



IS COMMUNITY FORESTRY DECREASING THE INEQUALITY AMONG ITS USERS? STUDY ON IMPACT OF COMMUNITY FORESTRY ON INCOME DISTRIBUTION AMONG DIFFERENT USERS GROUPS IN NEPAL

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Abstract

The present study was conducted to see how community forestry affects income distribution among the users by observing three community forests of Nawalparasi District, Nepal. The total sample of 90 included 30 from each community forestry group for the study. This total sample was divided into three income groups (i.e. high, medium and low). The shapes of Lorenz Curves indicated that the inequality among users of community forestry increased after implementation of community forestry. However, at intra-group level, the inequality decreased for all income groups of the population after community forestry. The result of Gini coefficient also signifies increased inequality among 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 Robin Hood index suggested that, in order to establish equality among users, the income that should be transferred from higher income to lower income group increased after community forestry. The Herfindahl index also increased after CF, indicating increased concentration of income resulting in increased inequality among users.

Keywords: *community forestry, income group, inequality, Nawalparasi, Nepal*

Introduction

Poverty and unemployment are the greatest problems that Nepal is facing today. Although economic development of the country after re-establishment of democracy in 1990 has resulted in a sizable increase in average per-capita GDP at current prices from NRs 6277 in 1991 to NRs 46224 in 2009/10 (**MOF 2011**), yet absolute poverty is widespread. In an overpopulated farming sector

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like Nepal, rampant under-employment is mainly low resource base. Farming enterprise, therefore, becomes an important source of income to a large majority of people and also the determinants of pace of growth of all sectors of farming, i.e. crop, livestock and forestry. Thus, effective policy and management systems in crop, livestock and forestry sector would be an important tool for income generation and livelihood improvement of rural poor people in Nepal.

Agriculture, along with forestry, contributes 35.3 percent of national GDP. The forest sector contributes 8.12 percent of agricultural GDP in Nepal. Thus forest sector contributes about 1 percent of national GDP (MOF 2011). Forest products, mainly timber and non-timber forest products, are one of the important sources of national revenue.

Three important policy decisions by government led to successful establishment of Community Forestry (CF) policy in Nepal. First was the approved Master Plan for the Forestry Sector (MPFS) in 1989 and then the enactment of Forest Act, 1993 and the Forest Rules 1995 (HMG/N 1999). These policy provisions gave the responsibilities of management, development and utilization of accessible forest areas to the communities, after local communities are organized as Forest User Groups (FUGs).

The Forest Act of 1993 divided the national forest into government managed forest, protected forest, community forest, household forest, and religious forest with the aim of social and economic development of people along with development, conservation and proper utilization of forest products. (HMG/N 1993).

The process of formation of CFUG was very slow in the beginning of the community forestry program. A measure of this trend through slope calculation using regression analysis indicated that 778 CFUGs per year were formed in the country before 1995. With the enforcement of the Forest Act (1993) and Forest Regulation (1995), community forestry was provided with the legal basis for its implementation. As a result, the number of CFUGs formed per year increased to 1,479 until the year 2000 (Kanel & Kandel 2004). As of Mid-March of 2011, there are 15,256 CFUGs established across the country. They manage 1.35 million ha of forests involving 1.78 million households (MoF 2011)

After the development of the community forestry program, it remained as a major forest management practice in Nepal. Community forestry encompassed both livelihood improvement as well as forest management. Branney and Yadav (1998) noticed the positive impact of community forestry as increase in both number of trees and area of forest in recent years. Upreti (2000) found that community forestry had a positive impact on socio-economic changes like gender balance, equity, poverty, and biodiversity and forest management. Acharya (2002) explained that the regeneration of forest

has improved as a result of the community forest program. The study conducted by Pokharel and Nurse (2004) through the Nepal Swiss Community Forestry Project found that development improvement in health, water, education and food security for the poor's resulted from the community forestry programme. Acharya *et al.* (2006) identified community forestry as a means to manage common forest resources, improve the environment, and contribute to rural livelihoods and as a means to conserve biodiversity.

However, the new policy of community forestry in Nepal as intended for poor and marginalized population is not gaining as much positive results as expected. Different authors show many limitations of this policy. Gauli (2003) found that an equal level of participation across different caste groups in labour work does not ensure equal decision-making and benefit sharing. Lower caste people were not involved in the above activities. A study of Malla *et al.* (2003) found forest user group committees were dominated by wealthier households thus the poorer households benefit significantly less than wealthier. Neupane (2003) concluded that there was large scale expansion of community forestry in Nepal but that it had no clear and consistent contributions to livelihoods, especially of the poor. Sharma (2009) analyzed the household income by income group in Kumariban, Badikhel CF of Lalitpur District in Nepal. Off-farm income was the main income for the households in the lowest income group. The low income households captured 29 percent of the income from the CF while the highest income groups were confined to 5 percent only.

The Gini coefficient of household income distribution was calculated by including community forestry income was 0.242 while excluding it was 0.265. The observation of Kanal and Kandel (2004) also shows that many unintended social situations had developed after community forestry which constituted inequity and unfairness at the local and national level and in terms of long-term sustainability of forest resources. Luitel (2006) mentioned that an unequal relationship exists in a village between the oppressed and the oppressor groups. As a result, it is mostly the local community leaders and elite groups who dominate decisions of the user groups.

Keeping in view all the above, this study was focused on impact of community forestry on income distribution among users of selected community forestry in Nawalparasi district.

Methodology

The study was confined to Nawalparasi district of Nepal. The district was purposely selected, as it is one of the successful districts in implementation of community forestry policy. There are 74 Community Forest Users Groups (CFUGs) that have been handed over by District Forest Office (DFO) in the

Nawalparasi district. Among these, 58 community forests consist of natural forest and the remaining 16 of plantation forest. Of the total 74, four CFUGs are handled by women only. Three community CFUGs having experience of more than 5 years of implementation of a community forestry program were selected randomly using random number table. Two community forests from natural forest (Sundaree and Namuna Women's CFUGs) and one Community Forestry from plantation forest (Jharahi) were selected randomly in such a way that one women managed and two co-managed CFUGs were included. The reference year for pre-community forestry was taken as 1995 and post-community forestry as year 2009.

Table 1: Details of Selected Community Forestry Users Group

Particulars	Sundaree CFUG	Namuna Women CFUG	Jharahi plantation CFUG
Address	Amarapuri VDC, ward 1-9	Devchuli VDC, ward 1,5 &9	Rajahar VDC ward no. 6 & 8
Handover date	1998	1996	1996
Area	364.75 ha	103 ha	30.8 ha
Type of forest	Natural forest	Natural forest	Plantation forest

Source: Field Survey, 2010

From each CFUG 30 individuals were selected randomly using a random number table. The sampled farmers were categorized into three income groups (High, Middle and Low income) based on their total net annual family income within a year (i.e. 2009) by dividing their cumulative income into three equal parts (table2).

Table 2: Classification of the Sampled Population According to Net Family Income

Income group of respondent	Net present annual family income(NRs)
Low income	≤ 57135
Medium income	57135 to 126865
High income	>126865

The data was collected both from primary and secondary sources. The primary data was collected by two levels of interview, community forest users and CFUGs executive committees. Secondary data were collected from different publications.

To measure the inequality in the distribution of income, among different income groups of users, Lorenz curve, Gini coefficient, Lorenz asymmetry

coefficient, Robin Hood index and Herfindahl index were used. Lorenz curve is the graphical tool to measure income inequality, using two spaced geometry. In this graph, there is a diagonal line (called perfect equality line) joining two opposite corners (), showing equal distribution of income. If any other line expressing actual distribution of income deviates from the perfect equality line, it shows income inequality and the extent of deviation determines the extent of inequality.

Gini ratio is the Gini index of concentration, which is derived from Lorenz curve and is the ratio of the area between the Lorenz curve and the diagonal line of equality (perfect equality line) to the area under the diagonal. Gini coefficient (G) can be computed by using,

$$G = \frac{2}{n\mu(n-1)} \sum \sum |Y_i - Y_j|$$

Where, μ is the mean income, n is the total number of sampled households, Y_i and Y_j are the shares of individuals i and j in total income.

Gini index of income based on ordered data by increasing level of income is expressed as follows (Dixon et al., 1987).

$$G = \frac{\sum_{i=1}^n (2i - n - 1)x_i'}{n^2\mu}$$

Where n is the number of individuals, x_i' is the ordered income of individuals i and μ is the mean income of population. The Gini coefficient calculated by the above equation should be multiplied with $n/(n-1)$ to obtain an unbiased estimate. The method given by Dixon *et al.* was used for present study.

Different Lorenz curves can have the same Gini coefficient (Damgaard & Weiner, 2000). Therefore, Damgaard and Weiner (2000), to characterize the shape of the Lorenz curve, proposed a so-called "Lorenz asymmetry coefficient" (LAC). This coefficient characterizes an important aspect of the shape of a Lorenz curve: it shows which size classes contribute most to the total inequality of the income. The coefficient (S) can be calculated from the ordered data of net family income using the following equations.

$$S = \frac{m+\delta}{n} + \frac{l_{m+\delta} x_{m+1}'}{l_n} \quad \text{Where, } \delta = \frac{\mu - x_m'}{x_{m+1}' - x_m'}$$

and μ is the mean income level, m is the number of individuals with a income less than μ , L_m is the cumulative income of individuals with a income less than μ , and L_n is the cumulative income of all individuals.

When $S = 1$, the Lorenz curve of the income is symmetric, while other S values represent asymmetric Lorenz curves. When $S > 1$, most of the inequality within the income is due to the High income individuals, which disproportionately contribute to the cumulative net income of household. When $S < 1$, the inequality demonstrated in the income is due primarily to the relatively large number of low income individuals.

The Robin Hood Index is equivalent to the maximum vertical distance between the Lorenz curve and the line of equal incomes. The value of the index approximates the share of total income that has to be transferred from households above the mean to those below the mean to achieve equality in the distribution of incomes (Kennedy *et al.* 1996). The Robin Hood index may also be calculated by summing the percentage of income for each tenth of an income distribution where the percentage exceeds 10% and subtracting from this the product of the number of tenths that meet this criterion times 10 % (Kennedy *et al.* 1996).

The index (also known as Herfindahl-Hirschman Index or HHI) is defined as the sum of squares of all N proportions is a measure of concentration. For increasing equality, value of index (D) is decreasing. That is, with increase in equality, the sum of squares of all income proportions decreases. Value of ' D ' varies from zero to one and takes a value of one when there is a perfect inequality and approaches zero, if there is perfect equality.

$$\text{Value of index (D)} = \sum_{i=1}^N P_i^2$$

Where, $P_i = \frac{A_i}{\sum_{i=1}^N A_i}$

Where P_i = proportion of income for i th respondent.

A_i = net income from i th respondent.

$\sum_{i=1}^N A_i$ = net income from all the respondents.

$i = 1, 2, 3 \dots 90$ (number of respondents)

Results and Discussion

Lorenz Curve

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 (Fig 1). 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.

Figure 1: Lorenz Curve of Total Net Family Income of Users Before and After Community Forestry

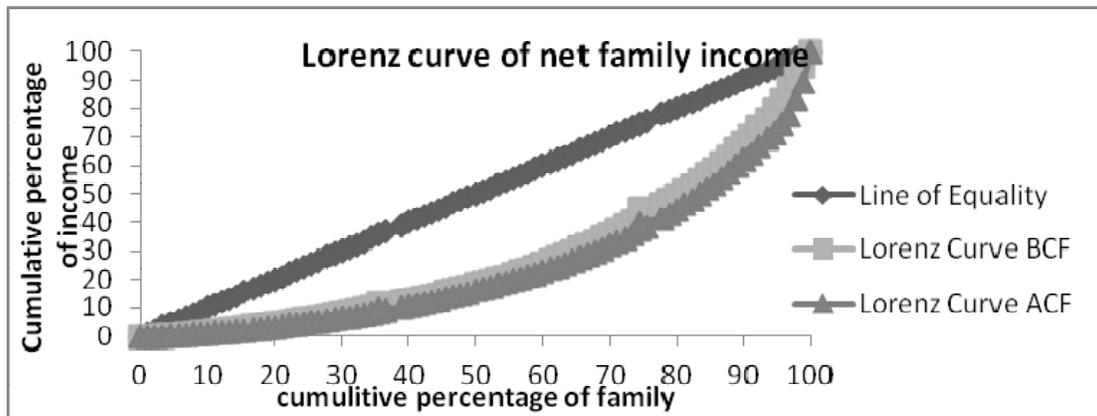
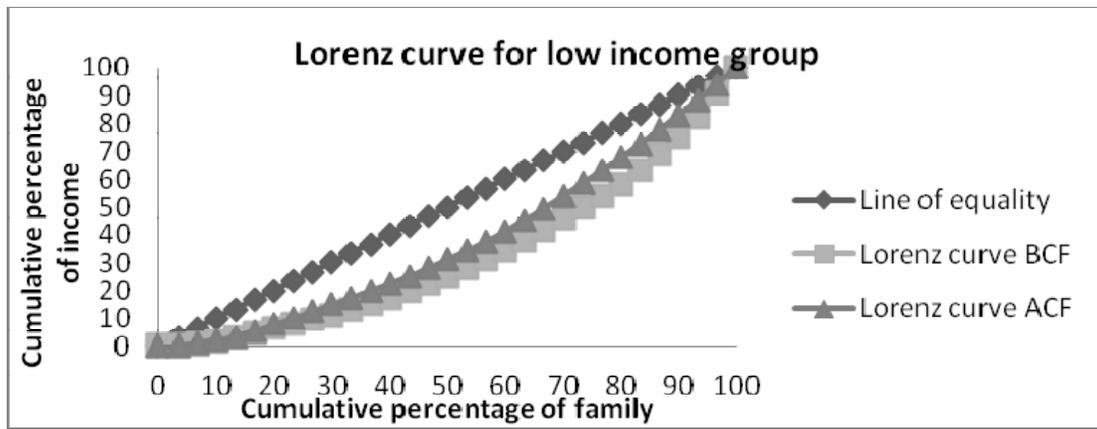


Figure 2: Lorenz Curve of Total Net Family Income for Low Income Group of Users Before and After CF



The Lorenz curve of net family income for low income group signifies that the equality among the users increased after implementation of community forestry (Fig 2). This was evident from the 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 that 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 (fig 3). 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.

Figure 3: Lorenz Curve of Total Net Family Income for Medium Income Group of Users Before and After CF

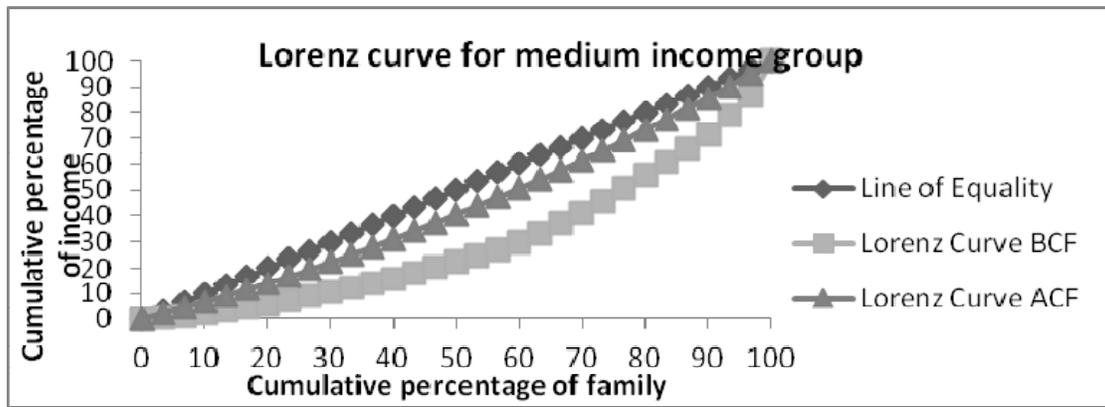
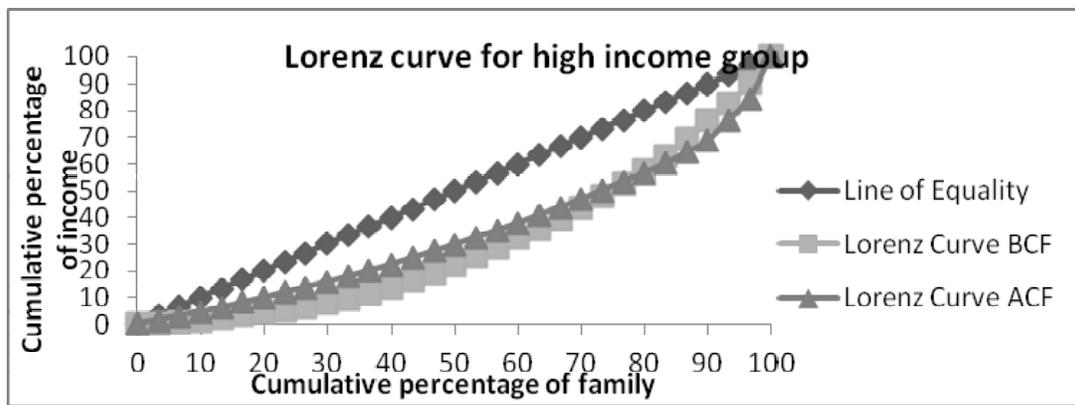


Figure 4: Lorenz Curve of Total Net Family Income for High Income Group of Users Before and After CF



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 (fig 4). 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 Coefficient

Gini ratio or Gini coefficient was used to observe inequality in income among different income groups of users of community forestry.

Table 3: Gini Coefficients for Different Income Groups

Income group	Gini Coefficient Before CF	Gini Coefficient After CF
Low income group	0.357	0.257
Medium income group	0.403	0.131
High income group	0.390	0.323
Overall	0.465	0.523

The Gini coefficient of total family income was increased from 0.465 before community forestry to 0.523 after implementation of community forestry (table 3). 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, the Gini coefficient for the medium income group was 0.403 before community forestry and decreased to 0.131 after community forestry. Thus the equality among medium income group was also increased after community forestry. For the low income group of users, results were the same as the above two cases. The 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.

Lorenz Asymmetry Coefficient

Which size classes contribute most to the total inequality of the income was calculated using the Lorenz asymmetry coefficient (Table 4). The LAC for the overall sample shows that Lorenz curve for income was asymmetric in both cases (i.e. before and after community forestry). Similarly the values of LAC was less than one ($S < 1$) in both cases (i.e. $S = 0.662$ before CF and $S = 0.935$ after CF). So that the inequality persistent in the user's income was due to presence of a large number of low income individuals.

In case of the high income group, the Lorenz curve was asymmetric both for net family income before and after community forestry. The LAC was less than one ($S = 0.884$) for net family income before CF. Thus, the inequality in the users was due to presence of large number of low income individuals. But LAC was more than one ($S = 1.436$) for net family income after CF, signifying inequality in the users was due to presence of large number of high income individuals.

Table 4: Lorenz Asymmetry Coefficient According to Income Group of the Respondent

Income Group	Before CF	After CF
Low income group	0.986	0.963
Middle income group	0.961	1.021
High income group	0.884	1.436
Overall	0.662	0.935

Similarly, the inequality of net family income of users among medium income group before CF was due to large number of low income individuals because LAC was less than one (i.e. $S = 0.961$). But LAC was more than one (i.e. $S = 1.021$) after CF, indicating inequality of net family income due to presence of large number of high income individuals among medium income group; and Lorenz curve was asymmetric in both cases.

The Lorenz curve was also asymmetric in case of the low income group of the users. The value of LAC for net family income was 0.986 before CF, so that the inequality was due to presence of large number of low income individuals. Similarly the value of LAC for net family income was 0.963 after CF among low income group of users, which indicates presence of large number of low income individuals.

Robin Hood Index

The Robin Hood index was used to approximate the share of total income that has to be transferred from households above the mean to those below the mean to achieve equality in the distribution of incomes.

Table 5: Robin-Hood Index For Different Income Groups of the Respondents

Income Group	RHI BCF	RHI ACF
Low income group	25.568	18.881
Medium income group	30.077	9.4819
High income group	27.77	23.175
Overall	34.626	38.102

In case of overall sample family, the Robin Hood index increased after implementation of community forestry (Table 5). It signifies that before community forestry it was possible to make equality in community by transferring 34.63 percent of income of those who were earning more than average income to those who were earning below than overall average. But after implementation of community forestry, it rose to 38.102 percent.

But at individual level of income group, the Robin Hood index significantly decreased after implementation of community forestry. With in high income group, the Robin Hood index was 27.77 percent before community forestry and decreased to 23.175 percent after community forestry. It implies that the transfer of income from high earning people to low earning people for equality with in high income group decreased after community forestry.

Similarly, same as in high income group implies both for medium income and low income group. The Robin Hood index was 30.077 before community forestry and it significantly decreased to 9.482 after CF in medium income group. And this figure was 25.568 before CF and decreased to 18.881 after CF in case low income group. Therefore, the transfer of income from high earning people to low earning people with in both medium income and low income group of people decreased after community forestry.

Herfindahl Index

The Herfindahl index was used to measure of concentration of income among different income groups of population that results inequality in income distribution. The HHI for net family income of the overall sample increased after implementation of community forestry (table 6). It was 0.0205 before CF and reached to 0.0299 after community forestry. This implies that the concentration of income increased, resulting increased inequality in the users.

Table 6: Herfindahl index for different income groups of the respondents

Income group	Herfindahl index BCF	Herfindahl index ACF
Low income group	0.0476	0.04
Medium income group	0.0542	0.0351
High income group	0.0495	0.0452
Overall	0.0205	0.0299

In case of high income group, the HHI for net family income was 0.0495 before CF and decreased to 0.452 after community forestry. So that the concentration of income decreased resulting increased equality among high income group. Same the case follows for medium and low income group of the users. The HHI was 0.0542 before and 0.0351 after community forestry for medium income group which signifies increased equality among users. Similarly, for low income group the HHI for net family income decreased from 0.0476 before CF to 0.04 after CF resulting increased equality among low income group of the users.

Conclusions

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.

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Endnote:

1 \$ = 72.90 NRs (As of 18th August, 2011)

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