AN ASSESSMENT OF SOIL FERTILITY STATUS AND CARBON STOCK ESTIMATION OF HASANTAR COMMUNITY FOREST AND ITS ADJOINING AREAS.

A dissertation submitted to the Central Department of Environmental Science
for the partial fulfillment of the requirement of the Degree of
Master's of Science in Environmental Science

Submitted by:
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LETTER OF RECOMMENDATION

This is to certify that the dissertation entitled "**An Assessment of Soil Fertility Status and Carbon Stock Estimation of Hasantar Community Forest and its adjoining areas**" submitted by Mr. Shyam Thapa for the partial fulfillment of requirement on the completion of Master's Degree in Environmental Science was based on the researcher's original research work under my guidance and supervision. This is the best piece of work among those under my guidance. The data presented in this dissertation are original and has not been submitted for any other degrees. I therefore, recommend this dissertation for approval.

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LETTER OF APPROVAL

This dissertation paper entitled "**An Assessment of Soil Fertility Status and Carbon Stock Estimation of Hasantar Community Forest and its adjoining areas**" submitted by Mr. Shyam Thapa has been accepted as the partial fulfillment of M. Sc. Degree in Environmental Science.

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Mr. Shyam Thapa

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Abstract

Peri-urban agiculture is the socio-economically and ecologically justified function for the food security, development and self sustainability of the urban society. Soil organic matter plays a vital role in the maintenance of soil fertility. It is concerned with the inherent capacity of the soil to provide nutrients for the growth of specified plants. pH, soil organic carbon and other macronutrients especially NPK has a major implications in soil health and exhibit considerable variability spatially both horizontally and vertically in the soil profiles based on land use, management microclimates and others.

Community forestry has been a successful policy initiative in controlling land degradation. It is the best strategy of the government that involves local people in forest management.

The present study was confined to the Hasantar Community Forest and its adjoining areas. The general objective of the study was to assess the fertility status in terms of organic matter or soil organic carbon (SOC), pH and NPK, next is the estimation of SOC pool and carbon in tree biomass (dry matter). The household survey was carried out in the month of November-December in order to supplement the study with ground reality.

The study showed that almost all sites were moderately acidic. The upland agriculture soil though had medium nitrogen fertility, was low to just medium in exchangeable potassium and low in available phosphorus. Similarly, forest soil was medium to high in N-fertility, almost low or low to medium in potassium fertility and insufficiently low in phosphorus nutrient. In most of the sites, the pH, SOC and NPK were found decreasing with depth but certain perturbations caused to bring variations in it. The total carbon stock of HCF (including SOC-pool and tree biomass carbon) was substantial even in a small forest area of 64 ha which was estimated to be 7562.85 t C. The study also showed that the carbon stored in the forest soil was 4-times more than that in tree biomass (dry matter). It also suggests that more carbon could be sequestered and stored in cultivated soil, forest soil and above ground tree biomass with efficient management.

Key words: Soil fertility, Soil fertility status, Soil organic carbon pool, Above-ground tree biomass, Carbon stock.

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Acronyms and Abbreviations

ADB	Asian Development Bank
AID	Agricultural Information and Communication Division
APP	Agriculture Perspective Plan
ARS	Agricultural Research Station
BD	Bulk Density
Ca	Calcium
CDM	Clean Development Mechanism
CFUGs	Community Forest User Groups
CHEA	Central Himalayan Environment Association.
cm	Centimeter
CO_2	Carbon dioxide
DAP	Di-ammonium phosphate
DBH /dbh	Diameter at Breast Height
DDC	District Development Committee
DFO	District Forest Office
DFRS	Department of Forest Research and Survey
DMG	Department of Mines and Geology
DoA	Department of Agriculture
DoF	Department of Forest
DSCO	District Soil Conservation Office
EC	Electrical Conductivity
ECOSOC	United Nations Economic and Social Council Commission on Sustainable Development
F.S.R.O	Forest Survey and Research Office
FADINAP	Fertilizer Advisory Development and Information Network for Asia and Pacific
FAO	Food and Agriculture organization.
FUGs	Forest User Groups
GDP	Gross Domestic Product
GHG	Green House Gas
gm	Gram

GPS	Geographical Positioning System
H	High
Ha/ ha	Hactare
HCF	Hasantar Community Forest
HFDP	Hill Forest Development Project
HHs or hhs	Households
HMGN	His Majesty's Government of Nepal
HUA	Hasantar Upland Agriculture
ICIMOD	International Centre for Integrated Mountain Development
ICS	Improved Cooking Stoves
IPCC	Intergovernmental Panel on Climate Change
IPNMS	Integrated plant nutrient management system
ISRSC	Informal Sector Research and Study Center
IUCN	World Conservation Union
K	Potassium
Kg	Kilogram
kms	Kilometers
L	Low
LRMP	Land Resource Mapping Project
M	Medium
m	meter
MA	Moderately Acidic
masl	meters above sea level.
me	Moles Equivalent
MFSC	Ministry of Forest and Soil Conservation
Mg	Magnesium
mg	milligram
MoAC	Ministry of Agricultue and Co-operatives
MOP	Muriate of potassium
MoPE	Ministry of Population and Environment
N	Nitrogen
na	not assessed
NARC	Nepal Agricultural Research Council
NBS	Nepal Biodiversity Strategy

OC	Organic Carbon
OM	Organic Matter
P	Phosphorus
Pg	Petagram ~ 10^{15} gm
Ppm	Parts Per Million
QWM	Queen Mary and Westfield college
Sl. A	Slightly acidic
SOC	Soil Organic Carbon
SOM	Soil Organic Matter
sq.	square
SSD	Soil Science Division
t C	tons of carbon
t	tons
TC	Traditional Chulo
UN	United Nations
UNFCCC	UN Framework Convention on Climate Change
VDC	Village Development Committee
W_B	branch weight
WECS	Water and Energy Commission Secretariat
W_L	leaf weight
Ws	Trunk stem weight
Yr	year
%	Percent