

Evaluating the importance of fodder trees to soil nutrition of farming systems in the mid-hills region of Nepal

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requirements for the degree of Master of Philosophy

Hiroshi Endo

Farming Systems Research Group

The School of Agriculture, Food and Wine

The University of Adelaide

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Thesis Declarations

I hereby declare that this work contains no material which has been accepted for the award of any other degree in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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The *EnLiFT* project ‘Enhancing livelihoods and food security from agroforestry and community forestry in Nepal’ is funded through the Australian Centre for International Agricultural Research (ACIAR). Commencing in April, in 2013, it has three key objectives including 1) to improve the capacity of household based agroforestry systems to enhance livelihoods and food security, 2) to improve the functioning of community forestry systems to enhance equitable livelihoods and food security of community forest user group members, and 3) to improve the productivity of, and equitable access to, under-utilised and abandoned agricultural land. I encourage any comments and enquiries, and attribute any mistakes to the author.

Abstract

The livelihood of Nepali farmers in mid-hills Nepal is interrelated to forest-livestock-farming system. Farmers go to the forest to take fodder as feed for livestock then the livestock products are used for their consumption and income sources. The fresh manure is utilized as fertilizer for crop farming as farm yard manure (FYM). However, the nutrient relationship among fodder, manure, and farm yard manure has not been clearly understood. In addition, the monetary value of the nutrient of FYM has not been quantified.

The aim of this study is to evaluate the importance of fodder trees as a source of soil nutrition. To achieve this, this study has the following objectives: 1) to examine the nutrient status in commonly-used fodder trees, 2) to determine the nutrient status of fresh manure from livestock feeding on different fodder trees, 3) to survey the use and quality of farm yard manure, and 4) to determine the equivalent market value of the nutrients in farm yard manure.

This study explains the results of analysis identifying the concentration of Nitrogen (N), Phosphorus (P) and Potassium (K) in four forest fodder species. Additionally, it analyses the nutrient composition (NPK) of the manure of five goats, cows and buffalo feeding on three types of fodder species over a 27 day cycle. Finally, it calculates the monetary value of the nutrients in both fodder and manure.

The nutrient content of each fodder species is different for each village and according to livestock type. The nutrient content of fresh manure produced by different fodder types also differed in K concentration (for cows) and in P and K concentrations (for buffalo). This study shows that *Quercus* is a promising fodder for cows and buffalo, along with *Ficus* fodder also for buffalo. Furthermore, the P concentration in FYM differed for each village. Lastly, an analysis of the equivalent monetary value of FYM determined that it is five to ten times less than the market value of FYM traded.

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Acronyms

ACIAR	Australian Centre for International Agriculture Research
ADF	Acid Detergent Fibre
AEC	Aquatic Ecology Centre
ANOVA	analysis of variance
AUD	Australian dollar
<i>Brassaiopsis</i>	<i>Brassaiopsis hainla</i>
C	Carbon
Ca	Calcium
cf	compare to the mean
C/N ratio	Carbon and Nitrogen ratio
CP	Crude protein
DDM	Digestibility Dry Matter
EM	Effective Micro-organism
<i>EnLiFT</i>	Enhancing Livelihoods and Food Security from Agroforestry and Community Forestry in Nepal
FCS	Food Consumption Score
FECOFUN	Forestry Community the Federation of Community Forestry Uses Nepal
<i>Ficus</i>	<i>Ficus nemoralis</i>
FYM	Farm Yard Manure
GDP	Gross Domestic product
GE	Gross Energy
K	Potassium
KU	Kathmandu University
LRP	Local Resource Person
N	Nitrogen
NAF	Nepal Agroforestry Foundation
NDF	Neutral Detergent Fibre
NO ₃ -N	Nitrate-nitrogen
NPK	Nitrogen, Phosphorus, and Potassium
NTFP	Non-Timber Forest Products
O	Oxygen
OC	Organic Carbon
P	Phosphorus
®	Trade mark
%	Percentage
<i>Prunus</i>	<i>Prunus cerasoides</i>
PSM	Plant Secondary Metabolism
<i>Quercus</i>	<i>Quercus lanata</i>
NRs	Nepali Rupees

SOC	Soluble Organic Carbon
t	ton
USDA	United States Department of Agriculture
y	year

Common Nepali words

bari	rain fed terraced field
doko	basket carried on back using a head strap
khet	irrigated field, usually lowland but can occur on terrace
ropani	land size unit, 1 ropani= 0.05 ha, or 508.8 m ²

Common names of fodder species

bainjh	<i>Quercus lanata</i>
dudhilo	<i>Ficus nemoralis</i>
gogun	<i>Saurauria nepaulensis</i>
hatipaile	<i>Brassaiopsis hainla</i>
kanyu	<i>Ficus semicordata</i>
kimmu	<i>Morus alba</i>
payun	<i>Prunus cerasoides</i>
siltimul	<i>Litsea cubeba</i>
timila	<i>Ficus auriculata</i>