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## २.१.२ नेपालको सामुदायिक वनमा काठ व्यवस्थापनबाट राजस्व र रोजगारीको अवसर (Revenue and employment opportunities from timber management in Nepal's community forests)

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### Abstract

Community Forestry (CF) in Nepal has contributed to generating forest resources, environmental health and community livelihoods. Though scholars, practitioners and advocates of CF have shown that CF is successful in restoration of greenery and enhancing growing stock, it is equally recognized that full economic potential of CF has not been realized. However, there is little study on the precise economic potential of timber management in Nepal's community forests. This paper assesses the total timber stock, its annual increment and total amount of allowable harvest in Nepal's community forests. We reviewed operation plans (OPs) of 2955 community forestry user groups (CFUGs) from 14 districts across the country selected through stratified random sampling. The findings were then extrapolated to estimate market price of timber and amount of employment generation from the processing of this volume of timber. The worth of timber so extracted would be approximately NRs 27 billion at the market price. Timber management in CFs would generate about 21,000 full time jobs every year. Finally, the paper highlights the implications to policy, regulatory provisions and institutional practice to realize the economic potentials of CF in addressing poverty of forest managing communities.

**Key words:** community forestry, operational plan, forest inventory, timber, growing stock, increment, annual harvest,

### Introduction

Community forestry in Nepal has contributed in generating forestry resources, improving environmental services and also supported community livelihoods (Thoms, 2008; Yadav et al., 2003; Iverson et al., 2006). Studies have indicated that community forests can contribute to community livelihoods, income, employment and government revenue. Though Banjade et al (2011) argued that Nepal's forestry sector has not been able to harness its economic potential, we do not have adequate information about the potential gain from avoiding sub-optimal use of timber and vice versa.

Studies have shown that community forests (CF) has successfully generated resources both in terms of restoring greenery and growing stock but economical potentiality of timber resources has remained untapped due to many reasons (Mahapatra, 2001; Nagendra, 2002). Firstly, we know little about total amount of harvestable timber from community forests and its

total monetary value. Secondly, there are various constraining factors that hinder sustainable harvesting and marketing of timber. Inventory guideline for CF has provided methodological guidance to estimate growing stock, increment and annual allowable harvest. It is argued that the present inventory guideline is conservative and therefore encourages under-harvest. Similarly, forest policies and resulting bureaucratic response also limit community forestry user groups (CFUGs) to harvest and market the timber.

## Context of Timber Management in Nepal

Total of 5.83 million hectare (39.6 percent of total land area) area of Nepal is classified as forests (including shrub lands) (FAO, 2010). The reachable forests<sup>1</sup> comprise about 51 percent of the total forest area and about 90 percent of the reachable forests are located below 2500 meter altitude (DFRS, 1999). In Nepal timber has remained an important source of government revenue throughout its modern history. It continues grow in recent years as well. For example, the share of wood products remained over 90 percent of the total forestry sector revenue in the year 2008/09 (Banjade, 2012). The timber based-based industries have invested over Rs 12 billion and have employment to over 150,000 persons through manufacturing industries such as ply, veneer, Kattha (catechu), saw mills and furniture (Bhatta 2011).

Similar reality applies to the community forestry as well. For example, an analysis of the annual income of 15 CFUGs in Nawalparasi district in the year 2010 showed that about 90 percent of their income came from timber sale alone (Banjade et al, 2011). Another study in Tanahu district also shows timber as the most significant product of community forestry (Pokhrel, 2010).

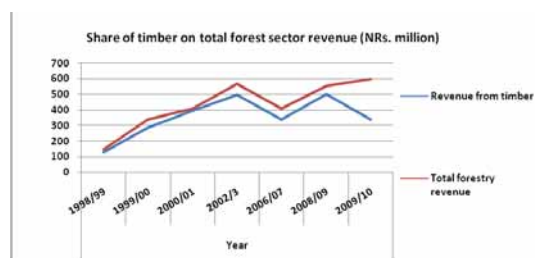


Figure 7 : Timber revenue and its share on total forestry revenue

Source: Banjade (2012)

Timber is an essential building material for private and public construction. Studies have shown that above 80% of the revenues to both government and community forest user groups comes from the sale/distribution of timber. However, unlike other business, timber trade is widely perceived negatively. Issues of timber are not adequately put into policy debates even if it is profoundly discussed amongst individuals, communities or government officials. Policies debates are rather focused on non-timber forest products (NTFPs), environmental services and more recently to carbon benefits (Banjade, 2012). Due to many policy constraints, and nominal supply from the existing management, not only the CF but also Nepal's forestry sector in general has not been able to harness its economical potential (*ibid*).

Studies have indicated that community forests can contribute to community livelihoods, income, employment and government revenue. However, we do not have adequate sufficient

<sup>1</sup> Reachable forests include forest areas other than protected areas (national parks, conservation areas), too sloppy forests (about 45 degree) and forests and landslides (DFRS, 1999)

data to generate credible arguments to say that community forests have contributed to income, employment and revenue. Though Banjade (2012) argued that Nepal's forestry sector has not been able to harness its economic potential, we do not have adequate information about the potential gain from avoiding sub-optimal use of timber and vice versa. Little has been done to actually quantify the 'timber potentiality' in terms of revenue, income generation or employment. Therefore, this study was carried out to estimate the total amount of timber and its monetary equivalent to generate evidence based knowledge on amount of timber that can be harvested sustainably from community forests of Nepal. This attempt will then helps in estimating the potential economic contribution of CFs and bring such data to the forefront of ongoing policy debate.

## Objectives

The study aims to understand the potentiality of community forestry to contribute on national economy from timber resources. Study objectives are to:

estimating total growing stock, annual increment and annual allowable harvest of the major timber species of community forests of Nepal.

finding out the average market price of the timber

estimating the monetary equivalent of the total stock of timber, yearly increment and allowable harvest estimating the revenue and employment potential from the existing timber management in community forests.

## Methodology

### *Selection of sample districts*

75 districts of Nepal have been divided into four strata have been identified viz high mountains, mid-hills, inner Tarai and Tarai (Fig 1) considering ecological variation and forest type.

For estimating the total growing stock of the timber, its annual increment and total annual allowable harvest in community forests, we adopted a stratified random sampling. The number of sample districts has been identified for 10% error and 95%

level of confidence using the standard formula (Saxena and Singh, 1987). Total of 14 sample districts have been identified as per the following (statistical) tool.

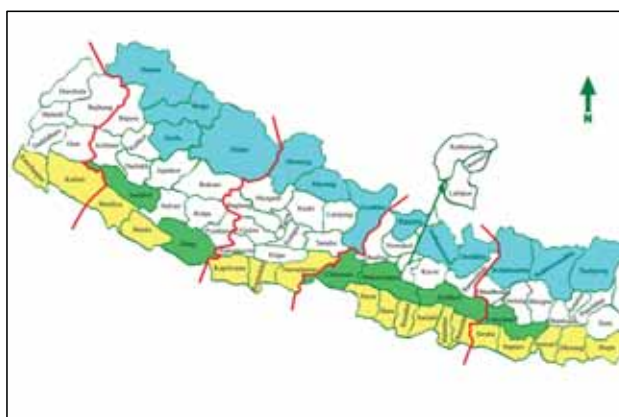


Figure 8: Stratification of districts

$$n = C_v^2 t^2 / E^2 = 13.52 = 14 \text{ (Approx.)}$$

Where,

$t=1.96$

$E=10\%$  (Usually we take 10% of error limit)

$C_v$  = Coefficient of variation = 18.76%

After the stratification, sample districts have been identified randomly in each stratum. The sample districts are-

Table 1: Stratification and sample districts

| Strata        | Sample districts  |
|---------------|---|
| High Mountain | Mugu (in the west) and Sankhuwasabha (in the east)  |
| Hills         | Dadaldhura (far west), Rolpa (mid-west), Baglung and Mygdi (west), Lalitpur (center), Dhankuta (east) |
| Inner Tarai   | Dang (western part), Makwanpur (eastern part)   |
| Tarai         | Kailali and Kapilbastu (western part), Sarlahi and Morang (western part)                              |

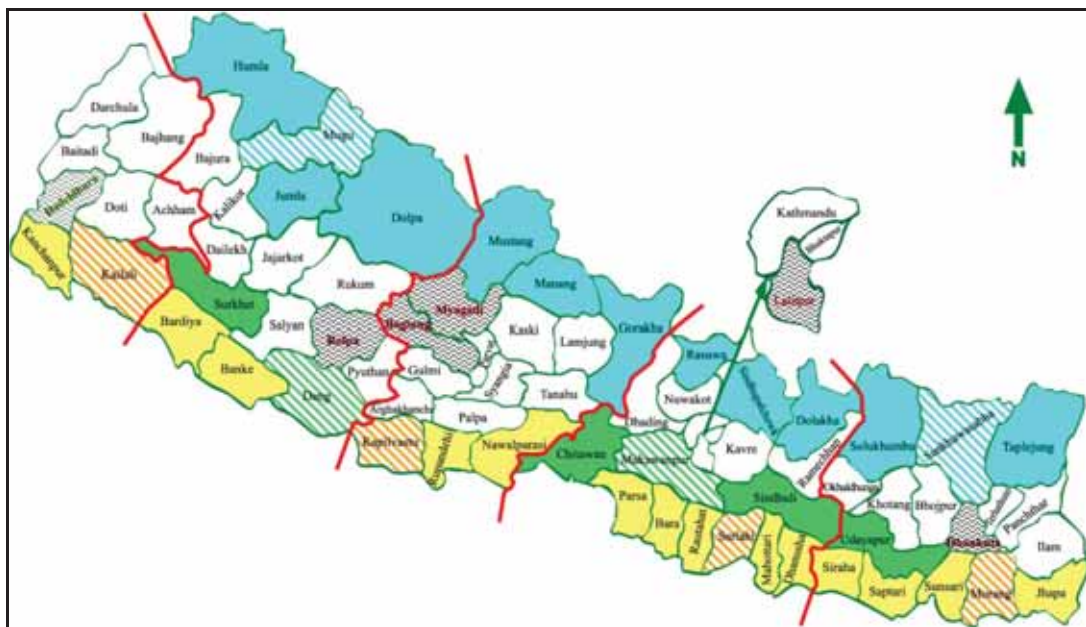


Figure 9: Distribution of sample districts



### *Estimation of growing stock, increment and AAH*

The present status of community forests in terms of total growing stock, its annual increment and annual allowable harvest of the major timber species has been copied from the operational plans of the CFUGs from the sample districts. Then the data has been extrapolated for each stratum. Finally, species wise total growing stock, annual increment and AAH of each species have been summed up to determine the total status for the CF.

### *Forest inventory in CFs*

Then we selected six community forests that represents six forest types of Nepal viz pine forest (Rolpa), Schima/Castanopsis forest (Myagdi), *Shorea robusta* forest (Tarai, Kapilbastu), *Shorea robusta* forest (Hill, Makwanpur), *Alnus nepalensis* forest (Dhankuta), and pine/spruce forest (Sankhuwasabha). In these community forests, we carried out the timber inventory using the Community Forest Inventory Guidelines (2005). The districtwise distribution of the community forests is given in the following map.

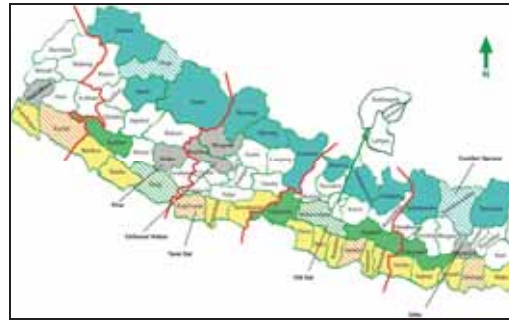


Figure 10: Distribution of inventory sites in sample districts

### **Methodological Challenges (Limitations)**

Determination of economical value, income and employment opportunity from the timber in CF is an assiduous attempt. It requires a robust methodology and sound data collection tools. Some of the challenges realized during the study are given below-

The basic data sources of the study were the operational plans of the CFUGs where received timber data- species wise growing stock, annual increment and annual allowable cut of the major tradable timber species. However timber data in OPs are arranged in different ways, ranging from sophisticated inventory analysis (including growth index) to obscure inventory data without species wise segregated data.

In many OPs, total growing stock was mentioned in lump sum, but AAC was set down species wise. Disaggregated timber data should be available in CF Division, Department of Forests through periodic reporting from CFUGs and District Forest Offices. However, such data systems were not available in all district forest offices. In few cases, the study team experienced certain level of reluctance in district forest offices to grant access to the operational plans.

Lack of data on species wise forest area was a major challenge experienced during extrapolation of the sample data.

The study relied on CF inventory data whose reliability is sometimes questionable. So, some errors in those basic data might have been accommodated into the study.

## Assumptions made during the analysis

The valuation of the timber is based on government rate and market price. Government rate has been disaggregated further according the quality (grades) of the timber<sup>2</sup>. For different grade price of timber, average price value is taken for calculation. Furthermore, reachable forest area in all physiographic regions viz. Tarai, Inner Tarai, Mid-hills and High-mountain is assumed to be 50% of the total forest area of each of those regions.

## Findings

### Potentiality of timber management in Nepal's Community Forest

This section presents estimation the potentiality of timber harvesting from community forestry. The growing stock, its annual increment, and annual allowable harvest (AAH) of each of nine major timber species have been determined.

#### 3.1 Timber extraction potentiality of Nepal's Community Forests

The present status of community forests in terms of total growing stock, its annual increment and annual allowable harvest of the major timber species has been copied from the operational plans of the CFUGs from the sample districts. Then the data has been extrapolated for each stratum. Finally, species wise total growing stock, annual increment and AAH of each species have been summed up to determine the total status for the CF. Table 2 summarizes the present status of timber in community forests.

Table 2 : Growing Stock, Annual Increment and Allowable Cut

| Major Species | Growing Stock (mil.m3) | Annual Increment (000 m3) | Annual Allowable Harvest (000 cft) |
|---------------|------------------------|---------------------------|------------------------------------|
| Sal           | 45.23                  | 517.43                    | 6007.84                            |
| Sissoo        | 0.62                   | 10.35                     | 86.95                              |
| Asna          | 3.51                   | 47.69                     | 552.68                             |
| Karma         | 2.46                   | 11.78                     | 128.76                             |
| Jamun         | 0.39                   | 5.29                      | 74.78                              |
| Chilaune      | 1.87                   | 47.86                     | 584.70                             |
| Khote Salla   | 5.76                   | 151.88                    | 2285.60                            |
| Utis          | 2.87                   | 65.72                     | 972.84                             |
| Gobre Salla   | 4.63                   | 50.93                     | 941.72                             |
| <b>Total</b>  | <b>67.3448219</b>      | <b>908.92</b>             | <b>11635.87</b>                    |

Source: Field data

<sup>2</sup> Related to Rules 9, 10, 18, 25, 46, 48 and 53, rate of fuelwood and timber

As shown in the table, total growing stock of reachable community forests (of nine major timber species) of Nepal's 67 million m<sup>3</sup>. Out of the total 1665419 ha of community forest area (Hamro Ban, 2068/2069), 849363 ha (51 percent of the total forest)<sup>3</sup> forest area has been considered as reachable forests. Annual increment of the total growing stock of 67 million cubic meter is 909 thousand cubic meter. Out of this annual increment, CFUGs are allowed to harvest about 11 million cubic feet of timber annually (See Table 2).

### 3.2 Economic potentiality of Community Forest from timber management

Assuming that all the annual allowable harvest is extracted and sold in the market, total timber would generate income of 4 billion rupees at the royalty rate. Market value of the total AAH would be about 27 billion rupees (Table 3). This shows that the market value of the timber extracted from community forests is about seven times bigger than the timber value at royalty rate.

Table 3: Annual allowable cut and its monetary equivalent

| Major Species | AAC<br>(000 cft) | Royalty<br>(Rs per<br>cft) <sup>+</sup> | Royalty<br>(Rs)      | Market<br>price <sup>++</sup><br>(Rs per<br>cft) | Market<br>Price (Rs)  |
|---------------|------------------|---|----------------------|--|-----------------------|
| Sal           | 6007.838671      | 533                                     | 3,202,178,012        | 3500   | 21,027,435,348        |
| Sissoo        | 86.95195423      | 300                                     | 26,085,586           | 2500   | 217,379,886           |
| Asna          | 552.6799897      | 250                                     | 138,169,997          | 2700   | 1,492,235,972         |
| Karma         | 128.7631641      | 250                                     | 32,190,791           | 2700   | 347,660,543           |
| Jamun         | 74.77547108      | 250                                     | 18,693,868           | 2000   | 149,550,942           |
| Chilaune      | 584.703144       | 200                                     | 116,940,629          | 700  | 409,292,201           |
| Khote Salla   | 2285.603661      | 175                                     | 399,980,641          | 1000   | 2,285,603,661         |
| Utis          | 972.8366607      | 100                                     | 97,283,666           | 350  | 340,492,831           |
| Gobre Salla   | 941.7157078      | 100                                     | 94,171,571           | 1000   | 941,715,708           |
| <b>Total</b>  |                  |   | <b>4,125,694,760</b> |  | <b>27,211,367,091</b> |

Source: Field data

3 DFRS (1999) has provided the proportion of reachable and non-reachable forest area for each of five development regions. Though each development region has different proportion, here we took the reference of The total proportion (i.e., 51 percent reachable forests) and assumed that the same proportion exists for the community forests as well.

<sup>+</sup> Related to Rules 9, 10, 18, 25, 46, 48 and 53, rate of fuelwood and timber. For different grade price, average price value is taken for calculation.

<sup>++</sup> average market price for each species was determined based on discussions with FenFit, Nepal.

### 3.3 Employment potential of timber management in Community Forests

The study has estimated the employment potential of the timber in community forests. It concludes that the existing timber management in CFs provides employment equivalent to 21,710 full time jobs per year. A detail description of the employment potential from the extraction of 1000 cft timber is given in Table 4.

Table 4 : Employment potential for extraction of 1000 cft timber

| Description   | Person Days |
|---|-------------|
| Tree felling and logging (6 MDs for 100 cft, roughly two trees)   | 60          |
| Collection cost (to depot i.e., Ghatgaddi, @Rs 100/cft (Terai) and @Rs 250/cft in hills, Rs 175/cft in average) | 350         |
| Logs measurement (one govt technician, two assistants and 4 workers, including 2 extra labors for any time)     | 7           |
| Loading (Rs 15/cft)   | 8           |
| Transportation (Dhangadhi to Kathmandu, Rs 150/cft)   | 150         |
| Unload (Rs 7/cft)   | 6           |
| Sawing (Rs 100/cft)   | 100         |
| <b>Total employment</b>   | <b>681</b>  |

Source: Personal communication with FENFIT officials.

Based on the employment potential of the extraction of 1000 cft timber, total employment potential of the community forests from timber has been estimated. The summary is depicted in the Table 5 below.

Table 5 : Employment potential of timber in CF

| Major Species            | AAC cft (000) | Person Days      |
|--------------------------|---------------|------------------|
| Sal                      | 6007.838671   | 4,091,338        |
| Sissoo                   | 86.95195423   | 59,214           |
| Asna                     | 552.6799897   | 376,375          |
| Karma                    | 128.7631641   | 87,688           |
| Jamun                    | 74.77547108   | 50,922           |
| Chilaune                 | 584.703144    | 398,183          |
| Khote Salla              | 2285.603661   | 1,556,496        |
| Utis                     | 972.8366607   | 662,502          |
| Gobre Salla              | 941.7157078   | 641,308          |
| <b>Total person days</b> |               | <b>7,924,026</b> |



Total of 7,924,026 person days is equivalent to 21,710 full time jobs per year. Assuming Rs 500 wage for a day, the monetary equivalent of this employment would be about 4 billion rupees, which is almost equal to the total timber value calculated at given royalty rate<sup>4</sup>. Comparing to the total employment generated from timber of 100,727 (ERI, 2012), employment from timber in community forests generates 21,710 which is 21 percent of the employment from timber extraction in total.

#### Sub-optimal management of Nepal's Community Forest

##### *AAC is set to the minimum*

CF inventory guideline (2061) has provided procedures to determine annual allowable cut (AAC) of major timber species. Following this guideline, forest technician has to calculate AAC for each of the major timber species. A general thumb rule is that AAC should not exceed the annual increment. Though it can be argued that CFUGs can take (if needed) all the timber increased in a year, the guideline urges the forest technician (also forest officials) to actually set the AAC limit to 40-60 percent of the total annual increment. However, the study found out that the average AAC limit set in CFUG operational plan is 37% of the total timber increased in a year. (Table 6)- *Karma* being the lowest (31%) and *Gobre Salla* being the highest 52%. This depicts the trend of the forest technician to set AAC limit to the lowest limit, even lower than the minimum limit set inventory guideline.

Table 6: Specieswise AAC percentage

| Major Species | AAC (%) |
|---------------|---------|
| Sal           | 33.17   |
| Sissoo        | 24.01   |
| Asna          | 33.11   |
| Karma         | 31.24   |
| Jamun         | 40.42   |
| Chilaune      | 34.90   |
| Khote Salla   | 43.00   |
| Utis          | 42.30   |
| Gobre Salla   | 52.83   |
| Average AAC   | 37.22 % |

Source: Field Survey, 2013

4 1) Sal- Grade A: 800; Grade B: 500; Grade C: 300 2)Sissoo- Girth greater than or equal to 4 feet: 400; Girth less than 4 feet: 200 3) Asna, Jamun, Karma- Grade A: 300; Grade B: 200 4) Chilaune- 200 5) Utis-100 6) Khote Salla- Grade A: 200; Grade B: 150 7) Other Pines- 100

CFUGs actually harvest less than AAC

Similar picture of sub-optimal harvest has been identified in the data set of department of forests. The data consists of the amount of prescribed cut in operational plans, amount stipulated in harvest permit and the actual harvest. This data is summarized in Table 7 has shown that CFUGs, in general, got harvest permit lower than the annual allowable harvest limit. CFUGs also do not harvest all the timber approved in harvest permit.

Table 7: Average AAC, harvest permit and actual out of a CFUG (average data per CFUG, not of district total)

| Districts               | AAC (cft) | Harvest Permit (cft) | Actual cut (cft) |
|-------------------------|-----------|----------------------|------------------|
| Kapilbastu              | 2186.82   | 1626.27              | 1626.91          |
| Kailali                 | 4948.99   | 3428.55              | 3067.84          |
| Dang                    | 4789.21   | 3716.14              | 1746.26          |
| Dhankuta                | 2484.88   | 1813.61              | 1435.69          |
| Dadaldhura              | 5877.80   | 5481.55              | 5471.10          |
| Rolpa                   | 2679.21   | 832.01               | 1532.54          |
| Makwanpur               | 3774.10   | 3015.85              | 2634.83          |
| Sarlahi                 | 4803.15   | 3818.10              | 4228.64          |
| Total (of 43 districts) | 4129.13   | 2822.85              | 2292.10          |

Table 7 shows the average per CFUG data of each of eight districts and average per CFUG data of 43 districts as well).

The table depicts that a CFUG in average had AAC of 4,129 cft. They got harvest permit from district forest office to cut 2,823 cft (68% of AAC). CFUG in turn actually harvested 2,292 cft (81% of the harvest permit). Out of 4129 cft sustainable supply (the AAC), CFUGs harvested only 2292 cft (55%) timber.

Similar picture of sub-optimal harvest has been identified in the data set of department of forests. The data consists of the amount of prescribed cut in operational plans, amount stipulated in harvest permit and the actual harvest.

The harvest data<sup>5</sup> (AAC, harvest permit and actual cut) of 513 CFUGs of eight districts

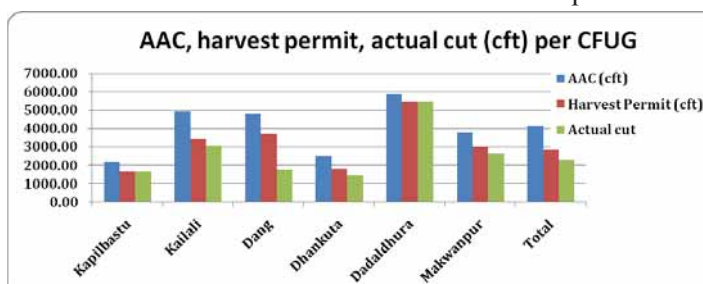


Fig 5: AAC, harvest permit and actual cut

5 Figures are not the total of all CFUGs in the districts. Rather they are the average of CFUGs sampled in each district.

(viz Kapilbastu, Kailali, Dang, Dhankuta, Dadaldhura, Rolpa, Makwanpur and Sarlahi) and the total harvest data of the total of 2328 CFUGs of 43 districts) are shown in Fig 5. Looking at the figure, we see that CFUGs do not get harvest permit for AAC amount mentioned in operational plans. Overall, the data reveals that the harvest cut is lower than the total AAC. The figure also shows the CFUGs' trend of lower harvest. The actual harvest amount is again lower than the amount prescribed in harvest permit.

## **Conclusion and ways forward**

Nepal's community forestry has huge potentiality of generating income, employment and government revenue through the management of timber, and therefore, can contribute to local and national economy. However, timber in CF has been under-harvest which leads to forgo this tremendous potentiality. We have provided few recommended actions as way forward. These recommendations have been made to fully realize the economic potentiality of the timber in community forests.

**Promote active forest management in all forest management regimes including CFs :** The study has shown that timber management in CF can significantly generate revenue, income and employment, and therefore, can contribute to poverty reduction and rural livelihoods improvement. This requires promotion of scientific (active) forest management across all management regimes including. The scientific practice of forest management including the estimation of growing stock, annual increment and annual allowable cut should be reformed to accommodate diversity of forests type and other ecological and management variation. Moreover, the science should be made more transparent and accessible to local forest managers, especially the CFUGs.

**Simplify timber harvesting and transportation procedure:** Studies have indicated that harvesting, transportation and sale/distribution of timber involves a complex set of legal procedures which is tedious, time consuming and complicated. Such legal provisions do not incentivize a fair and transparent transaction in this business, therefore discourages CFUGs to harvest timber to its full potential. Policy and regulatory framework should be revisited and revised to create an environment conducive for promoting and institutionalising sustainable forest management that help realise the full economic potentials of community forests. Constant flow of economic benefits from forests should be recognised as a pre-condition for the sustainability of forest ecosystem itself.

**Establish knowledge management system for supporting evidence based policy process:** It has been realized that there is poor knowledge on current level of extraction of timber from CF for both internal consumption and commercial sale. This knowledge gap can be filled by maintaining and regular update of CF database system. Such information should be available for research and analysis which can inform forest policies and programmes. This eventually helps strengthen and institutionalise an evidence based policy process.

**Institutional reform in forest administration:** current institutional structure of forest bureaucracy is not supportive for promoting scientific forest management and commercializing the forest products. The technically sound and economically costly human resources within

the Ministry of Forest and Soil Conservation should not be limited to administrative and policing roles. The technical knowledge of foresters should be fully mobilised to support scientific/sustainable forests management and developing forest based enterprises. Technical and administrative support should be oriented to promote forest management. This would help realise the economic potential of the CF towards achieving national development goals.

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