

# Carbon Sequestration Status of Sunaulo Ghaympe Danda Community Forest, Mid Kathmandu Valley, Nepal

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## Introduction

Carbon sequestration is the process of removing additional carbon from the atmosphere and depositing it in other reservoir principally through changes in land use.  
The forest is one of a reservoir, a component of the climate change system where GHGs is stored.  
The rate of carbon sequestration is less, particularly over mature trees (Luxmoore 2001)  
Community forest management is the preferable option for carbon sequestration.

### Nepal: Contribution on climate change

The net emission of GHGs are  
CO<sub>2</sub> was 9747 Gt, CH<sub>4</sub> was 577 Gt & NO was 30 Gt.  
Nepal showed a positive trend increased on temperature between 0.1°C to .5°C per decade.  
From land use data for 1978-79 and 1994, the total forest area decreased from 38% to 39% of the national land area, while Shrub land increased from 4.7% to 10.6%.  
Maraseni et al. (2005) estimated the carbon sequestration by Nepal forest by 1.62 megaton/yr.  
The community forest management practices is the good model of forest management that could affect the carbon sequestration in increasing order.

### Why research on Carbon sequestration

Only few studies have been done on intangible benefits from carbon sequestration (Gautam, 2002).  
Inadequate information about the status of biomass and the carbon stocks in community managed forest of Nepal after 1990 has been a major problem to estimate total contribution of CF on carbon sequestration.  
CFs in Nepal can help reduce deforestation and forest degradation, which could imply that it also reduces carbon emissions, increases sequestration and should be promoted under REDD+. This is not universally agreed, however, and broadening our understanding of forest biomass dynamics in both CFs and NCFs is important.  
In 30 years, the CF Program is believed to have delivered demonstrable ecological, economic and social benefits.  
Till date research do not allow us to track forest quality and carbon sequestration across time.

### Objective of study

To know the carbon stock of sampled year.  
To find the carbon sequestration rate of community forest.  
To estimate the carbon sequestration trend of sampled year.

## Methods and Methodology

Preliminary Survey:  
Primary data collection  
Measurement of tree DBH to estimate biomass  
Collection of soil samples to estimate SOC  
Secondary data collection: Net search, journals, Papers etc.  
Field visit January and February, 2007, 2012 and 2015 for measuring biomass and soil carbon

### Estimation of tree biomass

Estimation of tree biomass (Random sampling by circular plot method with an area of 250m<sup>2</sup>)  
Above ground biomass: by using empirical formula.  
 $L_n W = a + b \times L_n (DBH)$  (NARMSAP, 2000)  
Where: W = Green weight of tree component (biomass) in kg, a = intercept, b = slope and DBH = diameter of the tree at breast height.  
Root biomass: 15% of above ground biomass (MacDicken, 1997).  
Total above ground biomass organic carbon = Total above ground biomass of tree X 50%.  
Total below ground organic carbon = Total root biomass of tree X 50% + total SOC

### Soil Sampling

Soil sample were collected from centre of circular plot with depth wise i.e. (0-25 cm and (25-50) cm.  
% soil organic carbon: (Walkley & Black Method, 1934)  
Soil bulk density: Sampler core method (Baruah and Barakhar, 1999).  
Bulk density = Weight of oven dried soil / Volume of core sampler  
Estimation of soil organic carbon SOC (kg/m<sup>2</sup>) = % of SOC X soil bulk density (Kg/m<sup>3</sup>) X thickness of the soil horizon (m)

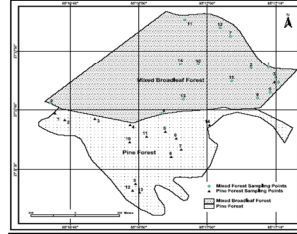
### Estimation of Carbon Sequestration Rate

Carbon sequestration rate as biomass = (carbon stock of this year - carbon stock of previous year)

### Estimation of Carbon Sequestration Trend

Carbon sequestration Trend = (carbon sequestration trend of this year - carbon sequestration trend of previous year)  
Study area  
The studied area, i.e. Sunaulo Ghaympe Community Forest lies on mid Kathmandu Valley, Nepal.  
The total area of the community forest is 51.4 hectares.  
The study area consist of two type of forest  
Pine Forest-31.4ha  
Mixed Broad leaf Forest: 20ha (only taken) for study

## Sampling Plots



## Results

### Biomass carbon Stock:

Mean carbon content:  
Mixed Broad Leaf Forest  
23.5ton/ha, 25.95ton/ha, 27.24ton/ha, 28 ton/ha and 24 ton/ha for the year 2004, 2007, 2009, 2011 and 2014.  
Of all samples year maximum carbon stock was found on plot number 11 and minimum was on plot number 13.

Biomass increment from the year  
2004 to 2007- 3.5%  
2007 to 2009- 5.96%  
2009 to 2011- 3.14%  
2011 to 2014- -1.4%

### Carbon Sequestration Status

2004 to 2007- 0.81t/ha/y  
2007 to 2009- 0.84t/ha/y  
2009 to 2011- 0.43t/ha/y  
2004 to 2011- 0.64ton/h/y  
2004 to 2014 - 0.5ton/ha

## Conclusion

The carbon stock of mixed broad leaf forest was found to be increased from the year 2004 to 2011 i.e. 23.4t/ha to 28.1 t/ha.  
The carbon stock for the year 2014 was found decreased compared with other years i.e. 24t/ha.  
In all sampling years in plot number 11, the carbon stock was found highest where as on plot no 13 the carbon stock was found lowest.  
The carbon sequestration trends for the year 2004 to 2007, 2007 to 2009 and 2009 to 2011 was found to be 0.81 t/ha/year, 0.64 t/ha/year and 0.43 t/ha/year respectively.  
The carbon stock was found to be decreased by 4t/ha from 2011 to 2014.  
The total carbon sequestration status of this forest from the year 2004 to 2014 was found to be 0.5ton/ha.

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