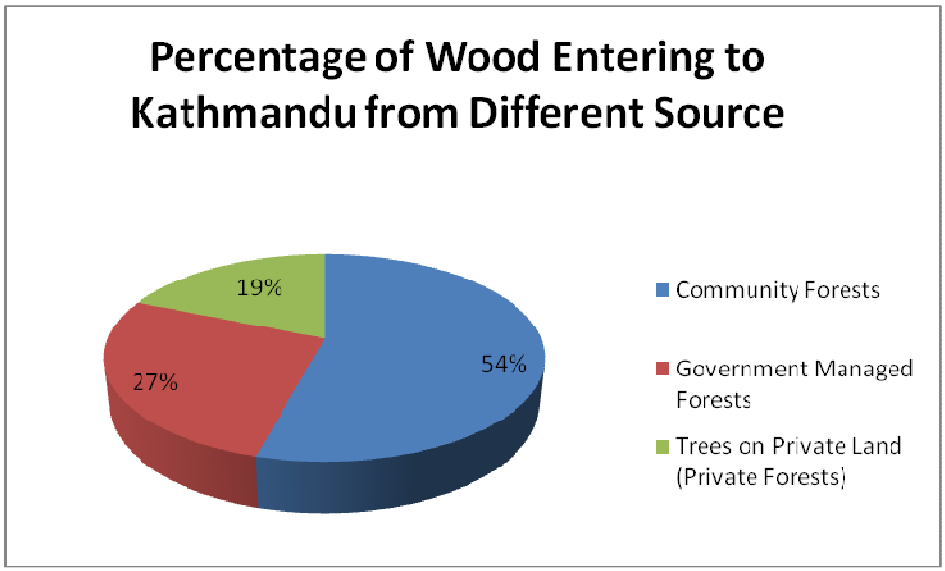

Figure IV: Pie-Chart Showing Percentage of Wood Entering to Kathmandu from Different Sources

The species wise composition of this timber entry in Kathmandu is given below:

Sal	56%
Asna	14%
Sissoo	12%
Pine	12%
Other	6%

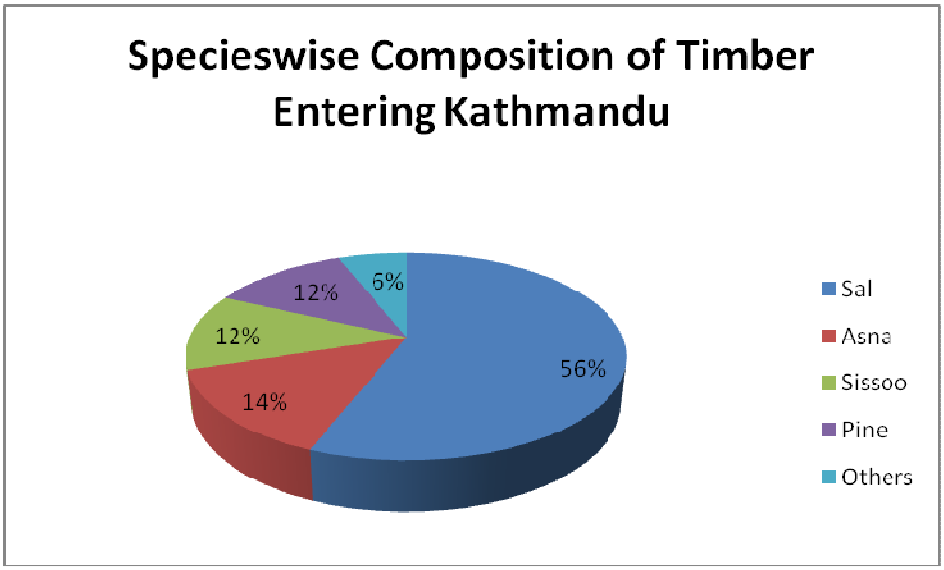

Figure V: Pie-Chart Showing Species Wise Composition of Timber Entering Kathmandu

Sal, Asna and Sissoo are derived from Terai. However, pine comes from the hills, and that too mainly from the Far-Western Development regions of Nepal.

5.6. Climate Change, Wood Supply and Private Forest

Forest conservation and enhancement is the cheapest means of carbon sequestration in the world. Therefore, REDD is becoming a popular program both in the developing countries and carbon financing in the developed countries. The production of this ecosystem service and its compensation in developing countries is a recurring theme in UNFCCC conventions.

Nepal is preparing to implement REDD program through financing from different international financing mechanism. The very objective of this REDD strategy is to reduce the harvesting use of woody products and to enhance its retention in the forests itself so that carbon is not emitted in the air. The compensation (payment mechanism) for REDD entails better management and reduced harvesting of forest products. This will create pressure to reduce forest product harvesting from the national forests including community forests of Nepal.

The REDD policy and strategy would provide incentives for tree farmers to grow trees on their private land, as reduced harvesting of forest products from national forests will create scarcity of forest products and their price increase. Agriculture Sample survey carried out in every 10 years also show that tree growers are increasing the number of trees on their farms. Table 11 and 12 show the number of trees on farm in 1991 and 2001 as reported by CBS.

Table 11: Number of Trees and Bamboos in Farms of Nepal in 1991.

Regions	Types of Trees				Area Under Bamboos (ha)
	Fruit Trees	Fodder Trees	Forest Trees	Total Trees	
Mountains	698,493	692,752	3,127,787	4,519,032	451
Hill	4,015,130	5,538688	20,131,787	29,685,585	3,198
Terai	4,435,701	196,686	10,217,090	14,769,477	2,375
Total	9,149.324	6,428,126	33,476,644	48,974,094	6,024

Source: CBS 1991

Table 12: Number of Trees and Bamboos in Farms of Nepal in 2001.

Regions	Types of Trees				Area Under Bamboos (ha)
	Fruit Trees	Fodder Trees	Forest Trees	Total Trees	
Mountain	1,055,377	628,082	4,937,414	6,620,873	80.90
Hill	8,875,183	12,974,473	25,691,001	47,540,657	2,280.30
Terai	6,514,109	746,894	8,076,529	15,337,532	3,984.90
Total	16,444,669	14,349,449	38,704,944	69,499,062	6,346.10

Source: CBS 2001

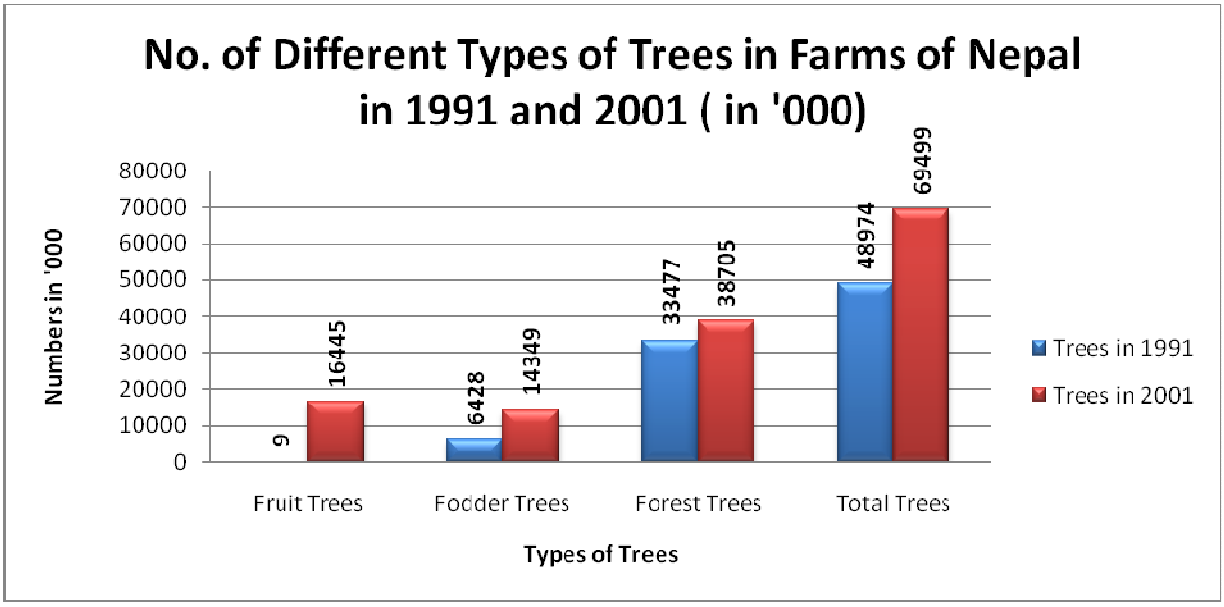

Figure VI: Bar-Diagram Showing the Increase in Number of Trees in Farms Between 1991 and 2001

The National Sample Census of Agriculture conducted by the Central Bureau of Statistics shows that about 27,000 ha of forest area is managed as compact tree plantation in 2001. However, official figure from the government shows that 2,458 private owners manage only about 2,300 ha of forest – more than 10 times difference in these two official records.

5.7. Surplus and Deficit of Forest Products in Different Regions

Table 13 and 14 provide the demand and supply of fuelwood and timber in three different ecological regions of Nepal over the coming 20 years at an interval of 5 years. Similarly, figure VII also gives a bar diagram of the demand and supply of wood in these three regions at an interval of 5 years. Fuelwood deficit would decline from 2.7 million tons in 2011 to about half a million ton in 2030 in the Terai. The

rest of other regions would have surplus fuelwood. The supply of fuelwood would increase in the Terai and other regions due mainly to increase in accessibility, recovery and improved management. Fuelwood demand would reduce drastically if the household consumption is reduced or if there is an increased substitution of fuelwood by LPG. The supply of wood can be significantly increased by enhanced forest management, for which concerted action by all the sectors and stakeholders is necessary.

Table 13: Summary Fuelwood Demand, Supply, Deficit and Surplus (in '000 Metric Tons)

Year	Mountain			Hill			Terai			Total		
	Demand	Supply	Surplus	Demand	Supply	Surplus	Demand	supply	Deficit	Demand	supply	Deficit/ Surplus
2011	820.89	944.46	123.57	4,413.89	5,437.49	1,023.60	5,301.94	2,584.46	-2,717.49	10,536.72	8,966.40	-1,570.32
2015	796.92	944.46	147.55	4,326.44	5,713.41	1,386.97	5,354.06	3,089.06	-2,265.00	10,477.42	9,746.94	-730.48
2020	776.01	1,131.49	355.48	4,269.33	6,960.01	2,690.68	5,480.55	3,722.46	-1,758.09	10,525.89	11,813.96	1,288.07
2025	750.02	1,318.52	568.50	4,174.61	8,254.78	4,080.17	5,564.08	4,381.68	-1,182.40	10,488.71	13,954.98	3,466.28
2030	721.31	1,505.55	784.24	4,053.45	9,597.72	5,544.28	5,615.65	5,068.84	-546.81	10,390.41	16,172.12	5,781.71

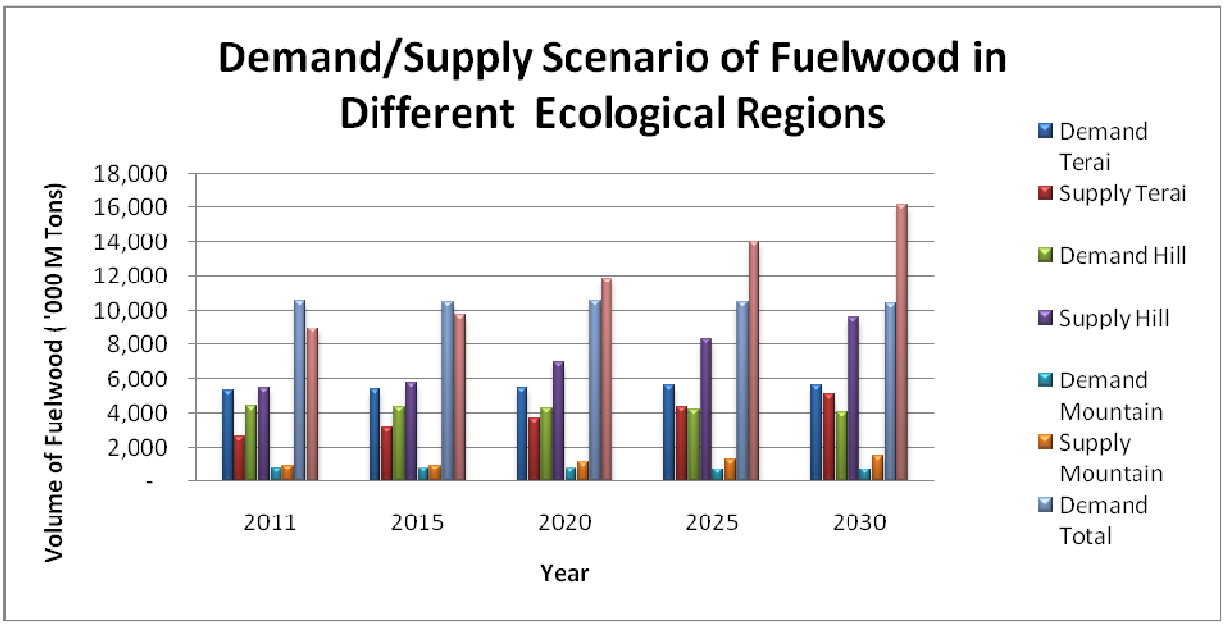

Figure VII: Bar-Diagram Showing the Demand and Supply Scenario of Fuelwood in Different Ecological Regions

Table 14 and figure VIII provide information on the demand, supply and balance of timber in the three regions of Nepal in various years from 2011 to 2030. The Terai regions will have a shortage of timber over time. However, the deficit would decline over time. For example, the deficit of timber would be about 300,000 M^3 in 2011 and 2015, but will reduce to less than 100 M^3 in 2030. This is mainly due to increased supply of timber through enhanced accessibility, recovery and higher productivity (better forest management). The other reasons would have surplus timber over the years.

The surplus timber in the hills and mountain should be tapped as an opportunity to expand wood processing units such as veneer and plywood factories or other reconstituted wood. The expansion of these factories can also mitigate the shortfall of timber in the Terai.

Table 14: Summary Timber Demand, Supply and Deficit/ Surplus (in '000 m3)

	Mountain			Hill			Terai			Total		
Year	Demand	Supply	Surplus	Demand	Supply	Surplus	Demand	supply	Deficit	Demand	supply	Deficit/ Surplus
2011	193.71	222.23	28.52	1,721.23	1,812.50	91.27	1,455.94	1,148.65	-307.30	3,370.88	3,183.37	-187.51
2015	202.55	222.23	19.68	1,783.18	1,904.47	121.29	1,548.27	1,247.36	-300.91	3,534.00	3,374.06	-159.94
2020	213.63	266.23	52.61	1,866.04	2,320.00	453.97	1,670.51	1,528.86	-141.65	3,750.18	4,115.10	364.92
2025	235.31	310.24	74.93	2,229.77	2,751.59	521.82	2,072.83	1,821.86	-250.97	4,537.91	4,883.69	345.78
2030	247.78	354.25	106.47	2,327.63	3,199.24	871.61	2,225.49	2,127.26	-98.23	4,800.89	5,680.75	879.86

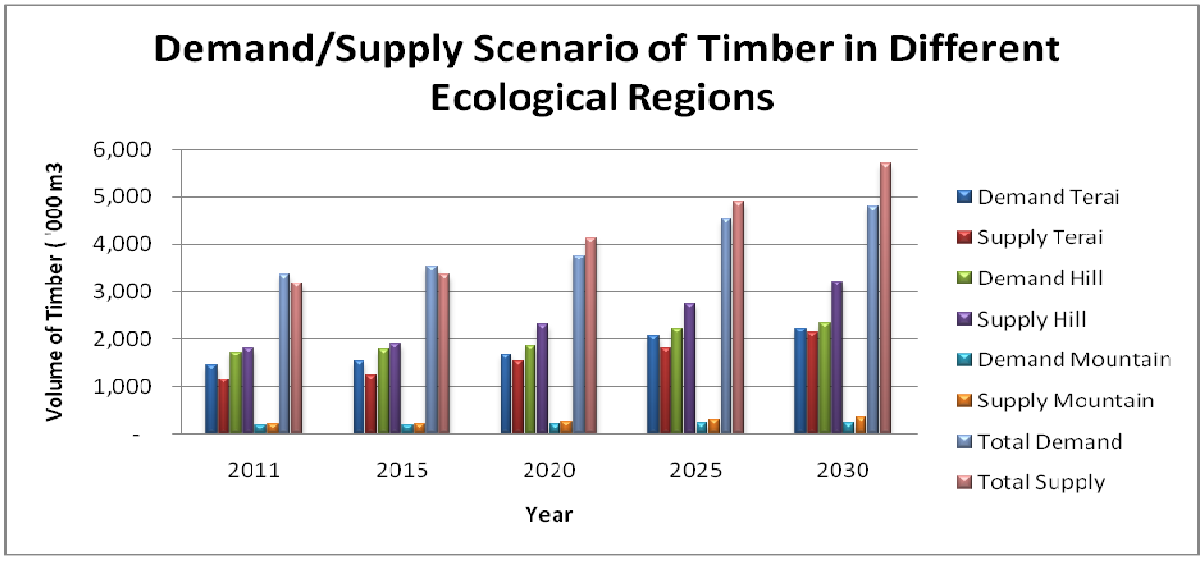

Figure VIII: Bar-Diagram Showing the Demand and Supply Scenario of Timber in Different Ecological Regions

6. Value Chain Analysis of Timber of Three Species

We carried out a value chain analysis of three important species namely Sal, Sissoo and Asna. The demand of Sal is very high for house and building construction. It is very popular for door and window frame. Sissoo is used for furniture and also as a decorative wood. Asna is comparatively heavy and is prone to disease attack if it is exposed to water. Thus, it is used for interior door and window frame, and also for parqetting.

Since these three species are predominantly traded in Kathmandu, we did a value chain analysis based in Kathmandu. It is estimated that about half of the commercially traded yet officially harvested timber is sold in Kathmandu. Majority of this timber comes to Kathmandu from the Terai forest.

Forests are harvested and logged in the Terai both in government managed forests, Community Forests and from private tree growers. This timber is then sold in the Terai and about half of this commercially traded timber ultimately comes to Kathmandu either in round logs or in the form of sawn timber. The market share of TCN selling its sawn timber in Kathmandu is negligible due to inadequate availability although its price is lower than the prevailing market price.

The following Table (Table 13) provides details of value chain of timber (sawn and round wood) in Nepal. The values up to the round wood are calculated for Terai, since the logs are sold initially in the Terai. Based on the market price of Sawn timber of Sal, Sissoo and Asna, we did the backward calculation based on the information provided by people engaged in harvesting, logging, and transportation and final sale in Kathmandu. The values of the timber both round wood and sawn depends on the dimensions and the species. Our calculations are based on the mostly demanded dimensions. For example, for sawn timber of Sal, the most preferred dimensions are 7 to 9 feet in length, and 4” by 3” in width and thickness.

Table 15: Value Chain Analysis of Sal, Sissoo and Asna (Nrs)

S. No.	Activities	Cost Per Cft.		
		Sal	Sissoo	Asna
1	Marking (Chapan)	13	13	13
2	Felling and Logging	13	13	13
3	Debarking and Ring cutting	8	8	8
4	Loading	11	11	11
5	Piling	5	5	5
6	Yarding	12	12	12
7	Transportation	40	40	40
8	Unloading	4	4	4
9	VAT	14	14	14
Sub Total I: Field Costs		**119**	**119**	**119**
1	VDC	10	10	10
2	Forest Development Fund	5	5	5
3	Local gangs	10	10	5
4	Transaction Costs	80	80	30
5	Log Marking	15	15	10
6	Return on Investment and Profit	30	30	15
7	Miscellaneous	15	15	10
Sub Total II: Additional Cost within District		**165**	**165**	**85**
1	Loading and Unloading	15	15	15
2	Miscellaneous	30	30	15
3	Transportation to Kathmandu	150	150	150
Sub Total III: Additional Cost in Urban Market		**195**	**195**	**180**
Total A = (I+II+III)		**479**	**479**	**384**
1	**Sawlog Price in Kathmandu**	**1700**	**1800**	**700**
2	Stumpage Price + VAT	1221	1321	316
3	**Stumpage Value**	**1081**	**1169**	**280**
1	Sawn Timber Price (Adjusting recovery percent)	2615	3600	1167
Sub Total IV		**2615**	**3600**	**1167**
1	Sawmilling Cost	70	70	70
2	Yarding	12	12	12
3	Piling	5	5	5
4	Return on Investment and Profit	400	400	300
Sub Total V: Additional Sawn Timber in Urban Market		**486**	**486**	**386**
Total Sawn Timber Price in Kathmandu = (IV+V)		**3101**	**4086**	**1553**

Note: The Recovery percent of Sal is taken as 65%, Sissoo is taken as 50% and Asna is taken as 60%.

Based on the above Table (Table 13), it appears that the government captures about 50 to 75 percent of the final sawn timber value. The return to government includes the Stumpage price and VAT. The government's share is the highest for Sal and Sisso and the lowest for Asna. Transportation accounts for about 9 to 24 percent of the total value of timber.

Table16: Share of total Value accruing to different stakeholders

Percent	Sal	Sissoo	Asna
Return to Govt	75	76	52
Total Transaction cost	8	8	9
Transportation	10	9	24
Others	7	7	14

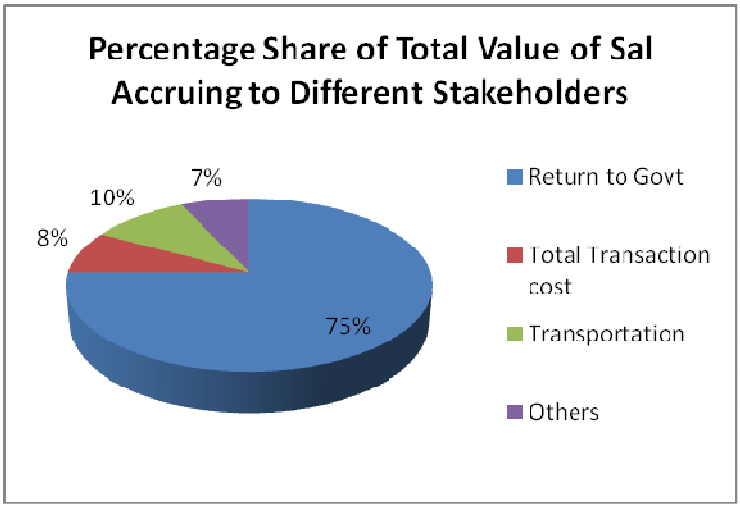

Figure IX: Pie-Chart Showing the Percentage Share of Total Value of Sal Accruing to Different Stakeholders

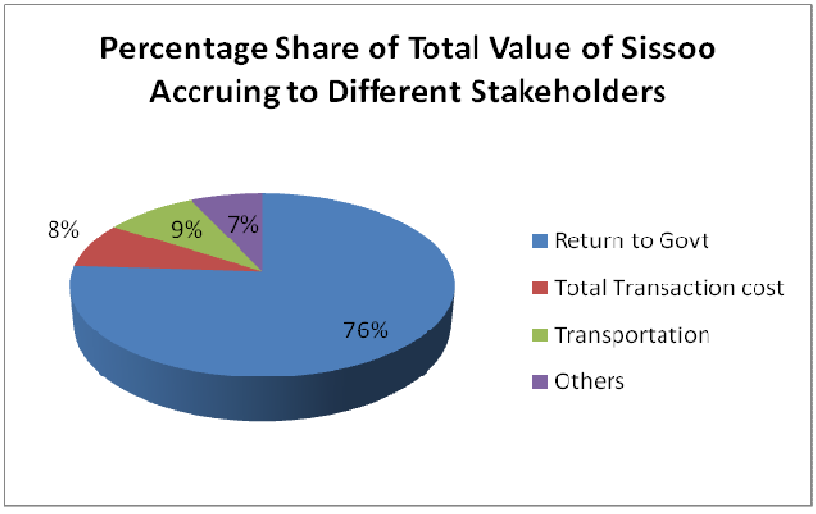

Figure X: Pie-Chart Showing the Percentage Share of Total Value of Sissoo Accruing to Different Stakeholders

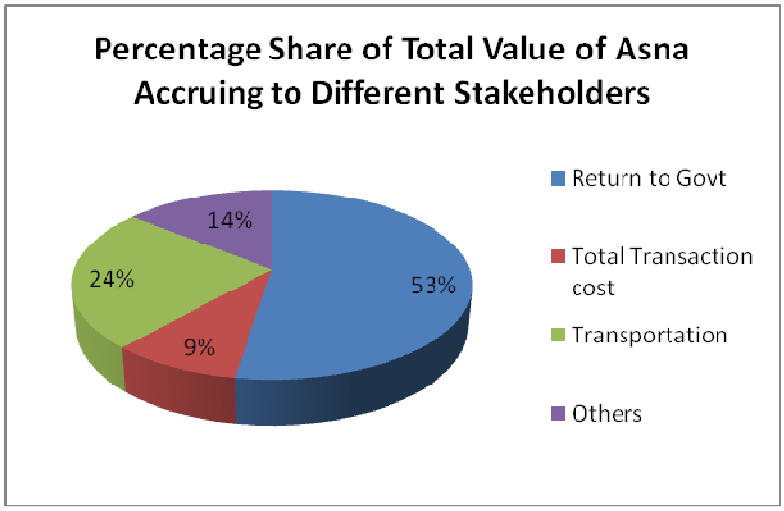

Figure XI: Pie-Chart Showing the Percentage Share of Total Value of Asna Accruing to Different Stakeholders

Transactions costs include payment to officials, timber marking and other miscellaneous costs. The cost which mainly consists of unofficial payment to different staff accounts for about 8 to 9% of the total value of timber. It is the lowest for Sissoo, but the transportation cost is highest for Asna. This is mainly due to the lower value of sawn timber of Asna in Kathmandu. Yet, its unit transportation cost is about the same as of Sal. Transportation costs include the costs incurred in the transportation of log, loading and unloading costs. Other cost includes costs incurred during marking, logging, felling, debarking, ring cutting, forest development fund, local gangs and VDC.

7. Suggestions for Reform

The demand and supply of forest products depends both on the bio-physical context of different regions of Nepal, the economic status of the people living in these regions and policies that are persued and implemented by the government.

It is estimated that about 20 percent of the youth of Nepal is working overseas, and they send remittance equivalent to about one third of the total GDP of Nepal. It is estimated that the total GDP of Nepal is about NRs 1.4 trillion in the fiscal year 2011/12. The infusion of cash through remittance, and the shortage of youth due to overseas employment have significant impact on the demand and supply of forest products in Nepal. The transition to cash economy has led to some substitution of fuelwood by Kerosine and LPG mainly in the urban and peri-urban areas of Nepal, which is also attested by the recent Nepal Living Standard Survey report. Similarly, collection and gathering of forest products is also reduced due to the lack of adults youths in the rural areas. This shortage of labour has some beneficial effects as well at least in the forestry sector – forest area and growing stock are increasing at least in the hills of Nepal as reported in the latest report on Dolakha (Niraula et al, 2011). However, the scenario in the Terai is different. Many hill families are also migrating either to the Terai or to urban areas leading to pressure on forests both for land and for forest products. Timber from the Terai is not only used by the residents of the region, significant amount of it is also transported and sold in Kathmandu and Pokhara. Thus, there is both a population pressure on the land and also a pressure on forest products in the Terai. This dual pressure, and the incentive to illegally harvest valuable Sal tree for quick money due to the presence of criminal gangs in the Terai has led to overharvesting of forest products in the Terai region.

The most important policies that affect the supply and demand of forest products are the followings:

- Demographic and economic factors significantly influence the demand of forest products in Nepal

- Regulatory policies relevant to Forestry, Agriculture, Mining's, Road Construction and Maintenance, Hydropower, and other Energy related policies.

- Fiscal and monitory policies such as royalty fixation of forest products, subsidies and taxation on tree plantation, wood production, timber and fuelwood supply and trade, commercialization and processing of these production. Foreign currency exchange rate will also determine the substitutes of timber and fuelwood that are imported from other countries.

- Pricing policies also affect the demand and supply of wood products in Nepal. Excessive export tax on the export of sawn timber virtually acts as a ban on the export of timber to other countries. Similarly, various pricing policies imposed on the sale of wood products through District Forest Products Supply committees, Timber Corporation of Nepal, and the dual prices on the wood products sold by the Community Forest Users' Group of Nepal (one for their own household consumption, and the other on sales outside the group members) affect the price of mainly timber in Nepal. Similarly, the floor price of logs (timber) set by the government on the sale of logs from the community forests and government managed forests affect the price of timber in Nepal. The price set by the Nepal Oil Corporation on the sale of LPG and kerosene affects the demand and supply of fuelwood as they are substitute products. Nepal Electricity Authority also sets the price of electricity in Nepal. These pricing policies of the government or its para-statal corporations actually determine the amount of fuelwood mainly in the urban areas of Nepal. A comparative study of the pricing of various types of fuel in Kathmandu shows that effective price of fuelwood as a source of energy is the highest, and the cheapest source is the electricity.

- Other policies such as transfer of forestry staff, uncertainty of political environment, on-and-off administrative directives and guideline and the rent seeking culture of Nepali society has drastically affected the demand and supply of mainly timber in urban and peri-urban areas of Nepal. This has led to high transaction cost in the supply of wood, that too of timber in the urban areas of Nepal. The economic growth of the country affects the purchasing power of its citizen and hence the demand and supply of wood products in Nepal.

Based on this demand and supply analysis, we can suggest the following reforms in policies:

- Although the forest act of 1993 and forest regulations of 1995 provide ample ground for tenure and governance reform in forestry, it has been handicapped by the on-and-off changed in policies and administrative orders. Policy needs to be consistent so that people can make decisions based on the written and formal legal provisions.

- The Department of Forests should announce the amount of forest products to be annually harvested from National Forests in advance in a transparent way so that loggers and timber traders can plan their activities accordingly. The price of timber bidding should also be published in a transparent way so that people know the difference in price between the round wood and the sawn timber sold in the market.

- Forest management needs to be enhanced mainly in the Terai in order to increase its productivity. There are ample scope and opportunity in the better management of forests in the Terai. This way, the supply wood products can be increased significantly. In order to do that, the following things should be immediately carried out on a priority basis:

    - More investment should be made in the forests. The money collected in the name of Forest Development Fund should be channelized towards forest investment (including more financial resource allocation in logistics);

    - The frequent transfer of the forestry staff should be stopped if not reduced drastically;

    - Training should be imparted to forestry staff both in the area of professional forestry as well as in soft programs such as public negotiation, public relations, conflict management etc.

    - Forest harvest plans should be made transparent so that everybody knows the amount of wood products to be sold through bidding process.

    - ICT should be used as an instrument of predictability in the supply of wood products and increase transparency in the sale of forest products

- The provision of sales and marketing of forest products by the government has not changed significantly even after the repeal of the Forest Act of 1961. The present provisions on the sales and marketing of forest products remains the same as that of the provisions of the Forest acts of 1961. This needs to be reformed to reduce the transaction cost of doing forestry business in Nepal.

- There is a scope of value addition of forest products in the hills. Veneer, fiber board and other reconstituted forest based industries could be established in the hills so that these value added products could be transported to the Terai and the urban areas of Nepal. This will also help in lowering the pressure of forest product demand in the Terai.

- Intensive tree plantation program can be promoted in the Terai through farm or agro-forestry. Rather than focusing on reduced land tax for intensive private plantations, mechanism could be devised through buy back guarantee of forest products, and reduced transaction cost in the harvest, logging, transportation and processing of wood products derived from private forests.

- It is very difficult to get relevant and correct information both from official and individual sources. Many of the times, information recorded in official sources do not match and hence very difficult to analyze and synthesize the data and information. We recommend that data and information should be updated and recorded correctly. Moreover, we suggest that price information at the main centres of timber trade should be made public such as price in Dhangadhi, Butwal, Chitwan, Birganj, Biratnagar, Kathmandu and Pokhara thtough monthly information of the Regional Forest Directors, Department of Forest and Ministry of Forest and Soil Conservation such as *Hamro Ban* of the Department of Forests and Websites of Department and Ministry.

References

Amacher, Gregory S., William F. Hyde and Keshav R. Kanel. 1996. Household fuelwood demand and supply in Nepal's Terai and Mid-hills: Choice between cash outlays and labor opportunity. World Development. Vol. 24. No. 4: 1725-1736.

Baland Jean-Marie, Pranab Bardhan, Sanghamitra Das, Dilip Mookherjee and Rinki Sarkar. 2010. The environmental impact of poverty: Evidence from fuelwood collection in rural Nepal. Economic Development and Cultural Change. PP 23-61.

CBS. September 2011. Preliminary Results of National Population Census. 2011. Central Bureau of Statistics. Government of Nepal. Kathmandu, Nepal.

CBS. October 2011.Nepal Living Standards Survey 2010/11. Statistical Report, Volume one and two. Central Bureau of Statistics. National Planning Commission Secretariat. Government of Nepal. Kathmandu, Nepal.

DFRS/FRIS. 1999. Forest Resources of Nepal (1987-1998). Department of Forest Research and Survey, Government of Nepal and Forest Resources Information System Project, Government of Finland. Publication no. 74. Kathmandu, Nepal.

Dhakal,Maheshwar and Misa Masuda. 2009. Local pricing system of forest products and its relations to equitable benefit sharing and livelihood improvement in the lowland community forestry program in Nepal. Forest Policy and Economics. 11: 221-229

DoF. 2005. Forest Cover Change Analysis of the Terai Districts (1990/91-2000/01). Department of Forests. Kathmandu, Nepal.

DoF, 2012. Community Forestry Data Base, Community Forest Development Division, Department of Forest.

Kanel, Keshav. May 1994. Market Opportunities and Constraints. FMUDP Working Paper No. 13. Forest Management and Utilization Development Project. HMGN/FINNIDA. Kathmandu. Nepal.

MPFS. 1988. Master Plan for the Forestry Sector Nepal. Main Report. His Majesty's Government of Nepal, Kathmandu, Nepal.

Natural Resource Committee, 2011, Forest Conservation Problems Report, Parliament of Nepal, January 2011.

Nepal Mani, Apsara Nepal and Kristine Grimsrud. September 2010. Unbelievable but True – Improved Cook-stoves are not helpful in reducing firewood demand in Nepal. SANDEE Working Paper. No. 51-10. Kathmandu, Nepal.

Niraula, Rabin R., and Surya Kumar Maharjan. June 2011. Forest Cover Change Analysis in Dolakha District (1990-2010). A study report submitted to Nepal Swiss Community Forestry Project, Kathmandu, Nepal

Olavi Rautiainen et al. 2000. Optimizing the management of even aged Shorea robusta stands in souther Nepal using individual tree growth models. Forest Ecology and Management. 126. 417-429.

Subedi, Vijaya Raj. 2011. Forest Management Opportunities and Challenges in Nepal. The Nepal Journal of Forestry. Vol XIV, No. 1: 95-110

Vegard Iversen, Birka Chhetry et al. 2006. High value forests, hidden economies and elite capture: Evidence from forest user groups in Nepal's Terai. Ecological Economics. 85. 93-107 WECS. July 2010.

WECS. July 2010. Energy Sector Synopsis Report. Water Energy Commission Secretariat. Government of Nepal. Kathmandu, Nepal.

Annexes

Annex-I:

Section 61, Number 8, Nepal Gazette, Part 5, Date: 2068/2/23

Part 5

Government of Nepal

Ministry of Forest and Soil Conservation

Notice

The Government of Nepal has changed the annex (as given below) of the Forest Regulations-2051 by using the rights provisioned under the Rule 68 of the Regulations.

1. Instead of Annex-2, it is replaced by the following Annex-2.

2. Instead of Section-B of Annex-6, the following Section-B is replaced.

S. No.	Subsoil Forest Product	Rate	Unit
1	Gravel	3	Per Cft
2	Lime stones	3	Per Cft
3	Roofing Slates	3	Per Sq. Ft.
4	Sand	1.5	Per Cft
5	Common Stone	1.5	Per Cft
6	Slate	3	Per Sq. Ft.
7	Imported Coal/Wooden Charcoal	15	Per Kg
8	Mud Coal	2	Per Kg

Note:

1. Under the prevailing law, if the Tax is paid once to any government organizations, then the Tax is not incurred again.
2. The above rate will be tripled while exporting the subsoil forest products.
3. Of Annex-7

    a. Serial Number 1,2,3,4 and 5 of Subsection 5 of Annex A has been removed.
    b. Subsection B has been removed.
    c. Annex-5 of Section C, is replaced by Annex-2.

Annex-2
(Related to Rules 9, 10, 18, 25, 46, 48 and 53)

Rate of Fuelwood and Timber

a. Round Log

S. No.	Timber Species	Grade	Rate per Cft (Rs)
1	Satisal (Rosewood)	-	1,500
2	Sal	A	800
		B	500
		C	300
3	Jungali Sissoo	A	1,000
		B	800
		C	500
4	Okhar (walnut), Champ, Sagawan, Dar	-	500
5	Bijay Sal	-	300
6	Sandan, Pajan	-	300
7	Sissoo (Planted)	Girth greater than or equal to 4’	400
		Girth less than 4’	200
8	Asna,Jamun, Karma, Tooni, Siris, Gamhari	A	300
		B	200
9	Devdar	-	150
10	Khote salla	A	200
		B	150
11	Simal	-	125
12	Harro, Barro, Faldu, Chilaune, Saur	-	200
13	Bhudkul, Gutel, Poplar, Uttis, Tikul, Katus, Masala, Amp, Other Pines, Fir, Spruce	-	100
14	Bajhi, Botdhayero	-	80
15	Khayer (While calculating its volume, its length has to be measured upto final inch)	-	600
			20/Kg
16	Seto Chandan	-	800/Kg
17	Others (except above species)	-	75/Cft

b. Roots and Stumps:

S. No.	Species	Rate (Rs)
1	Khayer	25/Kg
2	Sal	75/Stump
3	Others	40/Stump

c. Poles:

S. No.	Species	Grade	Rate Per Cft (Rs)
1	Sal	A	150
		B	100
2	Asna, Karma and Jamun	A	75
		B	50
3	Masala	A	50
		B	25
4	Others	A	25
		B	15

d. Firewood

S. No.	Purpose	Species	Rate (Rs)
1	Commercial	Sal	8,000/Chatta
			1.00/Kg (Including Lops, Tops and sawn)
		Sissoo and Teak	12,000/Chatta
			1.50/Kg
		Others	4,000/Chatta
			0.50/Kg (Including Lops, Tops and sawn)
2	Death Cremation	Sal	2,000/Chatta
			0.25/Kg(Including Lops, Tops and sawn)
		Others	1,000/Chatta
			0.15/Kg(Including Lops, Tops and sawn)
3	Household use	Sal	4,000/Chatta
			0.50/Kg (Including Lops, Tops and sawn)
		Others	2,000/Chatta
			0.25/Kg (Including Lops, Tops and sawn)

Note:

1) In case of the timber provided for agricultural implements (Yoke, Juwa, Hega, Haris) and to the family suffered from natural calamities, only 10 percent of the aforementioned rate will be applied.

2) While evaluating the timber and fuelwood from the standing trees and stumps, the value will be calculated based on B-grade timber for those species whose grade is not identified and for the timber whose grade is known, the rate is equal to the rate of respective grade as enlisted in the Table above. In case of firewood, the rate is equal to the value for commercial purpose.

3) The Sissoo regenerated naturally is considered as Jungli Sissoo. If the Jungli Sissoo and plantation Sissoo are not separatable. then the rate of the Sissoo will be rated equal to the rate of Jungli Sissoo.

4) For fixing the price of round log and poles, grading is done on the basis of the following standards:

a) Round Timber: If the quantity of timber that can be produced based on the amount of defects is found to vary, then grading should be done on the basis of the percentage of the sawn timber that can be produced. For example: if the timber of length greater than 7 feet and girth greater than 6 feet has higher proportion of defects, causing the production of sawn timber to less than 65%, then the timber can be graded as "B" grade. If the timber of length 5 feet and girth greater than 5 feet has lower proportion of defects, causing the production of sawn timber equal or greater than 65%, then the timber should be graded as "A" grade. The main basis for grading will be the girth of timber and the recovery percent of sawn timber.

1. Sal:

a. "A" Grade: A timber of length greater than 7 feet, Girth greater than 6 feet. If the timber is attacked by insects then the timber possessing upto two holes and from which 65% or more sawn timber can be obtained.

b. "B" Grade: A timber of length greater than 4 feet, girth ranging from 4 feet to 6 feet. If the timber is attacked by insects then the timber possessing upto 5 holes, cracked, fissured, having the occluded barks and tubers, hollow type and from which sawn timber greater than 40% and less than 65% sawn timber can be obtained.

c. "C" Grade: A timber of length greater than 2.5 feet, girth greater than 2.5 feet, fissured, cracked, tubered, bark occluded, hollow type, wrapped, if attacked by insect then the timber possessing more than 5 holes, decayed, having ring and from which sawn timber less than 40% can be obtained.

2. Asna, Jamun, Karma, Tooni, Siris and Gamari:

a. "A" Grade: A timber of length greater than 7 feet, girth greater than 6 feet. If the timber is attacked by insects then the timber possessing upto two holes and from which 65% or more sawn timber can be obtained.

b. "B" Grade: A timber of length greater than 2.5 feet, girth ranging in length from 2.5 feet to 7 feet, fissured, cracked, with knots, impregnated with bark, hallow wood, wrapped, or if attacked by insect then the timber possessing more than 2 holes, decayed, having ring and from which sawn timber less than 65% can be obtained.

3. Jungli Sissoo:

a. "A" Grade: A timber of Length greater than 7 feet, Girth greater than 6 feet. If the timber is attacked by insects then the timber possessing upto two holes and from which 65% or more sawn timber can be obtained.

b. "B" Grade: A timber of length greater than 6 feet, girth ranging from 5 feet to 6 feet. If the timber is attacked by insects then the timber possessing upto 5 holes, cracked, fissured, wood impregnated with bark and knots, hollow type and from which greater than 40% but less than 65% sawn timber can be obtained.

c. "C" Grade: A timber of length greater than 2.5 feet, girth ranging from 2.5 feet to 6 feet, fissured, cracked, wood impregnated with bark and knots, hollow type, wrapped, or if attacked by insect then the timber possessing more than 5 holes, decayed, having ring and from which sawn timber less than 40% can be obtained.

4. Khote Salla:

a. "A" Grade: A timber of length greater than 7 feet, girth greater than 5 feet. If the timber is attacked by insects then the timber possessing upto two holes and from which 65% or more sawn timber can be obtained.

b. "B" Grade: A timber of length greater than 2.5 feet, with girth less than 5 feet, fissured(CHIRIYEKO), cracked(CHARKEKO), knotted (GATHO BHAYEKO), wood with bark inside, hollow type, wrapped, or if attacked by insect then the timber possessing more than 2 holes, decayed, having ring and from which sawn timber less than 65% can be obtained.

b) Poles:

a. "A" Grade: Length greater than 6 feet, girth ranging from 2 feet to 2 feet 11 inches, fissured (CHIRIYEKO) and forked (FATEKO).

b. "B" Grade: Length greater than 6 feet, girth ranging from 1 feet 4 inch to 1 feet 11 inch, fissured, forked, and curved (BANGO, TINGO)

Justification: For the purpose of this Annex, Poles refers to the round log having less than 3 feet girth at the base and more than 6 feet length.

5) While fixing the price of the round timber, sawn timber and firewood, it should be done in the following ways.

a) Round Timber:

i. Length:

1. While measuring length of a log having the girth reducing from base towards the top, girth should be measured under bark at the centre portion of the log.

2. For the logs whose base, top and centre portion do not have the same girth, the girth should be taken at both ends of the log, and the average of two measurements is taken as the girth.

3. If there are large knots (GATHO) or fissure (Khalto) at the centre of the log, then the measurements should be rejected at such points. The measurements of girth should be done at two points on both side of the centre portions and it should be

closer to the centre. Then the average of the two measurements is taken as the girth of the log.

4. If the log is irregular or is narrowed, then the measurements should be taken at the 3 points (two measurements at end and one measurement at the centre) and the girth of the log is taken as the average of these three measurements.

5. While measuring the length of the logs, 1 foot should be taken for the lengths longer than 8 inches, 0.5 feet for the length between 4 inches to 8 inches and 0 feet for the length shorter than 4 inches.

ii. Girth: While measuring the girth, in case of nearest inches, 1 inch should be taken for the girth greater than 4 LINE and 0 inch should be taken for the girth upto 4 LINE.

b) Sawn timber:

i. Length:

1. While measuring the length of sawn timber, the length should be measured to the nearest inch by deducting the slant portion (CHHADKE BHAG).

2. The width of the sawn timber should be measured to the nearest inch.

ii. Width and Thickness: The width and thickness of sawn timber should be measured to the nearest inch. While doing so, the length of the decayed portions should be deducted i.e, length of decayed portions should not be taken.

c) Firewood: Firewood will be measured in Chatta as follows:-

1Chatta (500Cft) = 20 feet*5feet*5feet

6) Reduction of Hole (Damaged/Decayed) portion should be done in the following ways:

i. In case of the log having a hole/decayed portions/ RING in only one end, the length of the hole should be taken along the length of the log. While calculating the cross sectional area, the longest side of the hole should be measured. For calculating the net volume of the log, the volume of the hole is calculated by multiplying its length by its cross sectional area and deducting this volume from the gross volume of the log

ii. While deducting the hole/decayed portions/ RING present in both end of the log, the length of the whole log should be taken into account. For calculating the area of the hole, the longest side of both holes should be measured and the area of the two holes is averaged. This gives the cross sectional area of the hole/defect portion, which is then multiplied by the length of the hole to get the volume of the hole. This is then deducted from the total gross volume of the log to get the net volume of the log.

Annex-II

The Timber Corporation of Nepal Limited
Central Office, Babarmahal

The rate of round timber, sawn timber and fuelwood as per the decision made by the Board (SANCHALAK) meeting of 2068/3/16

Market Price of Round Log

Species	Grade	Length (Feet)	Girth (Feet)		Average Rate (Rs)
Sal	A		**5'≤Girth<7'**	**7'≤Girth**	1,397.83
		5'≤ L< 8'	1,382	1,403	
		8'≤ L<11'	1,391	1,406	
		11'≤ L	1,395	1,410	
	B		**4'≤Girth<6'**	**6'≤Girth**	1,067.00
		4'≤ L< 8'	1,050	1,072	
		8'≤ L<11'	1,055	1,076	
		11'≤ L	1,065	1,088	
	C		**2.5'≤Girth<4'**	**4'≤Girth**	765.00
		2.5'≤ L<4'	705	760	
		4'≤ L	795	800	
Jungli Sissoo	A		**5'≤Girth<7'**	**7'≤Girth**	1,595.00
		5'≤ L<7'	1,555	1,618	
		7'≤ L	1,571	1,636	
	B		**5'≤Girth<6'**	**6'≤Girth**	1,126.00
		5'≤ L<7'	1,105	1,135	
		7'≤ L	1,125	1,140	
	C		**2.5'≤Girth<4'**	**4'≤Girth**	717.00
		2.5'≤ L<5'	665	750	
		5'≤ L	680	775	
Asna, Jamun, Karma, Tooni, Siris and Gamari	A		**5'≤Girth<7'**	**7'≤Girth**	598.00
		5'≤ L< 8'	592	600	
		8'≤ L	597	605	
	B		**2.5'≤Girth<4'**	**4'≤Girth**	493.00
		2.5'≤ L<5'	465	501	
		5'≤ L	498	510	
Khote Salla	A		**5'≤Girth<8'**	**8'≤Girth**	420.50
		5'≤ L< 8'	412	424	
		8'≤ L	416	430	
	B		**2.5'≤Girth<5'**	**5'≤Girth**	365.50
		2.5'≤ L<5'	357	370	
		5'≤ L	361	374	

Species	Grade	Length (Feet)	Girth (Feet)	Average Rate (Rs)
Planted Sissoo	A		**4'≤ Girth**	612.00
		4'≤ L	612	
	B		**2.5'≤ Girth<4'**	377.00
		2.5'≤ L	377	

Species	Length (Feet)	Girth (Feet)		Average Rate (Rs)
		2.5'≤ Girth<4'	**4'≤ Girth**	
Devdar	2.5'≤ L<5'	378	395	391.00
	5'≤ L	388	405	
Bijayasal, Sandan and Pajan	2.5'≤ L<5'	615	625	624.50
	5'≤ L	624	634	
Okhar, Champ, Sagwan and Dar	2.5'≤ L<5'	831	845	844.00
	5'≤ L	842	858	
Bajhi and other Species	2.5'≤ L<5'	210	225	222.00
	5'≤ L	215	238	
Bhudkul, Gutel, Masala, Poplar, Uttis, Amp, Tikul, Katus, Other pines, Fir and Spruce	2.5'≤ L<5'	236	245	242.75
	5'≤ L	238	252	
Harro, Barro, Faldu, Chilaune and Saur	2.5'≤ L<5'	320	350	347.50
	5'≤ L	335	385	
Simal	2.5'≤ L<5'	255	275	238.75
	5'≤ L	265	280	
Satisal	2.5'≤ L<5'	2,033	2,204	2,140.00
	5'≤ L	2,076	2,247	

Rate of timber of less than 4' girth sold for the purpose of Agriculture Implements and Natural Calamities

Sal of C-grade : Rs 200 per Cft

Sissoo : Rs220 per Cft

Planted Sissoo and other species : Rs 190 per Cft

Rates of Poles (Balla Balli)

S. No.	Species	Rate per Cft	
		Grade A	Grade B
1	Sal	497.00	308.00
2	Asna, Karma, Jamun	242.00	180.00
3	Masala (Eucalyptus)	215.00	153.00
4	Other species	135.00	123.00

Rate of Khayer per Cft (Any size)	:	Rs 1,045
Rate of Root, Stumps of Khayer Species per Kg (Excluding extraction cost)	:	Rs 33
Rate per Root, Stumps of Sal Species per piece (Excluding extraction cost)	:	Rs 200
Rate per Root, Stumps of other Species per piece (Excluding extraction cost)	:	Rs 150

Market Price of Sawn Timber of Sal

Kathmandu, Pokhara and other Hilly District

Length (Feet)	**Thickness (T): ½"≤ T< 2½"** **Width (W): ½"≤ W< 4½"**	**2½"≤ T< 5½"** **2½"≤ W< 5½"**	**2½"≤ T< 5½"** **5½" < W**	**5½"≤T / ½"≤ T<2½"** **5½"≤T / 4½"≤ T**
5/2'≤ L<4'	1,600	2,120	2,045	1,955
4'≤ L<9'	1,845	2,690	2,670	2,275
9'≤ L<15'	1,880	2,720	2,690	2,365

Average Rate:- 2,237

Districts of Terai and Inner Terai

Length (Feet)	**Thickness (T): ½"≤ T< 2½"** **Width (W): ½"≤ W< 4½"**	**2½"≤ T< 5½"** **2½"≤ W< 5½"**	**2½"≤ T< 5½"** **5½" < W**	**5½"≤T / ½"≤ T<2½"** **5½"≤T / 4½"≤ T**
5/2'≤ L<4'	1,530	2,050	1,975	1,885
4'≤ L<9'	1,775	2,620	2,600	2,205
9'≤ L<15'	1,810	2,650	2,620	2,295

Average Rate:- 2,167

Rate of market price of Off size, Rejection, Off cuts (BAKAL), Cut piece and Sawdust produced during sawing

S. No.	Types	Unit	Rate in Kathmandu and Pokhara (Rs)	Rate in Terai Districts (Rs)
1	Off size	Quintal	3,000	2,600
2	Rejection, Off cuts, Cut piece	Quintal	1,150	950
3	Saw Dust	Sack (BORA)	125	100

Market Price of Fuelwood

The Corporation has fixed the minimum price of fuelwood for industrial and commercial purposes within the country. The rate is as follows:

Rate of Sissoo, Teak per Chatta	:	Rs 38,000
Rate of Sal per Chatta	:	Rs 33,000
Rate of other species per Chatta	:	Rs 24,500

Rate of fuelwood for death cremation purpose

Rate per quintal for Kathmandu, Pokhara and other Hilly District	:	Rs 975
Rate per quintal for Districts of Terai and Inner Terai	:	Rs 764

Rate of fuelwood sold for Religious and household purpose

Rate per quintal for Kathmandu, Pokhara and other Hilly District	:	Rs 1,200
Rate per quintal for Districts of Terai and Inner Terai	:	Rs 1,000

1. If the sawn timber of Sal having length 15 feet or longer is demanded, then the demand can be fulfilled by charging 20 percent more on the as specified above.
2. Additional amount of 15 percent on top of the above price would be charged to supply the order for planks and any other sawn timber of special size.

Note: Value Added Tax (VAT) will be charged on the price of all forest products mentioned above except fuelwood, Off-Cuts (BAKAL), Cutpiece, Rejection and Sawdust.

Annex-III:

Table III-A: Estimated Annual Yield from Different Forest Management Regimes and Land Use of Different Ecological Regions

Estimated Annual yield (tons of wood) per ha										
Land Use	Agriculture and NCI		CF and CFM		Leasehold Forests		Government Managed Forests		Grassland	
Year	Mountains and Hills	Terai	Mountain and Hills	Terai	Mountain Hills	Terai	Mountain and Hills	Terai	Moun tain	Hills and Terai
2011	1.15	0.55	3.00	6.00	1.50	3.00	2.00	4.00	-	0.30
2015	1.15	0.55	3.00	6.00	1.50	3.00	2.00	4.00	-	0.30
2020	1.43	0.70	3.33	6.67	1.67	3.33	2.33	4.67	-	0.30
2025	1.72	0.85	3.67	7.33	1.83	3.67	2.67	5.33	-	0.30
2030	2.00	1.00	4.00	8.00	2.00	4.00	3.00	6.00	-	0.30

Note: No annual harvest or yield is estimated from Protected Areas. The yield in Agricultural land and NCI is assumed to increase at the rate of 0.06 tons/ha/yr for Hills and mountains and 0.03 tons/ha/yr for Terai. The yield in CF, CFM and Government managed Forest is assumed to increase at the rate of 0.07 tons/ha/yr for Hills and Mountains and at the rate of 0.13tons/ha/yr for Terai. Similarly, In case of Leasehold Forest the estimated increase in yield for Terai, Hill and Mountain is 0.07, 0.03 and 0.03 tons/ha/yr. However, the yield in grass land is assumed to be constant for the whole 20 years.

Table III-B: Accessible Forest under Different Forest Management Regimes and Land Use of Different Ecological Regions

		Accessibility		
Land use		**Mountains**	**Hills**	**Terai**
Agriculture		1.00	1.00	1.00
NCI		1.00	1.00	1.00
Forests	**CF and CFM**	1.00	1.00	1.00
	Forests under PA	-	-	-
	Leasehold Forests	1.00	1.00	1.00
	Government Managed Forests	0.40	0.55	0.70
Grassland		-	0.80	0.90
Other		-	-	-

Table III-C: Recovery Factors of Forest Wood Produced from Different Management Regimes and Land Use of Different Ecological Regions.

		Recovery Factor		
Land use		**Mountains**	**Hills**	**Terai**
Agriculture		0.85	0.85	0.9
NCI		0.85	0.85	0.9
Forests	**CF and CFM**	0.75	0.75	0.8
	Forests under PA	0	0	0
	Leasehold Forests	0.75	0.75	0.8
	Government Managed Forests	0.6	0.6	0.7
Grassland		0.75	0.75	0.8

Table III-D: Area Projection under Different Land Use Types in Different Years.

Area under different land use in 2011 (in '000 ha)					
Land Use		**Mountain**	**Hills**	**Terai**	**Total**
Agriculture		211	1,798	1,082	3,091
NCI		517	449	65	1,031
Forests	**CF and CFM**	166	1,191	332	1,689
	Forests under PA	200	100	300	600
	Leasehold Forests	18	18	-	36
	Government Managed Forests	12	2,836	655	3,503
	Total	396	4,145	1,287	5,828
Grassland		138	1,592	36	1,766
Other		946	2,025	31	3,002
Total		**2,208**	**10,009**	**2,501**	**14,718**
Percent area		15	68	17	100

Area under different land use in 2015 (in '000 ha)					
Land use		**Mountain**	**Hills**	**Terai**	**Total**
Agriculture		211	1,798	1,084	3,093
NCI		517	449	65	1,031
Forests	**CF and CFM**	166	1,405	424	1,995
	Forests under PA	200	100	300	600
	Leasehold Forests	18	28	-	46
	Government Managed Forests	12	2,612	561	3,185
	Total Forest	396	4,145	1,285	5,826
Grassland		138	1,592	36	1,766
Other		946	2,025	31	3,002
Total		2,208	10,009	2,501	14,718
Percent area		15	68	17	100

Area under different land use in 2020 (in '000 ha)					
Land use		**Mountain**	**Hills**	**Terai**	**Total**
Agriculture		211	1,798	1,085	3,094
NCI		517	449	66	1,032
Forests	**CF and CFM**	166	1,619	517	2,302
	Forests under PA	200	100	300	600
	Leasehold Forests	18	38	-	56
	Government Managed Forests	12	2,388	466	2,866
	Total Forest	396	4,145	1,283	5,824
Grassland		138	1,592	36	1,766
Other		946	2,025	31	3,002
Total		2,208	10,009	2,501	14,718
Percent area		15	68	17	100

Area under different land use in 2025 (in '000 ha)					
Land use		**Mountain**	**Hills**	**Terai**	**Total**
Agriculture		211	1,798	1,087	3,096
NCI		517	449	66	1,032
Forests	**CF and CFM**	166	1,833	609	2,608
	Forests under PA	200	100	300	600
	Leasehold Forests	18	48	-	66
	Government Managed Forests	12	2,164	372	2,548
	Total Forest	396	4,145	1,281	5,822
Grassland		138	1,592	36	1,766
Other		946	2,025	31	3,002
Total		**2,208**	**10,009**	**2,501**	**14,718**
Percent area		15	68	17	100

Area under different land use in 2030 (in '000 ha)					
Land use		**Mountain**	**Hills**	**Terai**	**Total**
Agriculture		211	1,798	1,088	3,097
NCI		517	449	67	1,033
Forests	**CF and CFM**	166	2,047	701	2,914
	Forests under PA	200	100	300	600
	Leasehold Forests	18	58	-	76
	Government Managed Forests	12	1,940	278	2,230
	Total Forest	396	4,145	1,279	5,820
Grassland		138	1,592	36	1,766
Other		946	2,025	31	3,002
Total		**2,208**	**10,009**	**2,501**	**14,718**
Percent area		15	68	17	100

Table III-E: Percentage of Households with Woods and Branches as Construction Materials over Years

Year	Ecological Regions		
	Terai	Hill	Mountain
2011	45	6.1	3.2
2015	40.26	5.46	2.86
2020	34.34	4.66	2.44
2025	28.42	3.85	2.02
2030	22.50	3.05	1.60

Table III-F: Projected Number of Households and Houses over Different Years

Year	Household				House			
	Terai	Hill	Mountain	Total	Terai	Hill	Mountain	Total
2011	2636862	2644024	379098	5659984	2290804	2138254	338138	4767196
2012	2729636	2732205	386115	5847956	2371402	2209567	344397	4925367
2013	2822410	2820387	393132	6035929	2452001	2280880	350656	5083537
2014	2915184	2908568	400149	6223901	2532599	2352194	356915	5241708
2015	3007958	2996749	407166	6411873	2613198	2423507	363174	5399879
2016	3100732	3084930	414183	6599846	2693796	2494820	369433	5558049
2017	3193506	3173112	421201	6787818	2774395	2566133	375692	5716220
2018	3286280	3261293	428218	6975790	2854993	2637447	381950	5874390
2019	3379054	3349474	435235	7163763	2935592	2708760	388209	6032561
2020	3471828	3437655	442252	7351735	3016190	2780073	394468	6190732
2021	3564602	3525837	449269	7539707	3096789	2851386	400727	6348902
2022	3686452	3639901	457136	7783489	3202648	2943632	407744	6554024
2023	3808303	3753966	465002	8027272	3308507	3035878	414761	6759145
2024	3930153	3868031	472869	8271054	3414366	3128123	421777	6964266
2025	4052004	3982096	480736	8514836	3520225	3220369	428794	7169388
2026	4173854	4096161	488602	8758618	3626084	3312615	435811	7374509
2027	4295705	4210226	496469	9002400	3731943	3404860	442828	7579631
2028	4417556	4324291	504336	9246182	3837802	3497106	449844	7784752
2029	4539406	4438356	512202	9489964	3943661	3589351	456861	7989873
2030	4661257	4552420	520069	9733746	4049520	3681597	463878	8194995