

**BENEFIT SHARING AMONG COMMUNITY FOREST USERS**  
**(A Study of Gosainkunda Community Forest User Group, Kavrepalanchowk)**

A Thesis

Submitted to the Central Department of Economics  
Faculty of Humanities and Social Sciences, Tribhuvan University  
in Partial Fulfillment of the Requirements for the Degree of  
Master of Arts in Economics

Keshava Prasad Aryal

T.U. Regd. No. 2-1-17-16-98

Central Department of Economics  
Faculty of Humanities and Social Sciences  
Tribhuvan University  
Kirtipur, Kathmandu

March 2015

Date: 16 Chaitra 2071

## LETTER OF RECOMMENDATION

This thesis entitled "**Benefit Sharing Among Community Forest Users (A study of Gosainkunda Community Forest User Group, Kavrepalanchowk)**" has been prepared by Mr. Keshava Prasad Aryal under my supervision. I hereby recommend this thesis for examination as partial fulfillment of the requirements for the Degree of Master of Arts in Economics.

.....

Tara Prasad Bhusal  
Associate Professor  
Central Department of Economics  
Thesis Supervisor

Date: 30<sup>th</sup> March 2015

## APPROVAL LETTER

We, member of thesis committee, evaluated the thesis entitled "**Benefit Sharing Among Community Forest Users (A study of Gosainkunda Community Forest User Group, Kavrepalanchowk)**" prepared by Mr. Keshava Prasad Aryal to the Central Department of Economics, Faculty of Humanities and Social Sciences in partial fulfillment of the requirements for the Degree of Master of Arts in Economics and found satisfactory in scope and quality. Therefore, we accepted this thesis as a part of the Degree.

### Expert Committee

Dr. Ram Prasad Gyanwaly

Chairperson

.....

Dr. Uma Shankar Prasad

External Examiner

.....

Tara Prasad Bhusal

Thesis Supervisor

.....

Date: 6<sup>th</sup> April 2015

## **ACKNOWLEDGEMENTS**

I am indebted to my Thesis Supervisor Associate Professor Tara Prasad Bhusal, Central Department of Economics, Tribhuvan University, Nepal for his ideas and comments on my research work.

My sincere gratitude goes to all the household respondents and key informants for their precious time, sharing vital information and their interest in co-operation.

I would like to remember Mr. Krishna Bahadur Thapa, Assistant Forest Officer, District Forest Office, Kavrepalanchowk for his assistance in selecting the study site and Mr. Bachchu Ram Pudasaini, Ranger, Janagal Illaka Forest Office for providing Operational Plan and Constitution of Gosainkunda community forest user group.

Likewise, I would like to acknowledge Ms. Anju Upadhyaya for her ideas and encouragement while developing the thesis proposal.

My heartily thank goes to Ms. Saraswati Aryal and Mr. Ram Chandra Nepal for their help and encouragements to accomplish this research work.

Last but not least, I would like to thank all the personalities who helped me to accomplish this thesis.

Keshava Prasad Aryal

March 2015

# Table of Contents

LETTER OF RECOMMENDATION .....	ii
APPROVAL LETTER.....	iii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	vii
LIST OF FIGURES .....	viii
ABBREVIATION/ACRONYMS.....	ix
CHAPTER I.....	1
INTRODUCTION .....	1
1.1 Background.....	1
1.2 Statement of the Problem.....	5
1.3 Objective of the Study .....	6
1.5 Significance of the Study .....	6
1.6 Limitation of the Study .....	7
1.7 Organization of the Study .....	7
CHAPTER II.....	8
REVIEW OF LITERATURE .....	8
2.1 Introduction.....	8
2.2 Review of the National Studies.....	9
2.3 Review of the International Studies .....	16
CHAPTER III .....	24
RESEARCH METHODOLOGY.....	24
3.1 Framework for the Study .....	24
3.2 Study Area .....	25
3.2.1 Description of Gosainkunda Community Forest.....	25
3.3 Sources of Data.....	26
3.4 Population and Sample Size.....	26
3.5 Explanation of Variables.....	27
3.6 Sample Selection Procedure.....	28
3.7 Method of Data Collection.....	29

3.7.1 Review Appraisal.....	29
3.7.2 Household Survey.....	29
3.7.3 Key Informant Interview.....	29
3.8 Techniques of Data Analysis .....	29
CHAPTER IV .....	31
PRESENTATION AND ANALYSIS OF DATA .....	31
4.1 Introduction.....	31
4.2 Equality Addressed in Community Forestry Policy.....	31
4.3 Equality Status in the Use of Forest Products.....	34
4.4 Equality Status in Financial, Social and Human Resources .....	44
CHAPTER V .....	51
SUMMARY, CONCLUSION AND RECOMMENDATIONS .....	51
5.1 Summary.....	51
5.2 Conclusion .....	53
5.3 Recommendations.....	54
APPENDIXES .....	55
Appendix 1: Questionnaire for household survey.....	59
Appendix 2: Questionnaire for key informant interview .....	61
Appendix 3: Cumulative % of timber .....	61
Appendix 4: Cumulative % of firewood.....	61
Appendix 5: Cumulative % of grass .....	62
Appendix 6: Cumulative % of bedding material .....	62
Appendix 7: Cumulative % of financial resource.....	62
Appendix 8: Cumulative % of social resource.....	63
Appendix 9: Cumulative % of human resource .....	63
REFERENCES .....	55

## **List of Tables**

Table 3.1: Allotment of sample size in each homogeneous group .....	26
Table 4.1: Gini coefficients for the timber and firewood uses .....	344
Table 4.2: Gini coefficients for the grass and bedding material uses .....	366
Table 4.3: Gini coefficients for financial resource uses .....	444
Table 4.4: Gini coefficients for social and human resource development.....	455

## List of Figures

Figure 3.1: Study framework .....	24
Figure 4.2: Lorenz curve for the use of timber .....	35
Figure 4.3: Lorenz curve for the use of firewood .....	36
Figure 4.4: Lorenz curve for the use of grass .....	37
Figure 4.5: Lorenz curve for the use of bedding material.....	38
Figure 4.6: Group wise average quantity of timber use per household (in %) .....	40
Figure 4.7: Group wise average quantity of firewood use per household (in %) .....	41
Figure 4.8: Group wise average amount of grass use per household (in %) .....	41
Figure 4.9: Group wise average amount of bedding material use per household (in %).....	42
Figure 4.10: Percentage of households for the forest products sufficiency .....	43
Figure 4.11: Lorenz curve for the use of financial resource .....	44
Figure 4.12: Lorenz curve for the use of social resource.....	46
Figure 4.13: Lorenz curve for the use of opportunity on human resource development.....	47
Figure 4.14: Group wise average amount of financial resource use per household (in %) .....	48
Figure 4.15: Group wise average amount of social resource use per household (in %).....	49
Figure 4.16: Group wise receiving opportunity use on human resource per household (in %) .....	49
Figure 4.17: User's perception on benefit sharing mechanism .....	50



## ABBREVIATION/ACRONYMS

AFO	: Assistant Forest Officer
ANSAB	: Asia Network for Sustainable Agriculture and Bioresources
BM	: Bedding Material
CF	: Community Forest
CFUG	: Community Forest User Group
DFID	: Department for International Development
DFO	: District Forest Office(r)
DoF	: Department of Forests
Fecofun	: Federation of Community Forest Users Nepal
FUG	: Forest User Group
GC	: Gini Coefficient
GoN	: Government of Nepal
HH	: Household
MoFSC	: Ministry of Forests and Soil Conservation
MPFS	: Master Plan for the Forestry Sector
N/A	: Not Available
NPC	: National Planning Commission
NRB	: Nepal Rastra Bank
NRs.	: Nepalese Rupees
SHH	: Sample Household
SN	: Serial Number

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Community forestry development program is one of the priority programs of the country (DoF, 2015) which has been initiated in Nepal since 1978 (MPFS, 1989). Community forestry is a major program of the forest sector and its main objective is to meet the basic needs of local people, particularly fuel wood and timber through a sustainable forest management and utilization (Paudel, 2003). Department of forest (2015) has noted some major impact of community forest- restored degraded forest land, resumed greenery, increased bio-diversity, empowered women, poor and the disadvantaged group, promoted income generation and community development activities, improved livelihood and increased supply of forest products.

Community forestry are tempered by strong evidence that exclusion on the basis of income, class, caste and gender persist at community, household and within household levels and outcomes remain unequal in the forest sector. There is a continued persistence of major structural problems particularly those associated with social exclusion and inequity (MFSC, 2013).

Intra forest user group equity in benefit and cost sharing has been one of the characteristic features of community forest today. Most community forests have been practicing a system of mixed distribution that subsidizes the rate of forest products for poor and occupational castes only. For instance, almost 50% of CFUGs in Rapti region have mentioned positive discrimination for poor and marginalized households while distributing forest products in their constitutions. More than 20% of CFUGs have adopted a system of equitable forest product distribution on the basis of well-being ranking (Luintel et al., 2009).

There are several examples that demonstrate that equitable distribution systems are still at less than satisfactory levels compared with the positive achievements made in community development. Often, community development interventions are found to be quite conventional rather than innovative and pro-poor focused. In some situations, community forest users groups still pay lip

service only to the poor, women and marginalized communities and frequently, forest products are utilized only at subsistence levels which in many cases limit greater impacts from forest management.

However, an example of addressing the issue of equity between close-users and distant-users in Nawalparasi district, community forest user group have started the practice of contributing 5% of their annual income from the sales of forest product for the promotion of forestry activities in the southern part of the district for the special benefit of the distant-users. This type of decision is perhaps the first example in the country of supporting distant-users for their forest development. So far, more than NRs. 500,000 has been collected from user group and a subgroup is currently working to identify and plan for forest development activities such as nursery management, seedlings purchase, and public land management in south district (Luintel et al., 2009).

Nepal demonstrates a distinct social stratification based on the caste system and encompasses a wider socio-economic heterogeneity (Adhikari & Lovett, 2006). The dogma of the caste system though, still remains a contentious issue; it continues to act as an obstacle in the development of communities belonging to the lower social class. An important part of the caste system is that lower caste people often face a multitude of disadvantages in land endowment, socio-economic marginalization, participation in decision-making processes and employment opportunities (Lawati, 2005). The caste system and its attendant practices have been outlawed and declared punishable offences for quite some time, but these laws are difficult to implement. Nevertheless, untouchability still exists, to a different extent, in the hills and mountains and in the urban areas of the country. *Janajatis* (various ethnic groups) and lower-caste people such as *Dalits* still live in conditions of great poverty and social disadvantage, forming the most impoverished segment of society. About, 42 per cent of the population of the country is below the poverty line; of them 35 per cent belong to untouchable caste groups. This is largely due to economic marginalization of these groups which is further aggravated by lack of access to political decision-making by these groups (Adhikari & Falco, 2008).

In spite of more than three decades of development efforts supported by massive inflow of international aid. Nepal still remains one of the poorest and least developed countries in terms of

almost all indicators of economics and social welfare (World Bank, 1991). There are very few visible signs of the structural transformation of the economy. There is little else apart from agriculture to sustain the growing population. However, the agricultural sector upon which about 90 percent of population depend for their livelihood has remained largely subsistence and fairly stagnant in terms of productivity growth for a considerable period of time. The relative stagnation of the industrial sector and a rapidly growing population has contributed to accelerate the pressure on land resources. An increasingly large proportion of population is facing economic and social deprivation and the situation appears to be getting worse. With an extremely low level of per capita income and its negligible growth, more than 50 percent of the population estimated to live below the absolute poverty line. Since more than 90 percent of the absolute poor are estimated to be concentrated in rural areas (World Bank, 1991). Poverty in Nepal is predominantly a rural phenomenon and is intimately related to the limited access to productive assets (Sharma, 1992).

A part of national forest is handed over to the forest user group for the purpose of development, conservation, utilization and management of forest resources including freely price determination for selling the forest products (GoN, 1993). Community forest is handed over to the user group based on the distance of forest from the settlement, willingness of local users and their management capacity (GoN, 1995).

The relationship between growth, income inequality, and poverty lies at the heart of development strategy. There is intense debate over the extent to which the poor benefit from economic growth against the backdrop of inequality. At one end of the spectrum is the argument that the potential benefits of economic growth for the poor are undermined or even offset by the sharp increases in inequality. At the other end, is the argument that liberal economic policies and open markets, relying on trickle-down effects, raise the incomes of all, including the poor (Sharma, 2010).

An unequal relationship exists between the oppressed and the oppressor groups in a village (Luintel et al., 2009). As a result, the local community leaders and elite groups mostly dominate decisions of the user groups; fulfilling the concerns and needs of poor and vulnerable groups is still a difficult practice in community forestry. Thus, supporting poor and disadvantaged groups for their livelihood sustenance is a big challenge in community forestry. Community forest should identify

locally suitable income generation activities depending upon the comparative advantage of the locality, which can be implemented by focusing poor and disadvantaged groups. The community forest should implement and invest more on those activities so that local poor, women and disadvantaged group will be able to get real benefits from community forestry program in their livelihood sustenance.

Over the last thirty years community forestry has emerged into a radical approach for local level change, shifting from a protection-oriented form of forestry through to a property rights regime that delivers multiple benefits from improved forest quality, to changes in the rights of individuals to claim forest benefits and a host of other social and non-forest benefits (MFSC, 2013). Community forestry groups, in the absence of elected local government, have fulfilled many of its roles, acting as a local development node, providing an institutional space in which democratic decision-making happens and acting as an exemplar for future local-level democratic processes. There has been both persistence and change in the main state organizations with some significant and profound changes in the policy and legal frameworks enabling community forestry. At the same time some of the deeply embedded cultural and behavioral practices that condition Nepali society remain within forest organizations and continue to be a significant barrier to change. Irrespective of community forestry there has been livelihood improvements for most wellbeing classes and ethnic/caste groups. Community forestry has played a small but significant role in improving the livelihoods of rural people. Households have invested relatively small amounts of their labour time in community forestry activities to gain a range of benefits (MFSC, 2013).

CFUGs have proved themselves to be one of the essential local agencies for community development. One in which forest users roles are considered to be of great importance in villages to bring significant changes (Luintel et al., 2009). It is widely believed among the forestry and other development professionals that there is tremendous potential to establish CFUGs as the most viable local institutions for equitable and sustainable local development. CFUGs can create a conducive and synergistic environment for community development and livelihoods support to thrive through their coordination, collaboration and partnership with different development agencies beyond the forestry sector. However, policy and regulatory frameworks must be improved to enable this to occur. It is only then that the true potential of community forestry be achieved.

CFUGs have been able to mobilize locally available resources including: finance, indigenous knowledge; human capacities and natural resources for local development (Luintel et al., 2009). As such, they are likely to be effective and efficient in utilizing Nepal's scarce resource and likely to be sustainable in the long run. Officially, CFUGs can allocate up to 75% of their funds for activities other than forest development. They generate funds not only from the sale of forest products, but also from various other member contributions such as the membership fees, fines, donations, and enterprise activities. A key advantage in terms of resource use is that local people can use the resources generated from one activity e.g. the sale of medicinal plants, to fund (at least partially) other priority activities when resources are deficient (Luintel et al., 2009).

Community forestry over the years has brought many benefits to people. But it is recognized that there is still gap in community forestry practices in responding to the rural livelihood needs in a socially just manner.

## **1.2 Statement of the Problem**

Nepal is one of the first countries to begin people focused forest policy. Community forestry related policies in Nepal have focused on poor and marginalized population (Khanal, 2011). In addition to this, a study conducted by Ministry of Forests and Soil Conservation (2013) has noted forest user's reasons for satisfaction in performance of community forest user group. The main reasons for the satisfaction are fair and equal distribution of forest products according to availability, need based allocation of benefits (focus on the underprivileged), adjustment of regulations to fulfill demand, fair pricing on sale of forest products and pricing according to the ability of consumer to pay (free to those who cannot afford to pay).

This context indicates community forestry program has addressed poor and marginalized people to bringing them in equal benefit sharing. So, research question is whether and to what extent this forestry program has followed the equality in benefit sharing among community forest users. This thesis has particularly focused on the following questions:

- J) What are the policy provisions to address the equality on benefit sharing among the community forest users in Nepal?
- J) What is the quality status in the use of forest products among the community forest users in current one year?
- J) What is the equality condition of sharing the financial, social and human resources in community forest user group in the last five years?

### **1.3 Objective of the Study**

The general objective of this study is to assess the equality status on benefit sharing among the community forest users in Nepal.

Specific objectives of the study are as follows:

- i) To review forest policies related to the community forestry through equality perspective
- ii) To assess equality in the use of forest products among the forest users
- iii) To find out equality status on sharing financial, social and human resources among users

### **1.5 Significance of the Study**

Ministry of Forest and Soil Conservation (2013) has noted that Nepal's achievements in community forestry are recognized as the best practice model in the world. Forest covers approximately 40 percent of the total national land area in Nepal. It is one of the major productive resources and contributes around 10 percent to Nepal's gross domestic product. Community forestry occupies nearly 23 percent of total forest land and reaching around 30% households of the country through 17,865 community forest user groups throughout the country (DoF, 2011).

Equality in benefit (comes from the conservation and management of community forest) sharing among and within the community forest user group plays a vital role to maintain good governance from the local level. Higher level of equality in benefits could contribute to the rural community people to boost up them towards integrating and mainstreaming in the national development process.

## **1.6 Limitation of the Study**

This study was confined to the Gosainkunda community forest user group so that findings of the study do not necessarily represent the equality status of all the community forests across the country. Similarly, benefit sharing status in community forest user group was studied with the help of data taken for the period of last five years but it was one year only for the study of forest products (timber, firewood, grass and bedding material). In addition, this research was conducted only for the purpose of partial fulfillment of the requirements for the Degree of Master of Arts in Economics.

## **1.7 Organization of the Study**

The main body of this thesis has been organized in five chapters. Chapter I is introduction which covers background, problem statement, objective of the study, significance of the study, limitation of the study and organization of the study. Chapter II is review of literature that includes introduction, review of national studies and review of international studies. Chapter III is research methodology which consists of study framework, study area, sources of data, population and sample size, sampling, explanation of variables, method of data collection and the analysis of data. Similarly, Chapter IV is the important section of this thesis. It deals with the objective wise presentation and analysis of data. Chapter V composes of the summary, conclusion and recommendations of this research work. Finally, annexes and references have been put in the last parts of this thesis.



# **CHAPTER II**

## **REVIEW OF LITERATURE**

### **2.1 Introduction**

Income inequality is the unequal distribution of household or individual income across the various participants in an economy. In other word, it refers to the extent to which income is distributed in an uneven manner among a population (Gardner & Abraham, 2015). Income inequality is often presented as the percentage of income to a percentage of population. It is often associated with the idea of income fairness. It is generally considered unfair if rich have a disproportionately larger portion of a country's income compared to their population. The investopedia explains the causes of income inequality can vary significantly by region, gender, education and social status. Economists are divided as to whether income equality is ultimately positive or negative and what are the implications of such disparity (Investopedia, 2015).

Inequality is different from poverty but this is related to it. Inequality concerns variations in living standards across a whole population. By contrast poverty focuses only on those whose standard of living falls below an appropriate threshold level (such as a poverty line). This threshold may be set in absolute terms (based on an externally determined norm, such as calorie requirements) or in relative terms (for example a fraction of the overall average standard of living). Intuitively relative poverty is more closely related to inequality in that what it means to be poor reflects prevailing living conditions in the whole population. But the degree of inequality will have implications for both conceptions of poverty (Mckay, 2002).

Studies which were conducted by the using the measures of inequality have been reviewed in this chapter. In course of reviewing literatures, journal articles were primarily reviewed with some relevant reports in the context of national and international levels. The review contents are described in successive subheadings below.

## **2.2 Review of the National Studies**

Sharma (2009) had studied the impact of community forest (CF) on income distribution in Nepal. The objectives of his research were to assess the impact of community forestry on income distribution in regard to the existing income inequality in Nepal, to quantify the contribution of community forestry on farm-household income and to measure the effect of increased farm-household income from community forest particularly on the existing 'poor-rich' gap. The research had employed informal interview, secondary information and focus group meeting, wealth ranking, household survey for data collection and gathering information. The major findings were reducing income inequality as community forestry contributed to reduce Gini coefficient from 0.265 to 0.242. Hence, there is significant reduction of inequality with the inclusion of community forestry income. If intensive forest management is carried out in the community forests, the Gini coefficient of income distribution lowers by 0.038, the households under poverty decreases by 22 percentage point. The share of income of the one-third poorest households in total income increases by 1.4 percentage similarly the share of the one-third average households increases by 1.5 percentage while the share of the one-third richest households decreases by 2.9 percentage.

Paudel (2012) had conducted the study on forest size, income status and inequality in Parbat. The objectives of study were to examine the inequality in the community forest income distribution within a CFUG as well as the CF land distribution pattern in the Parbat district. It also investigated the user's perception on benefit sharing and the CF benefit to the poor. Data collection tools were focus group discussion, key informants interview and household survey. Altogether 120 respondents were randomly selected and surveyed. Secondary sources were also reviewed. Data was analyzed using the Gini coefficient, Lorenz curve, analysis of variance, Chi-Square test, Likert Scale. Result showed that CF income contributed an average of 22.79% of total forest income. The CF income was varied with sex, caste and education of the users, however, it was not significant. The Gini coefficient of the income distribution was found 0.48, 0.34 and 0.31 for CF income, Private trees income and total forest income respectively. Slight outward shifting of Lorenz curve showed CF had equalizing impact on the forest income distribution between forest user households. The inequality in community forest land distribution was found in increasing trend.

Ojha (2001) had conducted the study on commercial use of non-timber forest products: can the poor really get benefits? The paper was mostly based on Subedi and Ojha (2001), and had drawn on the author's experiences at ANSAB. Although the markets for NTFP is increasing, local harvesters have not been able to reap fair benefits. This is mainly because of non-conducive policy environment, imperfect market structure and complex socio-economic system that weaken the position of local communities in NTFP business. Citing the cases and figures of income disparity from NTFP trade in western Nepal, the author contends that policy is the overarching factor responsible for the situation. Any move to improve the situation should start from policy and provision of market and social services capable of elevating the position of local communities' bargaining power and share of benefits.

Sharma (1992) had conducted a research on regional inequality in the size distribution of income in Nepal. The objective of the study was to identify the regional inequality in income distribution. The data for this study was based primarily on the household budget survey (HBS) conducted by Nepal Rastra Bank (NRB) in two different periods. First survey was conducted during 1973-75 and next was during 1984-85. The analysis for the extent of inequality in the distribution of income can be ascertained either through Lorenz curve or through various inequality indices such as Gini coefficient, coefficient of variation, standard deviation of log income, variance of logarithms, Theil index, Aitkinson measure and Pareto index. Result showed that most urban areas belonging to the central development region followed by those belonging to eastern development region show greater degree of income inequality as compared to those located in the western and far western development region. Second, at the geographical level, the degree of income inequality has generally been found to be relatively higher in those urban areas that are located in the Terai plains than those in the hills region of the country. Third, at the national level, the highest degree of income inequality can be observed in the Birgunj followed by Janakpur, Bhadrapur, Biratnagar and Kathmandu whereas the degree of income inequality is amongst the lowest in Bhairahawa followed by Mahendranagar and Dang.

MFSC (2013) had conducted a study on review of community forestry in Nepal based on its persistence and change. The objectives of the study were to evaluate the impact of community forestry on household livelihood across Nepal; including a specific focus on the most disadvantaged

households b) link an evaluation of household livelihood changes to the capacity and capital of CFUGs. The impact study has followed five key methodologies. These were two national surveys, five case studies, database development, iterative consultative process and task force formation. Major findings were increased household access to natural capital. In addition, there is conversion of natural capital into financial capital. Community forestry has played a small but significant role in improving the livelihoods of rural people. Households have invested relatively small amounts of their labour time in community forestry activities to gain a range of benefits. Institutional training which focuses on development of leadership skills is taken up by more middle class households. Skill development training and educational support were more focused on the extreme poor households. Brahmin/Chettri households take up more of the forest management training. Survey had revealed some interesting differences between projects supported CFUG and those without project support. The main differences concern higher levels of good governance practices in project supported CFUGs both in terms of ensuring provisions that are laid down in the operational guidelines are acted upon by the CFUG and actually implemented. Users also show higher levels of awareness of rights and there are higher levels of pro-poor and pro-women targeting in project supported CFUGs.

Khanal (2011) has conducted the study on community forestry's impact on income distribution among forest users groups in Nepal. This study was conducted to see how community forestry affects income distribution among the users. Is community forestry decreasing the inequality among its users? Nawalparasi district was purposively selected. The total sample of 90 included 30 from each community forestry groups for the study. Altogether there were three community forest user groups from Nawalparasi district, Nepal. This total sample was divided into three income groups (i.e. high, medium and low). The result of Gini coefficient showed increased inequality among the forest users. The Gini was 0.47 before CF which increased to 0.52 after community forestry. However, Gini coefficients for individual income groups decreased after community forestry. The Lorenz Asymmetry Coefficients showed that, the inequality present among users was due to the presence of large individuals of low income group both before CF (coefficient 0.66) and after CF (coefficient 0.94). The Lorenz curve for net family income of the users before CF was near to line of equality than Lorenz curve after implementation of community forestry. This shows that the inequality in the users increased after community forestry. Similarly the Lorenz curve for net family

income of users for both cases (i.e. before and after community forestry) were significantly far from line of equality, showing persistence of high level of inequality among users of community forestry. The Lorenz curve of net family income for low income group signifies equality among the users increased after implementation of community forestry. This was evident from Lorenz curve of net family income, which shifted toward line of equality after community forestry. But there was significant difference between line of equality and Lorenz curve in both cases of before and after community forestry. It shows there was presence of income inequalities among the users.

The Lorenz curve of net family income after community forestry was much nearer from line of equality than the Lorenz curve before community forestry. So the equality among medium income group of users significantly increased after community forestry. But a residual difference between the line of equality and the Lorenz curve signifies persistence of inequality among users. In case of the high income group, the Lorenz curve of the net family income before and after community forestry crossed at a point in between two extremes. But the Lorenz curve of net family income before community forestry was below the Lorenz curve of net income after community forestry, in a larger part of the curve, indicating a decrease in inequality in income after implementation of community forestry. Similarly, both Lorenz curves were significantly far from line of equality, implying that larger inequality persist among high income users in both cases.

Gini ratio or Gini coefficient was used to observe inequality in income among different income groups of users of community forestry. The Gini coefficient of total family income was increased from 0.465 before community forestry to 0.523 after implementation of community forestry. This signifies that the inequality in income among users of community forestry was increased after community forestry. But the Gini coefficient for each income group of population significantly decreased after implementation of community forestry. In case of the high income group, the Gini coefficient was 0.390 before CF and this figure decreased after CF to 0.323. Thus, within the high income group, the equality of the user's was increased. Similarly, Gini coefficient for the medium income group was 0.403 before community forestry and decreased to 0.131 after community forestry. Thus, equality among medium income group was also increased after community forestry. For the low income group users, results were same as the above two cases. Gini coefficient was

0.357 before CF and decreased to 0.257 after implementation of CF among low income group of population, resulting increased equality within same (low) income group.

Although the community forestry in Nawalparasi district and Nepal as a whole is running both forest management and human resource management programs successfully, yet most of the users of CF are still out of its fold. This is due to larger attention given to the forest management than the livelihood aspects of the forest dependent population. The result of present study shows that the inequality among users of community forestry is increasing after implementation of community forestry. Community forestry program is getting more attention on forest management rather than livelihood aspects of that population who were using forest from many years as an important component of their family income. The main users of forest comprise poor and disadvantage group of the society; and the success of community forestry program relies on how it focuses on them. It is found that the long term strategy targeting the poor and disadvantaged groups was lacking in all community forestry user groups. Thus, many programs, especially income generating programs, should be planned and implemented in the future by CFUGs targeting that population. One of the reasons for an increment in inequality may be due to forest related activities not having been able to create more employment opportunities among users, especially those who were highly dependent on the forest before. As such, different activities like plantation, thinning, and harvesting, non timber forest product growing, processing and marketing should employ many of those people whose daily incomes are directly affected by their reliance on the forest.

Sharma (2010) had conducted a study on distribution of community forests in Nepal by development and ecological regions. The objective was to identify the equality in the distribution of community forests in Nepal by development and ecological regions. Method adopted was analysis of national FUG by using the data on community forests regarding the area of community forests and beneficiary households across the Tarai including inner parts, middle hills and high mountains. The data regarding distribution of community forests was analyzed on the basis of development regions. The Gini coefficient of distribution of community forests was calculated for 9 districts representing different ecological zones.

For grouped data, Gini coefficient was calculated by using the following formula:

$$G = \frac{\sum_{i=1}^n X_i Y_{i+1} - \sum_{i=1}^n X_{i+1} Y_i}{\sum_{i=1}^n X_i Y_i}$$

Where,  $X_i$  denotes the cumulative proportion of the population in the  $i$ th class interval, and  $Y_i$  denotes the cumulative proportion of the population in the  $i$ th class interval.

When the variables are measured as percentages, then both of them have to be divided by 100, in this case the above equation has to be written as:

$$G = 1 / (100)^2 [ \sum X_i Y_{i+1} - \sum X_{i+1} Y_i ]$$

Major finding of this study has been mentioned development and region wise. This study showed far western development region has the highest Gini coefficient while the western region has the lowest one. The western region has the lowest Gini coefficient because 74% of the community forest areas which are smaller than 200 hectares are handed over to the 90% of the beneficiary households. High mountain region had the highest Gini coefficient, because 56% of the forest areas which are larger than 200 hectares are handed over to only 14% of the households while 44% of the forests which are smaller than 200 hectares are handed over to 86% of the households. The Tarai and Inner Tarai had the lowest Gini coefficient.

Bardiya had the lowest Gini coefficient but the highest with Siraha. In Siraha, the community forests of size less than 200 hectares represent 26% of the community forest area and the area is handed over to 62% of the households, accounting for the highest Gini coefficient. In Bardiya, such forests represent 93% of the area which is handed over to 98% of the households. Thus, the distribution of community forests can be regarded as one of the best in Bardiya among the selected Tarai districts. Similarly for Dang, community forests smaller than 200 hectares represent 25% of the forests and are handed over to the 45% of the households. Ilam presents an unique picture: due to the directives of the then king for registering the forests where cardamom had been cultivated under the title of private owners, there has been only 0.2% of the area under <10 hectares accommodating 3% of the households. The community forests of size smaller than 200 hectares represent 16% area of the community forests and accommodate 42% of the households. Hence Ilam represents the lowest Gini coefficient among the studied Middle Hill districts. Among the High Mountain districts, Dolkha has the lowest Gini coefficient of community forestry distribution while Jumla has the highest value. In Dolkha, the community forests smaller than 200 hectares represent 47% of the area of community forests and accommodate 75% of the households. Similarly, in Jumla such forests represent 30% of the area while accommodating 88% of the households. In

Jumla, 63% of the community forests area is covered by forests >1000 hectares while only 7% of the households benefit from such forests. Consequently, Gini coefficient of community forestry distribution is quite high.

It is found that calculated Gini coefficient for year 2009 had been slightly reduced as compared to the year 2007. The mandatory provision of IEE/EIA in community forests has produced this unintended but desired result. If there will be a provision of fixing limits (both small and large) to the size of community forests, it would definitely help in moderating the coefficient of distribution of community forests besides easing the task of monitoring increasing number of community forests. Hence, it is concluded that though the mandatory provision of environmental assessment in certain community forests is being criticized in every nook and corner of the country, it has definitely produced an unintended but desirable outcome in community forestry management in Nepal (Sharma, 2010).

Sharma (2009) had prepared paper for expert group meeting on practical strategies to promote social integration: lessons learned from existing policies and practices. He had included the major results of his study. Inequality beyond a certain threshold could if not addressed in a timely manner, manifest in the explosion of social and political unrest. The decade-long conflict, which still needs to be finally resolved, is in essence an outburst of widening inequality. With the deregulation in particular of private investment in education and health, inequality is visible in the quality differences between public and private health and education services. This is likely to perpetuate and entrench potential inequality in the future. There is thus a pressing need to implement macroeconomic policies that foster a level playing field across sectors, population groups and geographical regions. There is an equal urgency for good governance, priority for skill enhancing programs for the deprived, and also for their social safety nets. Accelerated tax reform has led to a tax system where indirect taxes (such as customs duties and value added taxes) increased faster than direct taxes. The falling share of direct taxes did not contribute to lowering inequality. Similarly, remittances have helped to reduce poverty, however, such differences in earnings also contributed to widening inequality. He had further included some programs of Government of Nepal for the reduction of inequality in 2008/09. These are all senior citizens of age 70 years or more shall receive Rs 500 per month, all Dalits, single women, and population of designated remote areas of



age 60 years or above shall receive an allowance of Rs 500 per month, all fully handicapped and disabled individuals will be entitled to monthly Rs 1,000, provision of debt relief to small borrowers up to Rs 30,000, local construction initiatives to employ 100,000 people for 100 days each, total literacy to be achieved in 2 years, maternity health made free, youth self-employment fund to lend to the young entrepreneurs in commercial agriculture, agro-industries and service sector and intensive poverty alleviation programs in 55 districts directly focusing on backward community.

A study had been conducted on the contribution of community forestry to reduce the poverty in Dolakha (Baral, 2008). Objective of this study was to assess the economic contribution of community forestry in household income among different economic classes. All households of the CFUGs were classified into four economic strata - very poor, poor, medium and rich through participatory wellbeing ranking method. Twenty five percentage households were selected randomly from each economic stratum for household interviews. Detailed information on types and quantities of forest products collected for both commercial and subsistence use was collected from 115 selected households through questionnaire. Apart from the household survey, two group discussions with the CFUG committee members and a mixed gender group were also conducted. The data were analyzed using Statistical Package for Social Science (SPSS). Lorenz curves and Gini-coefficients were used to characterize the distribution of the household income with and without the contribution of community forestry. Result showed Lorenz curves of household income with and without CF income was plotted. The Lorenz curves of both CFUGs showed that the households' income with CF income is close to the line of equity implying the positive contribution of CF in reducing income inequality in communities. Hence, this study underscored the importance of commercial management of community forest with pro-poor programs in order to reduce poverty.

### **2.3 Review of the International Studies**

Katholnig (2012) had conducted the study on growth dominance and Gini index in even aged and uneven aged forests in Switzerland. The objective of the research was to find out whether there was a correlation between stand increment and growth dominance on one side, and stand increment and Gini-index on the other side. Another objective is to examine the course of the growth dominance coefficients in even- and uneven-aged stands. A total of 65 plots were studied in this research. The

area of the plots ranges from 1001m<sup>2</sup> to 20024m<sup>2</sup> and the elevation from 385m to 1640m. The plots were parts of different testing plots from thinning tests to tests on uneven-aged stands. Consequently, all stands of this study were managed and not without intervention since establishment as was the case in most of the above mentioned studies. The plots were measured several times, but the measuring periods differed from one plot to another and also within one and the same plot. Also the number of records was dissimilar. Period length was between 1 year and 13 years, number of observations varied between 3 and 18. All calculations and statistical analyses were conducted with the statistical software package R. Mean values and standard deviations were used to describe the data. Analysis of variance and Tukey's test were run to test for differences between the different classes of stands. In addition, various simple and multiple linear regressions as well as analyses of variance to analyze these regressions were applied to the dataset. Result showed there were significant differences between the mean values of the four classes mixed even-aged, mixed uneven-aged, pure even-aged and pure uneven-aged in regard of the Gini-index as well as in regard of the growth dominance. Except for the pure uneven-aged and mixed uneven-aged stands, mean Gini-indices of the stand classes were significantly different from each other. In addition, mean values of the growth dominance of the four classes all differed significantly from each other. Nevertheless, difference between even-aged and uneven-aged seemed to be higher than between mixed and pure.

Fisher (2004) has conducted the study on household welfare and forest dependence in southern Malawi. Objective of the study was to examine the role of forests in alleviating poverty in rural Malawi. The method adopted was household survey of 99 households in three villages between June 1999 and August 2000. The Gini coefficient, is a common measure of income inequality across individuals or households, was used for analyzing the collected data. For the sample households the Gini coefficient was computed and decomposed by six income sources: farm, forest, wage-work, self-employment, transfers, and remittances. Analysis showed all of the sample households used firewood for cooking and heating, and 75 percent engaged in forest occupations including sales of firewood and charcoal and employment by the logging industry. Home-consumed firewood and earnings from forest-based occupations constitute substantial shares of household income. On average, sample households earned about 30 percent of their income from forests. In addition, forest income reduced measured income inequality by 12 percent during the year of the

study. This reflects a pattern in which firewood collected from adjacent forests represents an important input to household income for all sample households.

A study had been conducted on contribution of forests to rural inequality reduction (Rabbi et al., 2010). A total of 180 households from three forest dominant valleys were surveyed and dataset was prepared from these interviews. Collected data were analyzed using the Gini coefficient and Lorenz curve. Major findings revealed that 59% of households derive their income from the forests. Other factors, such as household size, alternative sources of income, literate adult males, distance to market, distance to forest and geographic location affect household economic dependence on the forest. Results from Gini coefficient and Lorenz curve analysis prove that supplemental forest income helps in reducing economic inequality among the sample households.

A study had been conducted on forest income and poverty reduction under participatory forest management in Ethiopia (Yemiru et al., 2010). Objective of the study was to investigate the contribution of forest resources to the livelihoods of rural households under a participatory management. Data were collected through key informant interviews, group discussion, and household surveys from a total of 350 households. Income data were collected in four separate seasons at intervals of three months. The result indicated that forest products were the most important sources of income contributing to 34% and 53% of household per capita income and per capita cash income, respectively. Forest income also helped 20% of the population to remain above the poverty line. Forest income reduces inequality (Gini coefficient) by 15.5%. So, result confirmed the importance of forest income in poverty alleviation and as safety nets in times of income crisis.

Andersson & Agrawal (2011) had studied Inequalities, institutions and forest commons in South Asia, East Africa and Latin America. Altogether 228 forest user groups were studied. All the data reported were drawn from the IFRI database and consist of qualitative estimates derived from participatory appraisal exercised with key informants at the community level, as detailed by the IFRI research protocol. The descriptive analyses compared two forest-dependent communities in the middle-hills of Nepal and another two communities from Bolivia. Selected four communities were the ground of analysis and to examine the relationship between inequality, institutions and environmental change. The primary purpose of the comparative analysis was to explore and

illustrate the potentially moderating role of institutions in four diverse, real-world cases. The collective management of natural resources had identified that economic inequalities can influence resource governance outcomes negatively; however, in some situations it can also potentially positively.

Galbraith & Hale (2006) had studied state income inequality and presidential election turnout and outcomes. The aim of this paper was to outline a technique for estimating Gini coefficients of family income inequality for the fifty United States and the District of Columbia on an annual basis from 1969 to 2004. Result showed that the differences in pay inequality within states account for much of the differences in state inequality of family income. The evolution of nationwide pay inequality also closely corresponded to the income based measures at the state level. Gini coefficient of family income at the state level for the overlapping year was 0.936 which was stronger than the correlation of the two state measures.

Gatso & Wossen (2012) had conducted the study on Forest dependence and income inequality in rural Ethiopia. The aim of the study was to examine the determinants of forest dependence and the role of community forest on income inequality. The study used primary data obtained through 200 households' survey. In the survey, sample respondents were household heads. The study had employed a combination of primary data collection techniques such as a questionnaire distributed to sample households and interviews with concerned officials and key informants from the community under investigation. The study also used focus group discussions to generate important qualitative and quantitative data from the community. To select the sample households, the study utilized two-stage random sampling technique. In the first stage, simple random sampling technique was used to select 8 forest user groups (FUGs) out of 12 FUGs. In the second stage, sample households from the eight FUGs were randomly selected in such a way that the number of sample households taken from each FUG is proportional to the total number of members of the FUG. Gini coefficient was the analyzing tool for the data. Result showed that forest products play a crucial role in reducing income inequality in the study area. Income inequality increased by 24% when study excluded forest income from the calculation of inequality measure.

Wagle (n.d.) had conducted study on economic inequality in Nepal: dimensions and political implications. Dataset for this study included 3379 respondent households in the first wave and 3912 in the second covering a total of 7291 households. This analysis used household expenditure, income, and wealth useful to examine discrepancies in the ability of households to access or mobilize economic resources. In addition to this, data for the study had also been brought from the 1996 and 2004 waves of the Nepal Living Standard Survey (NLSS). These surveys were conducted under the auspices of the World Bank and UK Department of International Development to provide statistics for monitoring and evaluation of development programs. Result showed average household expenditure, income, and wealth and their appropriate sources for major caste/ethnic groups manifesting horizontal inequality. Compared to the national averages, for example, households with high caste background including the Brahmins and Chhetri had larger values of expenditure, smaller values of unadjusted income, and slightly larger values of adjusted income and wealth. Similarly, the middle caste Hindus, low caste Hindus, Newars, and Muslims had consistently smaller averages in 1996, where as the Janjatis and others had consistently larger averages. In addition, average household expenditure, income, and wealth were considerably larger in urban areas than in rural areas. The estimates for rural areas were one third the estimates for the urban areas or even lower except for income from agriculture and home or in-kind production, the popular domains of a country life.

A study had been conducted on distributional impacts of forest income on household welfare in rural Nigeria (Fonta et al., 2009). The study was driven by three specific research objectives. First is to estimate the distributional and poverty effects of forest extraction income in the Cross River community forest area of Southeastern Nigeria. Second was to estimate the impacts of forest income on rural income inequality. And third was to identify the determinants of forest extraction income. The sample includes 1,457 heads of household from a total of about 2,906 households drawn from 18 randomly selected communities. The actual sample interviewed, represented approximately 50 per cent of the entire households. Data were analyzed using Gini and poverty decomposable techniques. The study finds that forest income reduces both income inequality and poverty in rural Nigeria. Analysis of the determinants of forest income using Heckman's 2-step sample selection model indicates that the decision to participate in forest extraction increases with more access to community forest areas, larger and poorer households, membership in forest

management committees; and decreases with higher educational attainment and higher transfer income earnings. Likewise, forest income was found to be positively and significantly related to male-headed households, poorer heads of household and households that have more access to forest resources outside the community forestry areas. Furthermore, poverty and inequality simulations revealed that household welfare in rural Nigeria could be improved through policies and programs that; can stimulate increase earnings from minor forest resources, assist households to earn income from alternative sources such as agriculture and commerce.

A study had been conducted on economics of non-timber forest products (NTFPs) in Oyo-state, Nigeria (John et al., 2013). This research examines the Economic contributions of major non-timber forest products to the livelihoods of rural communities in Oyo State for the period covering 2002 to 2004, using descriptive statistics, multiple regression analysis, gross margin analysis, Gini-coefficient and normalized profit function analysis. A sample of 150 respondents was interviewed from two forest zones. The gross margin analysis shows that NTFPs trade in the study area was profitable with an average trader earning a gross margin of N8,827.64 per month. The Gini coefficient of 0.95 shows inequality in income distribution. The normalized profit function analysis shows that for Bush meat, there is equal economic efficiency in both rainforest and savannah zone respectively. However savannah NTFP, users do not have absolute price or allocative efficiency. In the case of fuelwood, there is no equal economic efficiency in both rainforest and savannah zone whereas NTFPs users in the savannah have absolute allocative or price efficiency. The implication is that for both types of NTFPs there is profit maximization i.e. the users equate the value of marginal product of their variable factors of production to their factor cost. Also fuel wood is sustainable in the savannah zone and government should encourage the sustainable development of forest trees through afforestation projects.

Cavendish & Campbell (n.d.) had studied on poverty, environment income and rural inequality in Zimbabwe. In the absence of an official census, a household roster was compiled consisting of 1,092 households, and 218 households were randomly selected to undertake a quantitative analysis of the impact of environmental income on household welfare. Environmental income, in this case largely from woodland-based resources, is strongly and significantly equalizing, bringing about roughly a 30 percent reduction in inequality. However, including the value of environmental

income leaves analysis of the causes of poverty and rural differentiation unchanged from those done with the standard data. While environmental income is important in mitigating poverty, it is unlikely to be important in lifting people out of poverty. In addition, causes of inequality and poverty were also examined through decomposition analysis. It was found that inclusion of environmental income made very little difference to decomposition results. Same variables were found to be significant correlated of rural inequality and poverty whether standard or total income measures were used. Variation in households' access to non-environmental cash income was found to be the most significant source of rural inequality, arising overwhelmingly from differences in households' entry into formal labour markets. However, agriculture was found also to be a significant secondary source of rural differentiation.

Herzer & Vollmer (2012) had conducted the study on inequality and growth, evidence from panel cointegration. This paper used heterogeneous panel cointegration techniques to estimate the long-run effect of income inequality on per capita income for 46 countries over the period 1970–1995. Although, it is common practice in panel cointegration studies to estimate a bivariate long-run relationship, it would be unreasonable to assume that long-run changes in per-capita income are driven primarily by changes in income inequality. However, it is reasonable to assume that the investment rate is a major determinant of per-capita income over time, and inequality is the element of income of particular concern. Moreover, since investment may act as a proxy for a number of unobserved time varying factors that can affect both inequality and income, it should be included in the analysis to control for non-stationary omitted variables.

Thus, we consider a model of the form:

$$\text{Log}(\text{Income}_{it}) = \alpha_i + \gamma_t + \beta_1 \log(\text{Invest}_{it}) + \beta_2 \text{Inequality}_{it} + \epsilon_{it}$$

where  $\alpha_i$  are country-specific fixed effects and  $\gamma_t$  are country-specific time trends, included to control for any country-specific omitted factors that are either relatively stable over time or evolve smoothly over time. The variable  $\log(\text{Income}_{it})$  is the log of real income per capita over time periods  $t=1, 2, \dots, T$  and countries  $i=1, 2, \dots, N$ ,  $\log(\text{Invest}_{it})$  is the log of the percentage investment share of real GDP per capita, and  $\text{Inequality}_{it}$  is the estimated household income inequality in Gini format. Result showed that inequality has a negative long-run effect on income, both for the sample as a whole and for important sub-groups within the sample (developed countries, developing

countries, democracies, and non-democracies). The effect is economically important, with a magnitude about half as high as the magnitude of an increase in the investment share.

Podder (1995) had conducted the study on the relationship between the Gini coefficient and income elasticity. Data analyzing techniques adopted were Gini coefficient, Lorenz curve, concentration curve, Engel elasticity. Let the Gini coefficient of income be denoted by  $Gx$  and the concentration index of expenditure on the item be denoted by  $Cy$ . Then the index of the deviation of elasticity from unity is given by:  $I n-1 = Cy - Gx$ . This formula has been used by a number of authors to compute an index of Engel elasticity. When  $C$  represents the concentration index of taxes, the same formula is also widely used as a global measure of tax progressivity. The area between the Lorenz curve of income and the concentration curve of expenditure on some item is often used as an overall weighted index of income elasticity minus one. This note shows that the area is in fact a linear transform of the deviation of elasticity from unity estimated at the mean of income, and thus establishes the exact relationship between the area between the curves and elasticity. This facilitates an accurate estimation of the elasticity itself, instead of an index of its deviation, from the values of the concentration index and the Gini index.

Lexerod & Eid (2005) had studied on the evaluation of different diameter diversity indices based on criteria related to forest management planning in Norway. The objective of the study was to evaluate different indices describing diameter diversity based on criteria related to applications in forest management planning. Eight previously described indices were evaluated based on 16 simulated and 174 empirical diameter distributions. Most of these indices were originally developed to describe species richness and abundance. Abundances are usually determined by the number of individuals. The Gini coefficient was found superior with respect to discriminant ability, capability of providing logical ranking of different distributions and sensitivity to variation in sample size. There is a wide range of possible applications of the Gini coefficient in forest management planning, e.g. to compare tree size diversity in different stands, to assess changes in tree size diversity over time, to quantify the influence of different silvicultural treatments on tree size diversity and to assess areas suitable for certain silvicultural treatments. The coefficient can also be used as an integrated part of growth simulators in order to control the silvicultural treatments in projections.



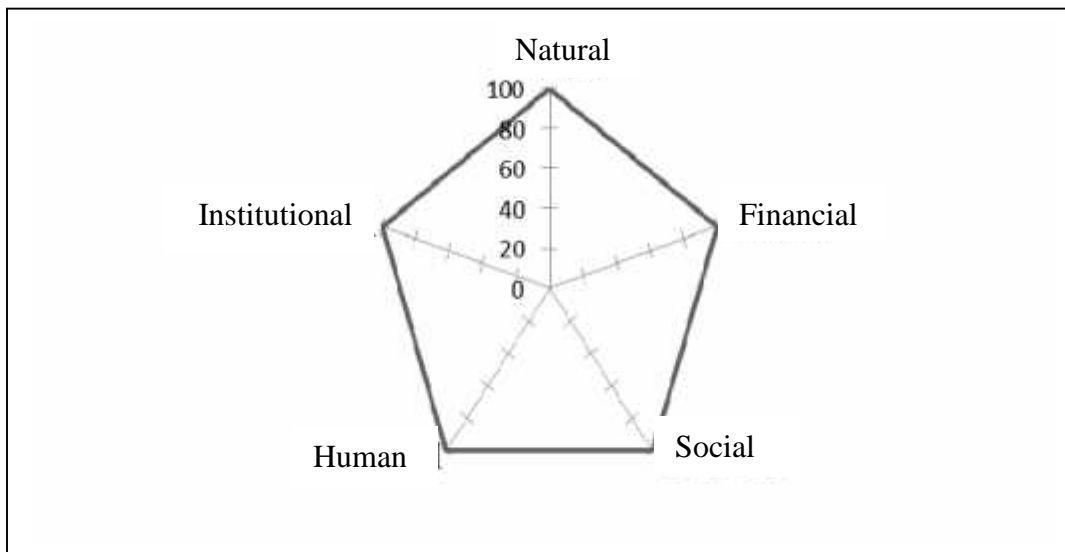
# CHAPTER III

## RESEARCH METHODOLOGY

### 3.1 Framework for the Study

This study had been carried out on the framework which is adapted from the sustainable livelihoods framework of Department for International Development (DFID). Conceptual framework is mentioned in the DFID's Sustainable Livelihoods Guidance Sheets (DFID, 1999). For this study purpose, study framework in Figure 3.1 shows community forest user's resources in five distinct categories—natural, financial, social, human and institutional. Natural resource covers timber, firewood, grass and bedding material. Financial resource includes the amount of cash that the users received from their community forest user group. Social resource deals with the membership or linkage established with a number of organizations except own forest user group. Human resource describes the opportunity that the users got in attending the number of training, workshop or visit in behalf of community forest user group. Similarly, institutional resource explains how the community forestry policies have addressed to ensure the issue of equality in benefit sharing among the community forest users.

**Figure 3.1:** Study framework



Source: Adapted from DFID, 1999

Forest dependant users have to seek the ways of nurturing and combining what assets they have in innovative ways to ensure better survival. The shape of the pentagon is used to show schematically the variation in user's access to assets. The idea is that the centre point of the pentagon, where the lines meet, represents zero access to assets while outer perimeter represents maximum access to assets. For instance, 0 represents zero access to assets but 100 denote maximum access as shown in Figure 3.1. But the notable thing to be clear here is that this framework is used only for categorizing the benefits come from community forest to study the equality status on sharing these benefits. In addition, study does not quantify and plot the values of capitals for drawing asset pentagon as well.

## **3.2 Study Area**

This study was carried out at Gosainkunda community forest user group. Gosainkunda community forest user group lies in Kavrepalanchok district. Researcher was staying in Kathmandu so that this community forest user group was purposively selected because of easy access to the field from Kathmandu.

### **3.2.1 Description of Gosainkunda Community Forest**

Gosainkunda community forest is composed of pine and broadleaf forests. In addition, there are natural and plantation forest. Major tree species of the forest are Salla, Chilaune and Kaphal. This community forest has been divided into four management blocks namely— Sahid Smarak, Panch Kumari, View Tower and Gosainkunda. The most important problems of this forest are grazing inside the forest, forest fire, illegal cutting and forest product extraction. This indicates conservation is key issue. In timber distribution, first priority goes to the user household who got natural disaster. Then, the households who construct new home, build cattle shed to keep them, want to repair old home, support to the social organizations and poor group of the general members of the user group at last. Timber price varies per unit based on the priority set. Firewood is distributed from mid November to the mid February. Similarly, ground grass collection is opened one day in a month. And bedding materials are distributed to the users two days in a month from mid February to the mid June.

### 3.3 Sources of Data

The study used both primary and secondary sources of data. This study was preferably based on the primary sources. Secondary sources were also reviewed to know how the community forestry related policies have addressed to the issues of equality in sharing the benefits of community forest among the community forest users in Nepal. Similarly, secondary sources were reviewed as supplementary source of data for the purpose of this research need and data triangulation. The collected data from the household survey were quantitative in nature while it was subjective in nature of data that was collected from the key informant interviews. In addition, data collected from the review of community forestry related policies were in the forms of points that was interpreted and analyzed subjectively.

### 3.4 Population and Sample Size

Gosainkunda community forest user group had 405 households which represents the population for this study. To make the population homogeneous in this study, Gosainkunda community forest user households had been divided into three homogeneous strata/groups— poor, medium and rich based on wellbeing ranking. By wellbeing ranking, a total number of poor group households were 45, while it was 270 user households in the medium group and there were 90 forest user households in the rich group. For this research purpose, 10% forest user households had been taken as sample households from each homogeneous wellbeing ranking group. This became a total of 41 households as sample size for this study. The detail on allotment of sample households from each homogeneous group has been given in Table 3.1 below.

**Table 3.1:** Allotment of sample size in each homogeneous group

S.N.	Homogeneous group	Population for each group	Sample size for each group (10%)
1.	Poor	45	5
2.	Medium	270	27
3.	Rich	90	9
Sample size			41

### **3.5 Explanation of Variables**

This study had taken seven variables—timber, firewood, grass, bedding material, financial resource, social resource and human resource. All the data relating to these variables were collected from the community forest user group and analyzed. Forest products cover four variables of this study. These are timber, firewood, grass and bedding material. Data for the quantity of these forest products were taken for the last one year. So, analysis of the forest products shows the equality in sharing the forest products in the last one year only. However, other three variables were studied for the last five years. The variables are described below:

#### **(I) Timber**

All the household respondents were asked how much quantity of timber you had collected from your community forest in last one year. The unit of timber was in cubic foot (cft).

#### **(II) Firewood**

Forest Regulation 1993 has defined firewood as species except KHAIR and dimension of firewood is: length is less than 2 feet while girth is less than 1.5 feet that cannot be used as pole or sawing purposes. Unit of firewood is BHARI and one BHARI is equivalent to 30 kilograms.

#### **(III) Grass**

Respondents were asked how much quantity of grass you had collected from your community forest in last one year. Additive quantity of grass and fodder is collectively known as the variable "Grass" for this study. This study had used the unit of grass in BHARI which is commonly used to represent the quantity of grass in the study site. One BHARI is equivalent to the 30 kilograms.

#### **(IV) Bedding material**

Bedding material means the leafy dry materials collected from the forest ground to serve as bed for cattle in the shed. Bedding material is known as SOTTAR in Nepali. Household respondents were asked how much quantity of bedding material you had collected from your community forest in last one year. This study had used the unit of bedding material in BHARI which is commonly used to represent the quantity of firewood in the study site. One BHARI is equivalent to the 30 kilograms.

#### (V) Financial resource

Variable 'financial resource' includes the summation of cash amount obtained from income, loan and free support only from community forest user group. This is cash amount so, the unit was in Rupee. This data was taken for the last five years. So, result has shown the equality in sharing the financial resources for the last five years.

#### (VI) Social resource

Variable 'social resource' means the number of organizations in which respondent households established their relations in terms of financial transaction and membership for this study purpose. This is the summation of number of organizations except their own community forest user group. This data was taken for the last five years. So, result has shown the equality in sharing the social resources for the last five years among the forest users.

#### (VII) Human resource

All the household respondents were asked about the number of opportunities they had got to participate in training, workshop and visits from the community forest user group. These types of opportunities enhance human resource development. This data was taken for the last five years. So, result has shown the equality in sharing the human resources for the last five years.

### **3.6 Sample Selection Procedure**

Simple random sampling was adopted to select the sample households for each three groups in the Gosainkunda community forest user group. The name of household head (for each group separately) was written with serial number in the CFUG's constitution. So, researcher wrote all those serial numbers (for each group separately) in the pieces of paper and folded them. Then, the numbers of folded paper were drawn randomly without replacement according to the predetermined sample size for each group. After that drawn folded papers were unfolded and noted the numbers. These numbers were tallied with the serial number given in constitution. In this way, sample households for each group were identified for the household survey.

### **3.7 Method of Data Collection**

This study had used three data collection methods—review appraisal, household survey and key informant interview. All the methods of data collection are described below:

#### **3.7.1 Review Appraisal**

Constitution and operational plan of CFUG were reviewed in order to understand the provisions of benefit sharing mechanism in Gosainkunda community forest users. Similarly, records and evidences of benefit sharing were also reviewed for the purpose of data triangulation to the household survey data. In addition to this, forest policy frameworks were reviewed to know the provisions mentioned for the poor and marginal community forest users in Nepal.

#### **3.7.2 Household Survey**

A set of questionnaire was developed to conduct household survey. All the identified sample households were surveyed from each group. Altogether 41 households were surveyed for this study. The prepared and used questionnaire for the household survey is given in Appendix 1.

#### **3.7.3 Key Informant Interview**

Key informants were interviewed to know equality status in using benefits come from community forest and also to know how to make benefit sharing mechanism more fair and equitable among users in the CFUG. Open ended questions for key informants were developed which is mentioned in Appendix 2. In total, five key informants were interviewed where assistant forest officer-1, district FeCoFUN-1, user committee-2 and general member-1 which are shown in Table 3.2.

### **3.8 Techniques of Data Analysis**

Gini coefficient is a measure of statistical dispersion developed by Italian statistician Corrado Gini, published in his paper entitled "Variability and Mutability" in 1912. The value of Gini coefficient ranges from 0 to 1 where 0 expresses perfect equality while 1 indicates highest inequality of distribution. This Gini coefficient is also known as Gini index or Gini ratio. In this study, set of distributions were prepared collecting the data from community forest users regarding the usages of amount of forest products (timber, firewood, grass/fodder and bedding material), received cash, linkages with the number of organizations and frequency of their participation in

training/workshop/visits. Each distribution was grouped into three sets of new distributions based on the wellbeing ranking— poor, medium and rich. Each distribution was arranged in an ascending order separately and calculated their Gini coefficients using the following formula for ungrouped data set.

$$GC = 1 + \frac{1}{n} - \frac{2}{n^2} \bar{Y} \sum_{i=1}^n (n+1-i) Y_i$$

Where,

GC = Gini Coefficient of the distribution

n = Number of individual data in a distribution

$\bar{Y}$  = Mean value of the variable

$Y_i$  = Individual data in the  $i^{\text{th}}$  item

i = Item (i=1, 2, 3.....n)

Quantity of timber noted from the household survey formed a distribution for timber-use. This distribution represents the whole community forest users. In addition, all households were categorized into three groups (Poor, medium and rich) according to CF constitution based on wellbeing ranking. So, this single distribution also formed another new three distributions for each category. This made four distributions from a single variable (like timber). In total seven variables were studied in this research. Thus, it formed a total of 28 distributions. By using the formula, all distributions were processed to calculate Gini coefficients using Microsoft Excel 2007. In addition to the Gini Coefficient, graphs like Lorenz curve, bar diagram and pie chart were drawn with the help of Microsoft Excel 2007 to represent and analyze the data.

# **CHAPTER IV**

## **PRESENTATION AND ANALYSIS OF DATA**

### **4.1 Introduction**

This section includes the presentation and analysis of data. In total seven variables—timber, firewood, grass, bedding materials, financial resource, social capital and human resources were studied to assess the equality status in sharing the benefit among the community forest users. Equality status on community forest's resource distribution has been described specific objective wise in subheadings below.

### **4.2 Equality Addressed in Community Forestry Policy**

Community forestry related policies had been reviewed with the objective of knowing how the policies have addressed equality in resource distribution of community forest among the users. Review found that there are four different policies—Guideline for the Community Forestry Development Program 2009, Program Implementation Guideline of Department of Forest 2014, Forest Policy 2015 and Thirteenth Plan 2013 which have addressed the equality issue of community forest. The contents of equality issues addressed in each policy have been presented below.

#### **(I) Guideline for the Community Forestry Development Program 2009**

The policy provisions with regard to the equality issues in community forest can be categorized into four different groups—participation, use of forest products, financial resource and human resources. The contents of the policy in each group are mentioned separately. Guideline has made mandatory to participate the poor and excluded groups in all groups, committees or teams of community forest to achieve the equality in resource distribution among the forest users. The points noted to address equality in participation are given here.

- i. Participation in groups, committees, working teams and general assembly
- ii. Formation of user committee: Committee should be proportionally constituted and at least 50% women are compulsory. In addition, there must be woman either president or secretary.



- iii. Positive discrimination and incentive to poor who participate in assembly, meeting, training or other works. It shall be free entry or low cost for being general member.
- iv. Monitoring and keeping record of attended poor and excluded members participation

Guideline has addressed equality in sharing the forest products with the help of different points which are mention here.

- i. Monitoring indicators should include program effectiveness conducted for poor and excluded empowerment. It also includes whether those groups' demand are fulfilled or not.
- ii. Role of CFUG/C is to follow justice distribution on sale and distribution of forest products
- iii. Special provision to provide forest products at free/ low cost ensuring justice distribution
- iv. Approved amount of forest product will be distributed on equity basis among forest users

Similarly, Guideline has addressed to bring the equality in sharing the financial resources among the forest users in Nepal. The major points noted in the policy are written here.

- i. At least 35% of CF fund should be mobilized for target programs focused to the poor group.
- ii. Emergency fund for poor.
- iii. Part of community forest land can be allocated to poor and excluded for income generation.
- iv. Employment in CFUG like nursery nika, forest watcher and office assistant
- v. Pro-poor oriented livelihood program to uplift their living standards

Guideline made mandatory to expend at 35% of CF fund to the poor and excluded users of community forest user group. It is needed to develop the program for targeted groups to make community forest as an important livelihoods source of poor users. There should be a separate section in community forest operational plan where there should mention poor oriented program. In addition, human resource development activities like awareness raising workshop, training and literacy program are included in the guideline as mentioned here.

- i. Priority in visits and trainings
- ii. Equity process should be adopted in human and institutional development.
- iii. Creating opportunity for skill based training and self-employment
- iv. Educational scholarship for poor users' children.
- v. Compulsory participation of poor group in training and workshop

Guideline for the community forestry development program 2009 has addressed issues to make equality in sharing the benefits among the community forest users in Nepal. This guideline has envisioned that positive discrimination of the poor and excluded groups ultimately leads to the equality in benefit sharing in the community forest user group. Participation and representation of those groups have been ensured from the formation of community forest user group to the preparation of operational plan, different monitoring team, assembly, meeting and other discussions and committees existed in the community forest. Executive committee of community forest user group should be proportionally constituted with at least 50% women compulsory. In addition, there must be woman in major position like either in president or in secretary. These groups' participation is motivated with the economic incentives when they attend training, meeting or other works in community forest. Similarly, justice distribution of forest products is ensured with the special provision of free cost or low cost to purchase the forest products. Review found that it is compulsory to do wellbeing ranking of the forest users and at least 35% of community forest fund should be mobilized for target programs focusing to the poor group. Furthermore, priority in visits and trainings like financial management, forest management and group management has been ensured along with equity process in human and institutional development.

#### (II) Program Implementation Guideline of Department of Forest 2014

Review of Program Implementation Guideline of Department of Forest 2014 showed it has addressed equality issues in sharing the benefits among the community forest users in Nepal. Program implementation guideline of Department of Forest 2014 has included provisions to provide an assistance in preparation and implementation of livelihoods plan of poor and excluded and promoting them to involve in income generation activities. In addition, it covers renew of community forest operational plan to include climate change adaptation plan focusing to the poor, women and excluded groups.

#### (III) Forest Policy 2015

Review of Forest Policy 2015 showed that it has addressed the equality issues in sharing the benefits among the community forest users in Nepal. It has itself justified that the need of this forest policy is for the justice distribution of benefits among the forest users and ensure justice distribution of benefits achieved from the conservation of biodiversity and resources and environmental

services. Similarly it envisions the overall guidance for justice allocation of benefits among the forest users that comes from community forest.

#### (IV) Thirteenth Plan 2013

Thirteenth plan 2013 has also addressed the equality issues in sharing the benefits among the community forest users in Nepal. It mentions that capacity building, empowerment and creation of green job shall be done for forest dependant poor and women. In addition to this, at least 53% of CF fund shall be invested for social and economical empowerment of poor to bring the equality in resource distribution among the forest users.

### 4.3 Equality Status in the Use of Forest Products

Household respondents were asked how much quantity of forest products they used in the last year. This research had studied four types of forest products—timber, firewood, grass and bedding materials. Gini coefficients were calculated for all these studied forest products with the help of formula for ungrouped data distribution. These calculated Gini coefficients for use of timber and firewood at the level of community forest user group and wellbeing ranking groups are arranged in Table 4.1.

**Table 4.1:** Gini coefficients for the timber and firewood uses

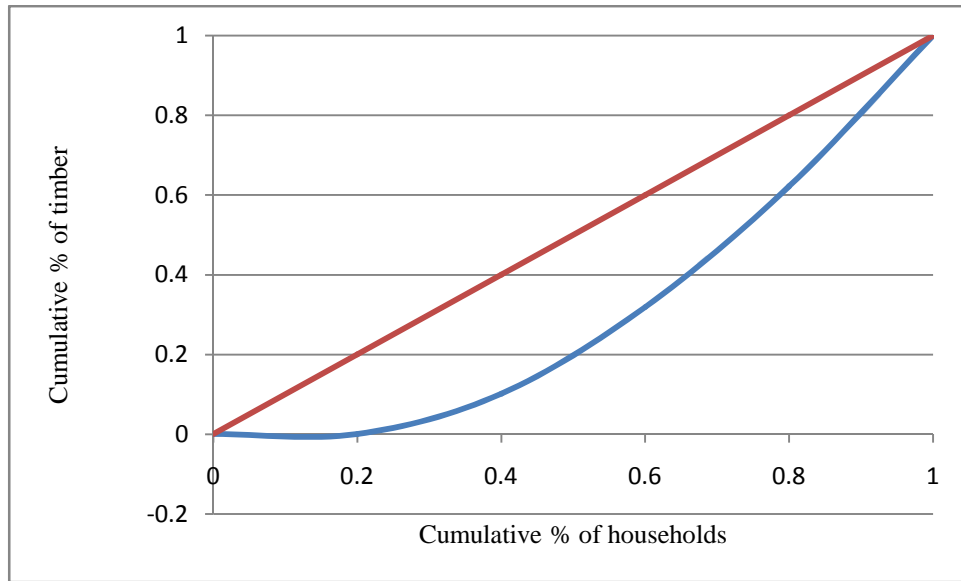
Categories	Timber	Firewood
CFUG	0.419	0.129
Poor	0.552	0.118
Medium	0.434	0.087
Rich	0.162	0.095

Source: Calculated from field data, 2015

Table 4.1 shows the Gini coefficients of Gosainkunda community forest user group for the use of timber is 0.419. Lorenz curve for the use of timber is flatter in the bottom and it also shows that 20% user households had used zero quantity of timber last year (Figure 4.2). By wellbeing groups, poor household group has the highest value of Gini coefficient (0.552) which is followed by medium group (0.434) and rich (0.162). This indicates there is higher equality in sharing the timber

quantity among the rich group while it is the largest inequality among the distribution of timber among the poor households in this year. However, the equality status in medium group and CFUG found slightly equal rather than poor and rich households in the community forest.

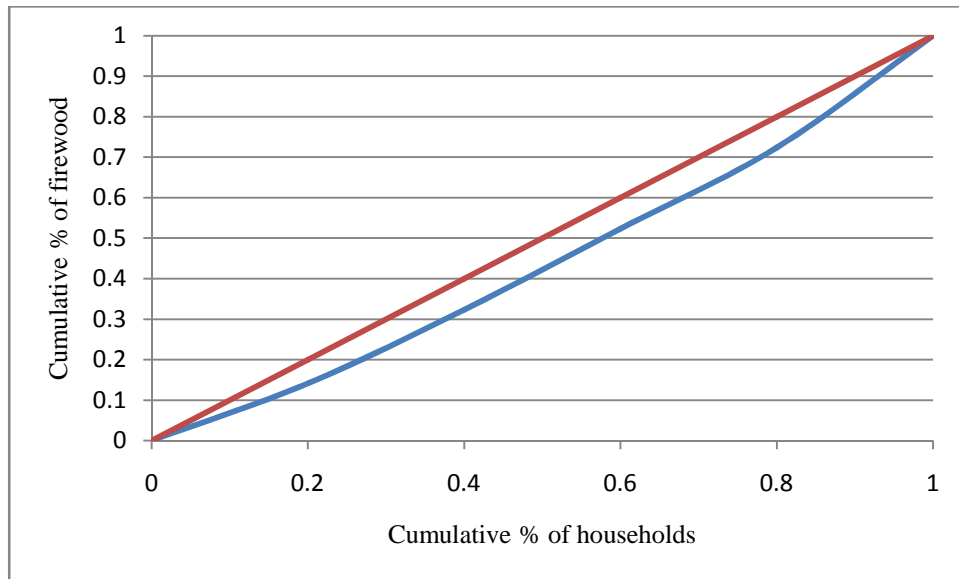
**Figure 4.2:** Lorenz curve for the use of timber



Source: Calculated from Appendix 3

Similarly, Table 4.1 shows the Gini coefficients of community forest user group for the use of firewood is 0.129. Lorenz curve for the use of firewood is nearer to the line of perfect equality showing more equality than timber use last year (Figure 4.3). By wellbeing groups, poor household group has the highest value of Gini coefficient (0.118) which is followed by rich group (0.095) and then medium group (0.087). This indicates there is slightly higher equality in sharing the firewood quantity among the medium group while there is largest inequality in the distribution of firewood among the poor households in this year. However, the equality status at rich group stood in the middle and CFUG found the higher inequality even more than poor household. In fact, it is found that there is higher equality in the use of firewood regardless wellbeing group.

**Figure 4.3:** Lorenz curve for the use of firewood



Source: Calculated from Appendix 4

Comparing the Gini coefficients between timber and firewood use, data shows there is greater fluctuation in equality status in the use of timber. This further indicates there is variation in timber use between different wellbeing ranking groups in the community forest users group. However, firewood distribution is found to be nearly equal between wellbeing ranking groups than timber use at the level of whole forest user group. This is supported by the key informant interview that firewood is equally needed to all the forest users.

**Table 2.2:** Gini coefficients for the grass and bedding material uses

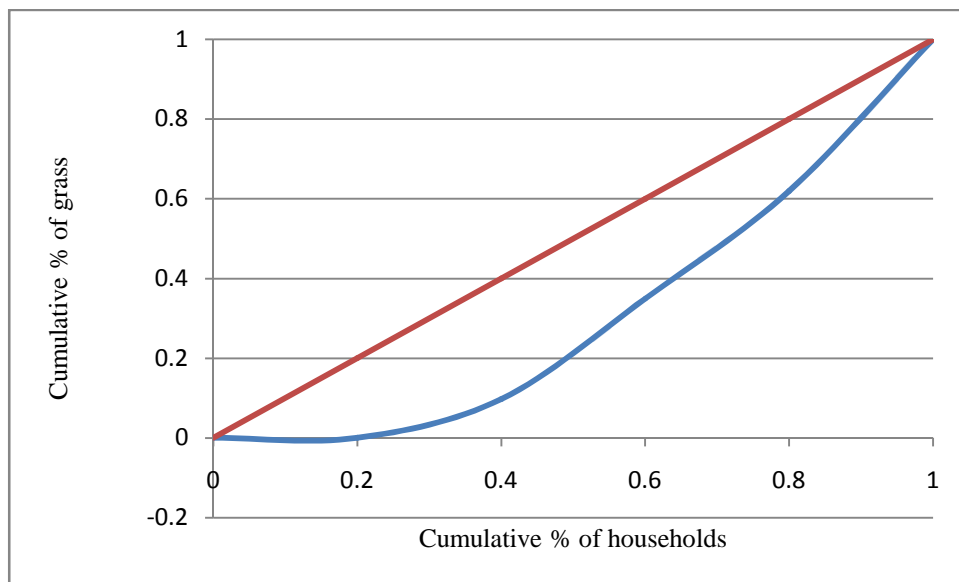
Categories	Grass	Bedding material
CFUG	0.408	0.419
Poor	0.056	0.079
Medium	0.250	0.258
Rich	0.667	0.688

Source: Calculated from field data, 2015

Table 4.2 displays the arrangement of Gini coefficients for use of grass and bedding material at the level of community forest user group and wellbeing ranking groups. Result shows Gini coefficients

of community forest user group for the use of grass is 0.408. Lorenz curve for the use of grass is flatter in the bottom while tapering towards the top showing more inequality among the users (Figure 4.4). By wellbeing group, rich household group has the substantially highest value of Gini coefficient (0.667) which is followed by medium group (0.250) and poor (0.056). This indicates there is higher equality in sharing the grass quantity among the poor group while it is the largest inequality among the distribution of grass among the rich households last year.

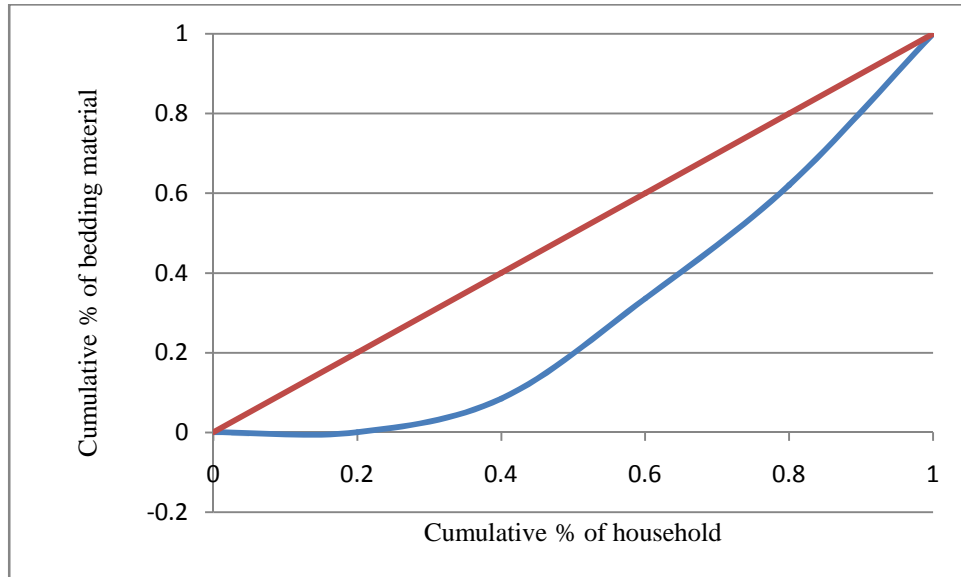
**Figure 4.4:** Lorenz curve for the use of grass



Source: Calculated from Appendix 5

Similarly, Table 4.2 also displays Gini coefficients of community forest user group for the use of bedding material which is 0.419. Lorenz curve for the use of bedding material is like grass which is flatter in the bottom while tapering towards the top showing more inequality among the users (Figure 4.5). Among the wellbeing groups, rich household group has the substantially highest value of Gini coefficient (0.688) which is followed by medium group (0.258) and poor (0.079). This indicates there is higher equality in sharing the bedding material among the poor group while it is found largest inequality among the distribution of bedding material in the rich households last year.

**Figure 4.5:** Lorenz curve for the use of bedding material



Source: Calculated from Appendix 6

Comparing the Gini coefficients between grasses and bedding material use, data shows there is greater fluctuation in the equality status within each forest product. But, it is clear that there is greater equality in the use of grass and bedding material by category. This further indicates that the households, who use grass, also use the bedding material. This is supported by key informant interview that grass and bedding materials are only required to the users who keep cattle and goats in their households.

By wellbeing ranking groups, poor has sharply higher level of inequality (0.552) in the use of timber as compared to the use of firewood, grass and bedding material as shown in Table 4.1 and 4.2. In contrast, rich group has significantly more inequality in the use of grass (0.667) and bedding material (0.688) in comparison with timber (0.162) and firewood (0.095).

Among the studied four types of forest products, it is found that community forest users had higher equality in the use of firewood rather than the use of timber, grass and bedding material. Almost all the forest users used to use the firewood for the purpose of cooking and heating in their households. This necessity made them collect the firewood how much quantity they are allowed to collect from their community forest. The rule of community forest user group for collecting firewood was equal

to all the user households as mentioned in constitution of community forest user group. So they got chance to collect equal quantity of firewood among the forest users. Though, some households were very near to the forest and some were relatively far from the forest. Moreover it is found that the users who were nearer to the forest were collecting slightly more quantity of firewood than the users who were away. Even having this condition, equality status was seen in case of using the firewood among the forest users because there was insignificant variation in the collected quantity. In addition, equality was also seen within the different wellbeing ranking groups because of residing poor households nearer to the forest and they all used to collect somewhat more quantity of firewood from the community forest. Likewise far residing user households, specifically who were nearer to the market, collected the firewood quantity as specified in the rule of community forest. They were from richer group and also equality was observed within richer group. This showed equality in the use of firewood among all the forest users and also within each different wellbeing ranking group in the community forest users.

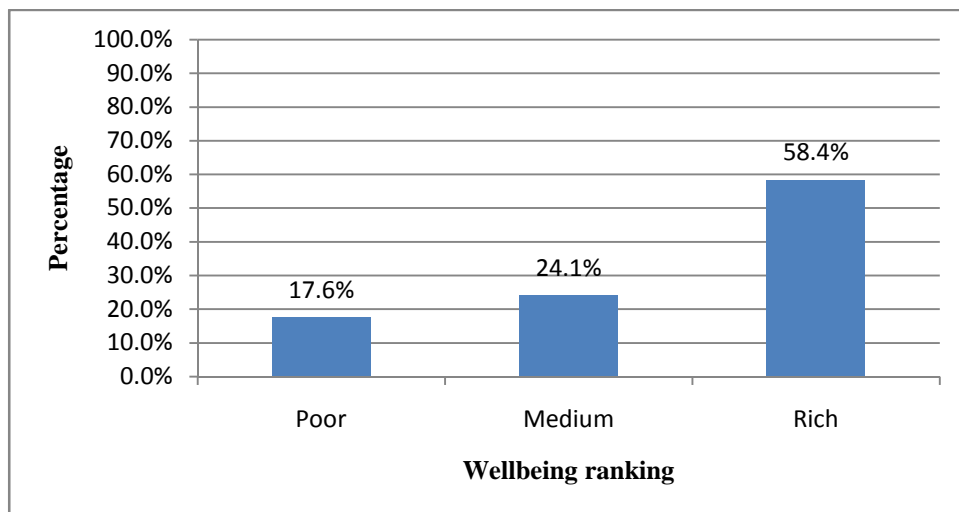
Poor has higher level of inequality (0.552) in the use of timber as compared to the use of firewood, grass and bedding material. As Gosainkunda community forest is small and there was insufficient production of timber to fulfill the demand of all users. So there was a priority to collect the timber. The first priority was given to the users who got disaster. Similarly, the users who want to build a new home, to build a shed, to repair an old home, support to the social organizations and lastly to the poor and excluded user households. Inadequate timber in the community forest and last priority to the poor households invited higher level of inequality within poor group. It is further supported by the fact that poor households do not have needed cash amount for building new homes and other constructions works. In addition, poor should pay minimum cash amount per cubic foot of timber what they were found to be unable to purchase. So they are found to be away from the use of timber and only some poor households got a chance to use timber from community forest. This situation made higher inequality in timber use among the poor households in the community forest user group. In contrast, richer have slightly more ability to purchase timber for the construction works and they use in somewhat equal manner. That is why richer households were found to be more equal in using the timber in the community forest.



While talking about the grass and bedding material, rich group has significantly more inequality in the use of grass (0.667) and bedding material (0.688) in comparison with timber (0.162) and firewood (0.095). Field observation and key informants interview showed that poor households were rearing cattle and goats. They need sufficient quantity of grasses and bedding materials for their domestic animals. So, poor households were equally collecting the grasses and bedding materials from community forest. This condition led to the equality in using the grass and bedding material among the poor households. But, the entire rich households were not rearing cattle and goats. There was even distinctly variation in rearing the number of cattle among the rich households. They also had diversified economic strategies than poor households. This proved that rich households needed less quantity of grass and bedding material as compared to the poor households. It led to the higher inequality in the use of grass and bedding material among the rich group in comparison with poor in the community forest user group.

The use of quantity of forest products per household also helps to explain the variation in the use of forest products. The use of timber, firewood, grass and bedding material has been presented in bar diagrams by wellbeing group below.

**Figure 4.6:** Group wise average quantity of timber use per household (in %)

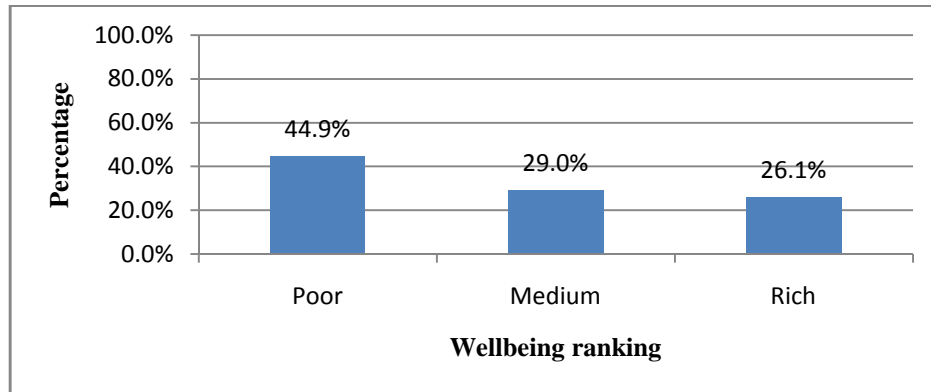


Source: Calculated from field data, 2015

Figure 4.6 shows the use of timber quantity is raising towards the rich from the poor group. Rich households were using the highest percentage of average quantity of timber per household (58.4%)

while it is found that poor household used the least percentage quantity of the timber (17.6%). Similarly, medium group used the quantity of timber (24.1%) which was slightly higher than that of poor households.

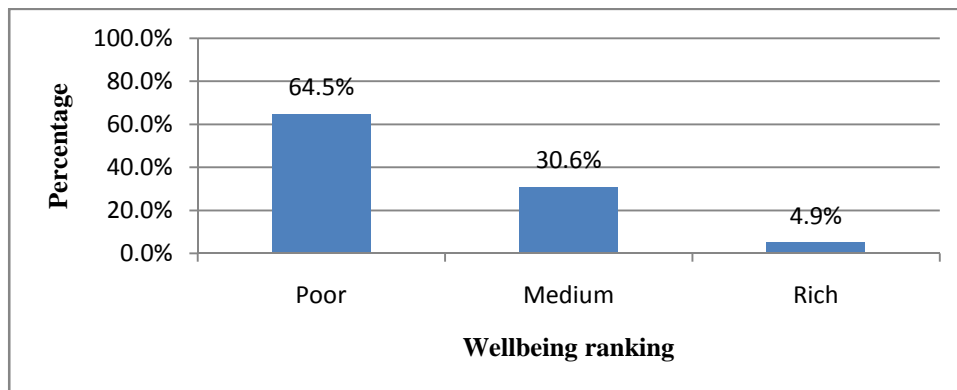
**Figure 4.7:** Group wise average quantity of firewood use per household (in %)



Source: Calculated from field data, 2015

Figure 4.7 shows the percentage of average quantity of firewood use per household in Gosainkunda community forest user group. Trend of the percentage of average quantity of firewood use per household is gradually decreasing from poor to the rich. Poor households were using the highest percentage of average quantity of firewood per household (44.9%) while it is found that rich household used the least percentage of firewood quantity (17.6%) in the community forest user group. In case of medium group households, they used 24.1% of firewood quantity which was slightly higher as compared to the rich households.

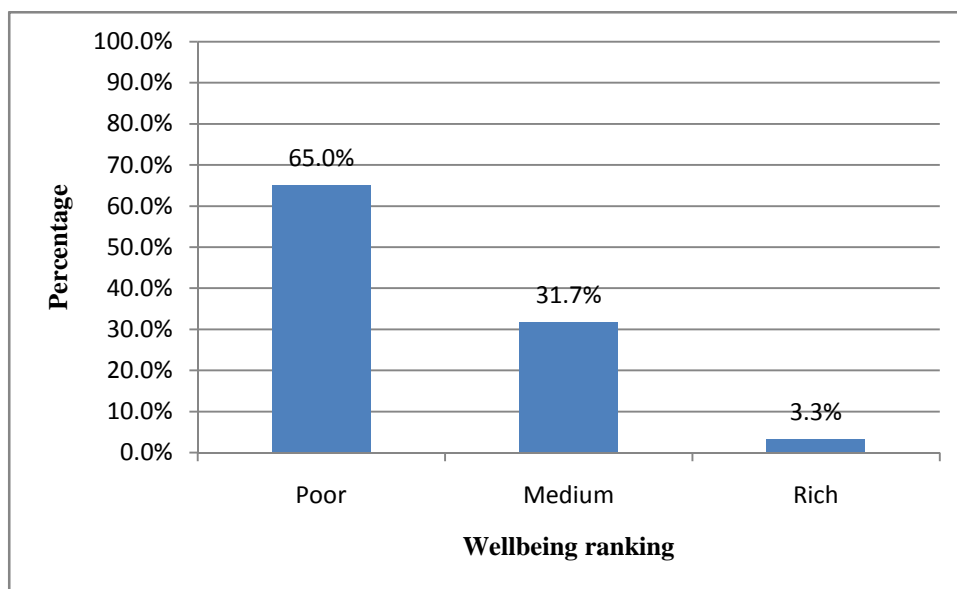
**Figure 4.8:** Group wise average amount of grass use per household (in %)



Source: Calculated from field data, 2015

Figure 4.8 shows the percentage of average quantity of grasses use per household in Gosainkunda community forest user group. Result shows the trend of the percentage of average quantity of grasses use per household is sharply declining from the poor to the rich group. In other words, poor households were using the highest percentage of average quantity of grasses per household (64.5%) while it is found that rich household used the least percentage of grasses quantity (4.9%) in the community forest user group. And medium group households used 30.6% of grass which was higher as compared to the rich households.

**Figure 4.9:** Group wise average amount of bedding material use per household (in %)

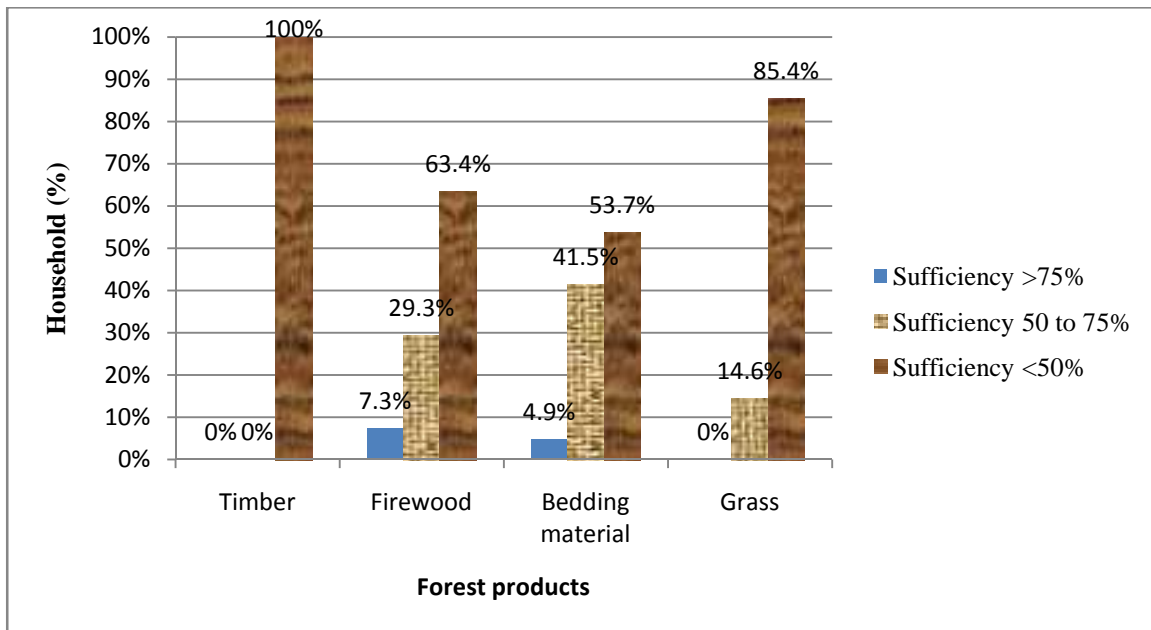


Source: Calculated from field data, 2015

Bedding material (SOTTAR in Nepali) is the collection of fallen dried leaves of the plants and lying on the ground in forest which is used as bed for the cattle in the shed. Figure 4.9 shows the percentage of average quantity of bedding material collected per household in Gosainkunda community forest user group. Result shows poor households were using distinctly highest percentage of average quantity of bedding material per household (65%) while it rich household used shapely least percentage of bedding material quantity (3.3%) in the community forest user group. And it was found that medium group households used 31.7% of bedding material quantity which is less than half of the rich households.

Household respondents were also asked about the forest products sufficiency. Figure 4.10 shows forest products were lacking to meet the basic need of them year round from Gosainkunda community forest. All the surveyed households experienced the timber supply sufficiency less than 50% of their need from the forest. This clearly indicates that timber is the most scarce forest product among the users in this community forest user group. 63.4% household reported that they got firewood quantity less than 50% of their household need this year. Firewood sufficiency (50-75%) was experienced by 29.3% household. In addition, more than 75% firewood demand was fulfilled only for the 7.3% household. In addition, more than 75% firewood demand was fulfilled only for the 7.3% household.

**Figure 4.10:** Percentage of households for the forest products sufficiency



Source: Field survey, 2015

The highest percentage of users (53.7%) were enjoying with less than 50% bedding material sufficiency which is followed by 41.5% household who enjoyed 50-75% sufficiency and 4.9% household for more than 75% sufficiency. In terms of grass, result shows 85.4% household were fulfilled with less than 50% sufficiency. There is high demand of grasses but the capacity of community forest to supply grass is very low.

#### 4.4 Equality Status in Financial, Social and Human Resources

Household respondents were asked whether they have received any loan, returnable or free cash supports and scholarships from the Gosainkunda community forest user group since last five years. Table 4.3 displays the Gini coefficients for the use of financial resources among the forest user in the last five years. Result shows there is slightly higher level of inequality among the community forest user group level (0.552) than any wellbeing ranking groups. Lorenz curve for the use of financial resource is flatter in the middle and away from the line of perfect equality indicating the higher inequality among the users (Figure 4.11)

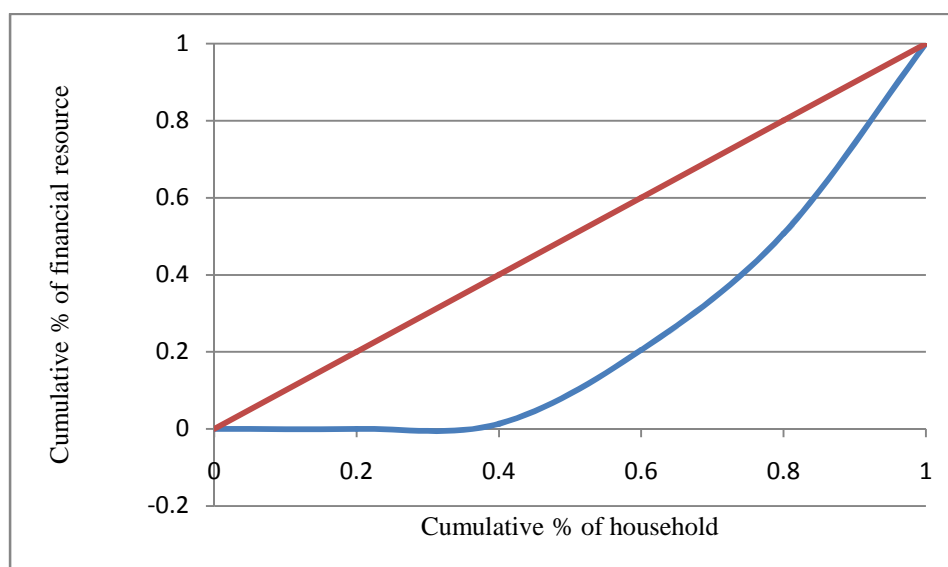
**Table 4.3:** Gini coefficients for financial resource uses

Categories	CFUG	Poor	Medium	Rich
Gini coefficient	0.552	0.37	0.498	0.509

Source: Calculated from field data, 2015

Among the wellbeing groups, poor group (0.37) has more equality in comparison with medium (0.498) and rich (0.509) in receiving the financial supports from the community forest user group. This fact is supported by the key informants that poor are prioritized to support them financially in the community forest user groups according to the prevailing forest policy frameworks.

**Figure 4.11:** Lorenz curve for the use of financial resource



Source: Calculated from Appendix 7

Slightly higher inequality was found in the use of financial resources among the community forest user (0.552) but it was more equality among the poor group (0.37). Community forestry development program's guideline 2009 has promoted the poor group to involve in income generation activities. In addition, they were supported with different financial services like free interest loan, low interest rate loan and educational scholarships from the community forest fund. In Gosainkunda community forest user group, there was less household number of poor in comparison with rich and medium households. That is why it is easier to serve poor households with financial services from community forest fund than the medium and rich households. This resulted more equality in sharing the financial resources within the poor group of households in the community forest than medium and rich. In addition, financial resources were variably distributed among the rich. Some had received high amount but other had not chance to enjoy. Medium households were in higher number so it is sufficient to serve all the households. This situation brought the inequality in sharing the financial resources in case of all the forest users as a whole in the community forest. This is also supported by key informants that poor are prioritized to support financially in community forest user groups according to the prevailing community forestry related policy frameworks.

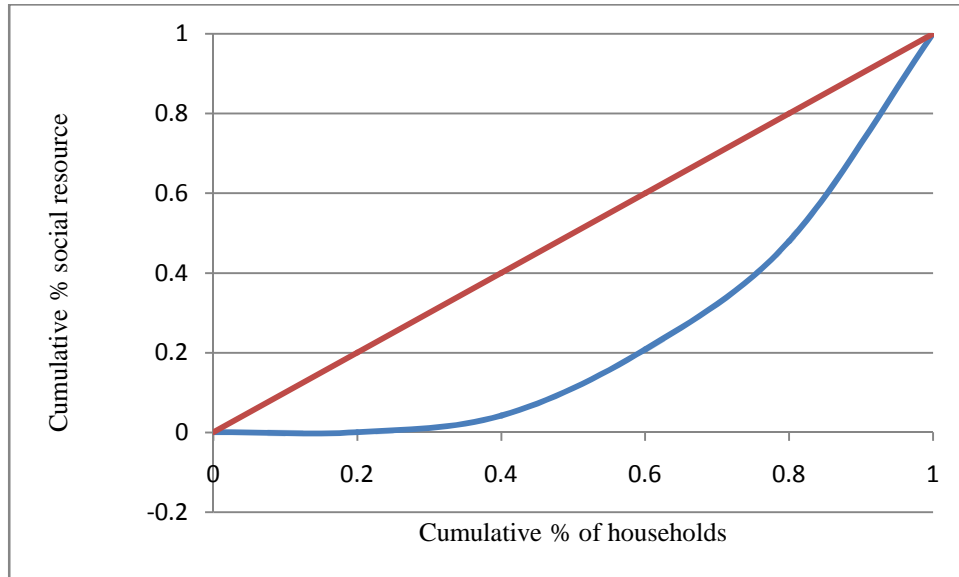
**Table 4.4:** Gini coefficients for social and human resource development

Categories	CFUG	Poor	Medium	Rich
Social	0.553	0.667	0.519	0.189
Human	0.420	0.125	0.422	0.304

Source: Calculated from field data, 2015

Respondents were also asked regarding the linkage and network established through the cash transaction or having memberships with the number of organizations except Gosainkunda CFUG in the last five years. Table 4.4 shows higher inequality among the users (0.553) in the use of social resources. Lorenz curve is flatter and away from the line of perfect equality as shown in the Figure 4.12. By wellbeing group, poor group (0.667) has the highest inequality while rich group (0.189) has the highest equality in the use of social resources. This is supported by key informant interview that social linkage and networks of poor are increasing in community forest users.

**Figure 4.12:** Lorenz curve for the use of social resource



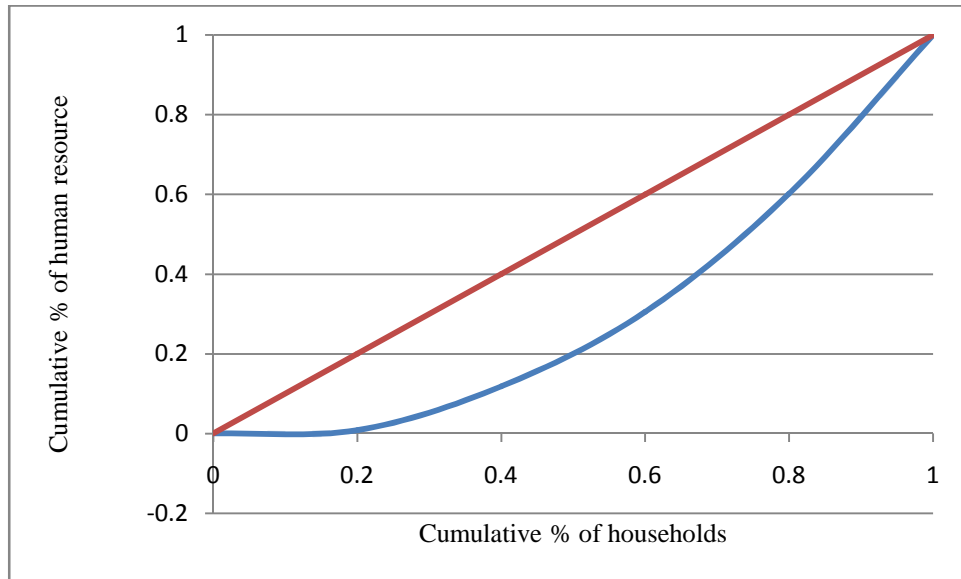
Source: Calculated from Appendix 8

In addition, respondents were asked how many times they had got opportunities to attend training, workshop and exposure visit/travel in the last five years. Table 4.4 shows the value of Gini coefficient for the use of opportunity on human resource development is 0.42. Figure 4.13 shows slightly equality in the use of human resource than the use of financial resource. By wellbeing group, medium group (0.422) has the highest inequality but poor group (0.125) has the highest equality in using the human resource in the community forest user group.

Poor group (0.667) has the highest inequality in establishing social linkage and networks with different organizations while it was highest equality among the rich group (0.189). Poor group of households were engaging for fulfilling their subsistence need. Key informants interview showed they had lesser access to the resources. Primarily they were depending on subsistence agriculture with livestock farming. They did not have more time to spend out of their daily needs. Social resources are slightly long term benefiting aspect but they need immediate benefit. These reasons all poor had no access to enjoy the social resources. However, policy provisions have prioritized poor to bring them to utilize social resources being in membership or establishing the linkage and network with different organizations. Now the poor households were increasing in the use of their social resources. This variation in the use of social resources causes the highest inequality among

the poor households in comparison with medium and rich groups of households. In contrast, rich users had been enjoying social resource being members and establishing relations in different organizations. This made slightly more equality among the rich group of households in the community forest.

**Figure 4.13:** Lorenz curve for the use of opportunity on human resource development



Source: Calculated from Appendix 9

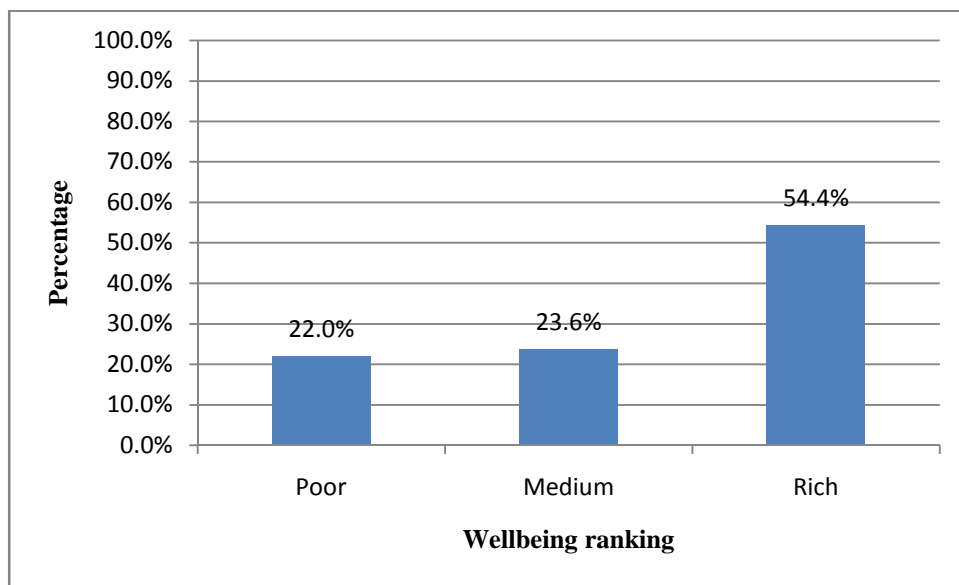
Medium group (0.422) has the highest inequality in case of getting opportunity to attend training, workshop and exposure visit/travel while it was highest equality in the poor group (0.125). Studied community forest user group had the highest number of medium group of households. Only some of them had got opportunities to attend human resource development activities like training, workshop and visits and others had not got chance. This obviously led to the higher inequality among the medium group in receiving the opportunity for human resource from their community forest. In other hand, community forestry guideline has prioritized to attend the poor compulsorily in those activities. Poor households had less in number in this community forest user group. So all had got chance to attend in the activities one household by one in priority basis. This made the highest equality among the poor households than medium and rich.



Economic inequality for Nepal is denoted by Gini coefficient 0.328 while it is 0.353 and 0.311 in urban and rural areas respectively (NPC, 2014). As comparison to the national data of economic inequality, result showed that community forest users had higher degree of inequality in sharing the benefits come from the community forest. However, inequality status other than economic aspect is far higher in comparison with the result of the inequality status in sharing the benefits among the community forest users.

The uses of financial, social and human resources per household also help to explain the variation in the use of these resources in the community forestry user group. All these three resources are presented in bar diagrams by wellbeing group below.

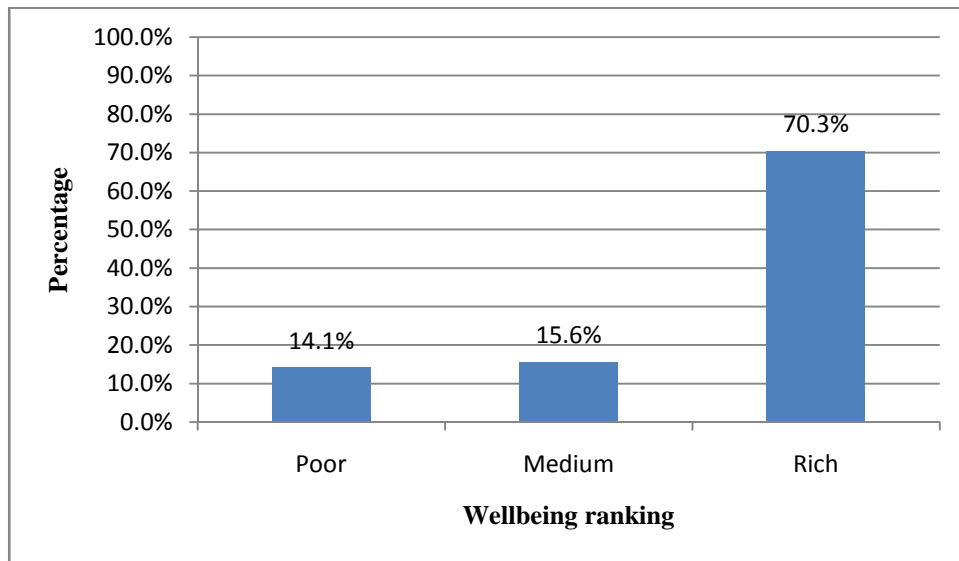
**Figure 4.14:** Group wise average amount of financial resource use per household (in %)



Source: Calculated from field data, 2015

Figure 4.14 shows the percentage of average cash amount use per household in Gosainkunda community forest user group. Result shows the trend of the percentage of average cash amount use per household is increasing towards rich group from the poor. This shows poor households were using the least percentage of average cash amount per household (22%) while it was sharply highest among the rich household (54.4%) in the community forest user group. Medium group households (23.6%) used slightly higher percentage of cash amount as compared to the poor households.

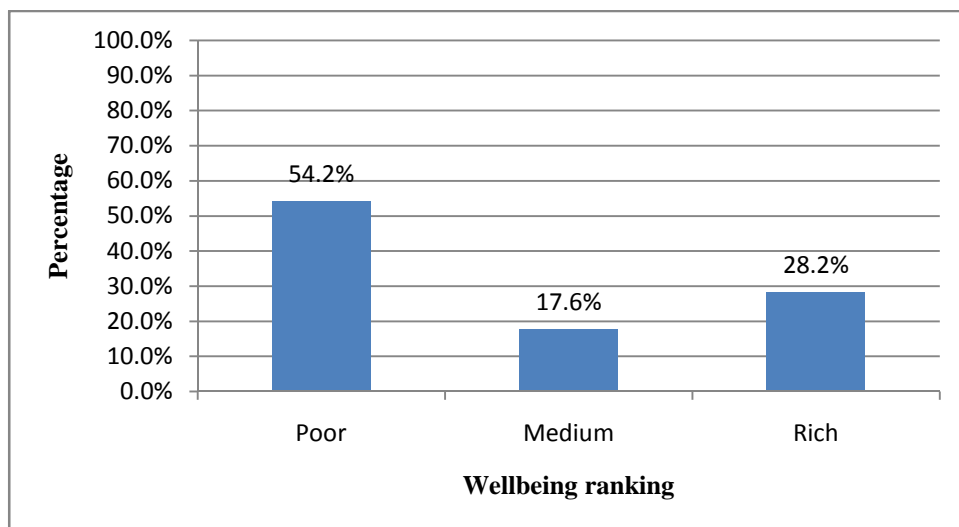
**Figure 4.15:** Group wise average amount of social resource use per household (in %)



Source: Calculated from field data, 2015

Regarding the use of social resource, Figure 4.15 shows that the trend is higher towards the richer group. Rich group had the social network with the largest number of organizations. In contrast, poor had only 14.1%. In addition, medium group (15.6%) had marginally higher figure than that of poor group in the community forest users.

**Figure 4.16:** Group wise receiving opportunity use on human resource per household (in %)

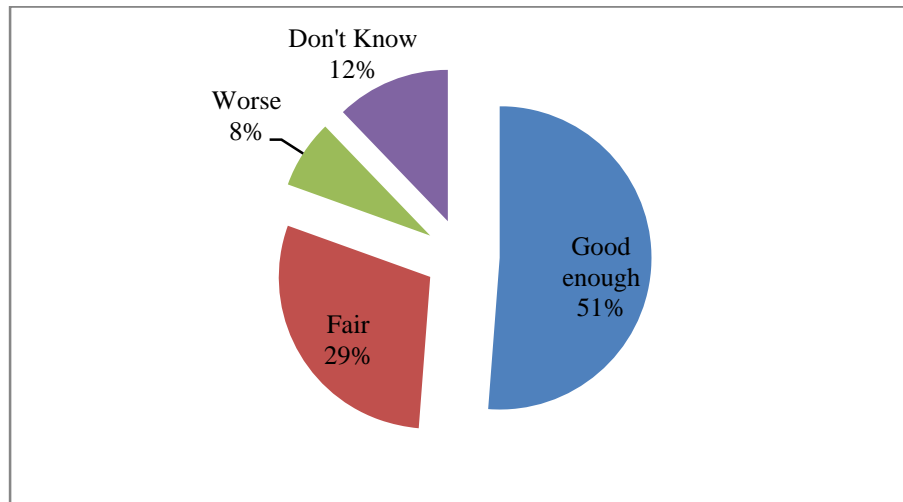


Source: Calculated from field data, 2015

Similarly, in the use of opportunity on participating in number of training, workshop or visit organized by Gosainkunda community forest user group, Figure 4.16 shows poor households (54.2%) got most opportunity for participation in human resource development activities. It was followed by rich group (28.2%) and medium (17.6%) respectively. This is supported by the key informant interview that poor households are prioritized to take part in these activities for their empowerments.

Household respondents were also asked about the benefit sharing mechanism in their Gosainkunda community forest user group. Respondents had been given four options— good enough, fair, worse and don't know regarding the assessment of their existing benefit sharing mechanism in the community forest user group. Figure 4.17 shows majority percentage of household (51%) reported the benefit sharing mechanism is good enough which is followed by fair (29%). In contrast 8% household felt the mechanism is worse and 12% households were unknown to the benefit sharing mechanism of the forest user group.

**Figure 4.17:** User's perception on benefit sharing mechanism



Source: Field survey, 2015

# **CHAPTER V**

## **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Summary**

Community forestry development program is one of the priority program initiated in 1978 in Nepal. This is a major program of the forest sector and main objective is to meet the basic needs of local people, particularly fuel wood and timber through a sustainable forest management and utilization. Community forestry related policies in Nepal have focused on poor and marginalized population. A study conducted by Ministry of Forests and Soil Conservation has also noted forest user's reason for satisfaction in performance of community forest user group. The main reason for the satisfaction is fair and equal distribution of forest products according to availability. But it is unknown to what extent this forestry program has followed equality in benefit sharing among the forest users. So, the objective of this study is to assess the equality status in sharing the benefits among forest users. This study was conducted in Gosainkunda community forest user group so that findings of this study do not necessarily represent equality status of all the community forests across the country. While talking about governance, equality in benefit sharing among and within the community forest user group plays a vital role to maintain good governance from the local level. Higher level of equality in benefits could contribute to the rural community people to boost them up towards integrating and mainstreaming in the national development process.

Gosainkunda community forest user group has 405 households which represents the population for this study. To make the population homogeneous in this study, Gosainkunda community forest user households had been divided into three homogeneous strata/groups— poor, medium and rich based on wellbeing ranking. Then, 10% households had been taken as sample households from each homogeneous group for this research purpose. This became a total of 41 households as sample size for this study. Study used review appraisal, household survey and key informant interview methods of data collection. Simple random sampling was adopted to select the sample households for each three groups in the Gosainkunda community forest user group for the purpose of household survey. In addition, five key informants were interviewed. Collected quantitative data were analyzed by using the formula developed by Corrado Gini to find out the Gini coefficient of each distribution.

Review of policies found that Guideline for the community forestry development program 2009, Program implementation guideline of Department of Forest 2014, Forest policy 2015 and Thirteenth plan 2013 have addressed the issues on equality in benefits sharing among the community forest users in Nepal. Provisions in these documents mention that positive discrimination of poor and excluded groups ultimately leads towards equality in benefit sharing among the community forest users. In addition, at least 35% of community forest fund should be mobilized for target programs focusing to the poor group. Furthermore, priority in visits and trainings like financial management, forest management and group management has been ensured along with equity process in human and institutional development.

Gini coefficient of timber use among the forest users was 0.419. By wellbeing group, poor (0.552) has highest value of Gini coefficient followed by medium (0.434) and rich (0.162). Similarly, Gini coefficient of firewood use among users was 0.129. By wellbeing group, poor (0.118) has highest value of Gini coefficient followed by rich (0.095) and medium (0.087). This data shows community forest has higher equality in using firewood regardless wellbeing group. In terms of grass, Gini coefficient for users was 0.408. By wellbeing group, rich has substantially highest value of Gini coefficient (0.667) followed by medium (0.250) and poor (0.056). In addition, Gini coefficient for bedding material use was 0.419 among the forest users. By wellbeing group, rich has substantially highest value of Gini coefficient (0.688) followed by medium (0.258) and poor (0.079).

There is slightly higher inequality in sharing financial resources among users (0.552) than any wellbeing groups. By wellbeing, poor (0.37) has more equality in comparison with medium (0.498) and rich (0.509) in receiving financial supports from user group. In terms of social resources, poor (0.667) has highest inequality while it was highest equality among rich (0.189) in using social resources. In addition, medium group (0.422) has highest inequality in receiving opportunities on human resource development while it was highest equality among poor (0.125).

## 5.2 Conclusion

Review of policies related to the community forestry found that Guideline for the community forestry development program 2009, Program implementation guideline of Department of Forest 2014, Forest policy 2015 and Thirteenth plan 2013 have addressed the issues on equality in benefit sharing among the community forest users in Nepal. Provisions in these documents mention that positive discrimination of poor and excluded groups ultimately leads towards equality in benefit sharing among the community forest users. In addition, at least 35% of community forest fund should be mobilized for target programs focusing to the poor group. Furthermore, priority in visits and trainings like financial management, forest management and group management has been ensured along with the equity process in human and institutional development.

There is more equality in the use of firewood than the use of timber, grass and bedding material among the community forest users. By wellbeing group, there is disparity within poor group in the use of timber but higher equality in the use of grass and bedding material. Gini coefficient of timber use among the forest users was 0.419. By wellbeing group, poor has highest value of Gini coefficient followed by medium. Similarly, Gini coefficient of firewood use among users was 0.129. By wellbeing group, poor has highest value of Gini coefficient followed by rich. This data shows community forest has higher equality in using firewood regardless wellbeing group. In terms of grass, Gini coefficient for users was 0.408. By wellbeing group, rich has substantially highest value of Gini coefficient followed by medium. In addition, Gini coefficient for bedding material use was 0.419 among the forest users. By wellbeing group, rich has substantially highest value of Gini coefficient followed by medium.

There is highest disparity in the use of financial and social resources as compared to the use of forest products (except firewood) and human resource. By wellbeing, poor has more equality in comparison with medium and rich in receiving financial supports from user group. In terms of social resources, poor has highest inequality while it was highest equality among rich in using social resources. In addition, medium group has highest inequality in receiving opportunities on human resource development while it was highest equality among poor.

### 5.3 Recommendations

This study has recommended the following as mentioned below:

- i) Guideline for the community forestry development program 2009 should include the mandatory provision of equity in participation and resource distribution among the forest users.
- ii) Community forestry guideline should quantify the percentage of poor member's involvement in skill development trainings. This helps to generate the income of poor and excluded groups in the community forest user group.
- iii) Policy should mention the minimum definite percentage of flown CF budget to the poor and excluded groups for their education and income generation.
- iv) There should be a free provision in CF constitution to supply minimum quantity of timber continuously to the poor based on their need.
- v) There is insufficiency of forest products to the forest users. It is needed to do plantation where the denuded site for increasing the resource stock that helps to fulfill the demand of forest products in future.
- vi) Fast growing plant species are recommended to get benefitted in a short period of time.
- vii) It should be strictly restricted free grazing inside the community forests which helps to grow and the forest seeding and sapling in the forest.
- viii) Community forest user committee should help the poor and medium group households to get members in cooperatives and financial institutions.
- ix) Community forest user committee and financial institutions should provide free loan or minimum interest rate of loan for income generation activities.
- x) Forest user committee should involve them in skill development training rather than involving in awareness raising activities.
- xi) Forest user committee should provide educational scholarships to the children from poor and excluded groups.

## REFERENCES

- Adhikari, B. & Falco, S. D. (2008). *Social Inequality and Collective Action: An Empirical Study of Forest Commons*. Michigan: International Forestry Resources and Institutions Programs.
- Adhikari, B. & Lovett, J. (2006). Institutions and Collective Action: Does Heterogeneity Hinder Community-Based Resource Management? *Journal of Development Studies* , 78 (1), 5-15.
- Acharya, B. (2009). *Research Methods in Anthropology and Sociology*. Kathmandu, Nepal: National Book Centre.
- Andersson, K. & Agrawal, A. (2011). Inequalities, institutions, and forest commons. *Global Environmental Change* , 866-875.
- Cavendish, W. & Campbell, B. (n.d.). Poverty, environmental income and rural inequality: A case study from Zimbabwe.
- DFID. (1999). *Sustainable Livelihoods Guidance Sheets*. Department for International Development.
- DoF. (2011). *CFUG Database Record Available in MIS*. Kathmandu, Nepal: Community Forestry Division. Department of Forest.
- DoF. (n.d.). *Home: Community Forest Division*. Retrieved January 28, 2015, from Community Forestry. Department of Forests Web site: <http://www.dof.gov.np/>
- Fisher, M. (2004). Household Welfare and Forest Dependence in Southern Malawi. *Environment and Development Economics* , 9 (2), 135-154.
- Fonta, W. M., Ichoku, H. E. & Ayuk, E. (2009). The Distributional Impacts of Forest Income on Household Welfare in Rural Nigeria. *Journal of Economics and Sustainable Development* .
- Galbraith, J. K. & Hale, T. (2006). *State Income Inequality and Presidential Election Turnout and Outcomes*. Lyndon B. Johnson School of Public Affairs. Austin, Texas: The University of Texas Inequality Project.
- Gardner, M. & Abraham, D. (2015). *Inequality*. Retrieved March 23, 2015, from Home page: <http://inequality.org>



- Gatiso, T. T. & Wossen, T. (2015). Forest dependence and income inequality in rural Ethiopia: evidence from Chilimo-Gaji community forest users. *International Journal of Sustainable Development & World Ecology* , 22 (1), 14-24.
- GoN. (1993). *Forest Act*. Singha Durbar, Kathmandu, Nepal: Government of Nepal.
- GoN. (1995). *Forest Regulations*. Singha Durbar, Kathmandu, Nepal: Government of Nepal.
- Herzer, D. & Vollmer, S. (2012). Inequality and growth: evidence from panel cointegration. *J Econ Inequal* , 10, 489-503.
- Investopedia. (2015). *Dictionary*. Retrieved March 23, 2015, from Investopedia: <http://www.investopedia.com>
- John, J. I., Nnamdi, M. S. & Aduralere, I. I. (2013). Economics of non-timber forest products (NTFPs) in Oyo-state, Nigeria. *IOSR Journal Of Humanities And Social Sciences (IOSR-JHSS)* , 18 (4), 01-18.
- Kandel, K. R. (2007). *Current status of community forestry in Nepal*. Bangkok, Thailand: Community Forestry Division, Department of Forests submitted to regional community forestry training center for Asia and the Pacific.
- Katholnig, L. (2012). *Growth Dominance and Gini-Index in even-aged and in uneven-aged forests*. Vienna: Master Thesis Submitted to the Institute of Forest Growth and Yield Research Department of Forest and Soil Sciences, University of Natural Resource and Applied Life Sciences.
- Khanal, B. (2011). Is community forestry decreasing the inequality among its users? Study on impact of community forestry on income distribution among different users groups in Nepal. *International Journal of Social Forestry (IJSF)* , 4 (2), 139-152.
- Lexerod, N. L. & Eid, T. (2006). An evaluation of different diameter diversity indices based on criteria related to forest management planning. *Forest Ecology and Management* , 17-28.

- Lawati, M. (2005). *Towards A Decocratic Nepal Inclusive Political Institutions for a Multicultural Society*. New Delhi: Sage Publication.
- Luintel, H., Ojha, H., Rana, B., Subedi, R. & Dhungana, H. (2009). *Community forestry in Nepal: Promoting livelihoods, community development and the environment*. Livelihood & Forestry Programme and Forest Action.
- McKay, A. (2002, March). Inequality Briefing. *Defining and Measuring Inequality* , p. 1-6.
- MFSC. (2013). *Persistence and Change: Review of 30 years of community forestry in Nepal*. Singha Durbar, Kathmandu, Nepal: Ministry of Froest and Soil Conservation.
- MPFS. (1989). *Master Plan for the Forestry Sector*. Singa Durbar, Kathmandu, Nepal: Ministry of Forest and Soil Conservation.
- NPC. (2014). *Thirteenth Plan*. Singha Durbar, Kathmandu, Nepal: National Planning commission.
- Ojha, H. R. (2001). Commercial Use of Non-Timber Forest Products: Can the Poor Really Get Benefits? *Journal of Forestry and Livelihood* .
- Paudel, G. (2012). *Forest Size, Income Status and Inequality (A case study from community forests of Parbat district, Nepal)*. Institute of Forestry, Pokhara.
- Paudel, S. (2003). Community Forestry in Nepal. *Him J. Sciences* , 62-65.
- Podder, N. (1995). On The Relationship Between The Gini Coefficient And Income Elasticity. *The Indian Journal of Statistics*, 57, 428-432.
- Rabbi, F., Bauer, S. & Idalinya, J. (2010). Contribution of forests to rural inequality reduction: present scope and future options for rural development and sustainable use of forests. *International Journal of Sustainable Development & World Ecology* , 17 (1), 4-14.
- Sharma, A. R. (2009). *Impact of Community Forestry on Income Distribution in Nepal*. Kathmandu: Tribhuvan University in Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Economics.

- Sharma, A. R. (2010). Using Gini coefficient for analysing distribution of community forests in Nepal by development and ecological regions. *International Journal of Social Forestry (IJSF)* , 3 (1), 17-27.
- Sharma, B. (1992). Regional Inequality in the Size Distribution of Income in Nepal. *The Himalayan Review* .
- Sharma, S. (2010). Income Inequality in Nepal. *Inequality and Social Justice in Asia* , 207-240.
- Sharma, S. (2009). *Poverty, Growth and Economic Inclusion in Nepal*. Paper presented in Expert Group Meeting on 'Practical Strategies to Promote Social Integration: Lessons learned from existing policies and practices.
- Sony, B., Walter, S. & Harald, V. (2009). Does Community Forestry Contribute to Poverty Reduction? An Evidence from Nepal. *Conference on International Research on Food Security, Natural Resource Mananagment and Rural Development*. University of Hamburg: Tropentag.
- Wagle, U. R. (n.d.). *Economic Inequality in the 'Democratic' Nepal: Dimensions and Political Implications*. W Michigan Ave, Kalamazoo: School of Public Affaires and Administration, Western Michigan University.
- World Bank. (1991). *Nepal: Poverty and Income*. A World Bank Country Study. Washington D.C.: World Bank.
- Yemiru, T., Roos, A., Campbell, B. M. & Bohlin, F. (2010). Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, Southern Ethiopia. *International Forestry Review*, 12 (1), 66-77.

## APPENDIXES

### Appendix 1: Questionnaire for household survey

Name:

Age:

Gender:

Address:

Occupation:

Socio-economic class:

No. of SHH:

1. How much amount of forest products have you received from community forest this year?

S.N.	Description	Unit	Quantity	Species	Remark
1.	Timber				
2.	Firewood				
3.	Bedding material				
4.	Grass				
5.					

2. Please mention your forest products sufficiency from your community forest this year?

S.N	Description	100%	99-75%	74 to 50%	< 50%	Other sources if not fully sufficient
1.	Timber					
2.	Firewood					
3.	Bedding material					
4.	Grass					
5.						

3. Have you got job opportunity in CFUG since last five years?

S.N.	Position	Salary per month (Rs.)	Duration	Remark
1.				
2.				
3.				
4.				
5.				

4. Have you received any supports in terms of cash from CFUG since last five years?

S.N.	Description	Amount	Interest rate	For what	Remark
1.	Loan				
2.	Cash support		N/A		Returnable or free
			N/A		Returnable or free
			N/A		Returnable or free
3.	Scholarship		N/A		
			N/A		
			N/A		

5. Do you have any linkage with other organizations except your CFUG since last five year?

S.N.	Description	No. of organization	Total times of	Remark
1.	Membership			
2.	Cash transaction			

6. How many training/visits have you attended recommended by your CFUG since last five year?

S.N.	Description	Number	Remark
1.	Training/ workshop		
2.	Exposure (visit/travel)		

7. Do you think benefit sharing mechanism is fair in your community forest?

Good enough  Fair  Worse  Don't know

8. If benefit sharing mechanism is not good enough, what is your suggestion to make it better?

9. Please mention about benefit sharing in your community forest user group if it is left to ask.

Thank you for your time!

## Appendix 2: Questionnaire for key informant interview

1. Do you think forest policy framework has focused on poor and marginal users in Nepal?
2. Have community forest user group's constitution and operational plan addressed poor and marginal users in terms of benefit sharing?
3. Is there any policy barrier to make equality in sharing benefits among forest users?
4. What is the condition of benefit sharing mechanism in Gosainkunda community forest user group?
5. How can Gosainkunda community forest user group further promote equality in benefit sharing among all the forest users in coming days?

.....\*\*\*.....

## Appendix 3: Cumulative % of timber

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	0	0.00	0.00
40	134	0.10	0.10
60	288	0.22	0.32
80	400	0.30	0.62
100	500	0.38	1.00
Total	1322		

Source: Field Survey, 2015

## Appendix 4: Cumulative % of firewood

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	136	0.14	0.14
40	174	0.18	0.32
60	192	0.20	0.52
80	192	0.20	0.72
100	265	0.28	1.00
Total	959		

Source: Field Survey, 2015

**Appendix 5: Cumulative % of grass**

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	0	0.00	0.00
40	192	0.10	0.10
60	495	0.25	0.35
80	532	0.27	0.62
100	749	0.38	1.00
Total	1968		

Source: Field Survey, 2015

**Appendix 6: Cumulative % of bedding material**

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	0	0.00	0.00
40	182	0.08	0.08
60	542	0.25	0.34
80	614	0.28	0.62
100	819	0.38	1.00
Total	2157		

Source: Field Survey, 2015

**Appendix 7: Cumulative % of financial resource**

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	0	0.00	0.00
40	3000	0.01	0.01
60	43000	0.19	0.20
80	68000	0.30	0.51
100	111000	0.49	1.00
Total	225000		

Source: Field Survey, 2015

**Appendix 8: Cumulative % of social resource**

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	0	0.00	0.00
40	2	0.04	0.04
60	8	0.17	0.21
80	13	0.27	0.48
100	25	0.52	1.00
	48		

Source: Field Survey, 2015

**Appendix 9: Cumulative % of human resource**

Quintile	Total BM in quintile	% of BM in quintile	Cumulative %
20	1	0.01	0.01
40	13	0.11	0.12
60	22	0.19	0.31
80	35	0.30	0.60
100	47	0.40	1.00
	118		

Source: Field Survey, 2015