Ecological trade-offs between agroforestry land-use, biodiversity conservation and management intensification

Case study from in and around Lawachara National Park, Moulvibazar, Bangladesh

A thesis submitted for the partial fulfillment of M.Sc in Forestry

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July, 2009

Certification

This is to certify that this paper entitled, **'Ecological trade-offs between agroforestry land-use, biodiversity conservation and management intensification**' is an original paper prepared by Registration no. **2005621006** (Session 2005- 06) based on his field study at **LawacharaNational Park**, Moulvibazar, Bangladesh for the partial fulfillment of his M.Sc. in Forestry degree at Shahjalal University of Science and Technology, Sylhet, Bangladesh. He has completed the work under my supervision and I do hereby approve the style and contents of this paper.

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Declaration

This is to declare that, it is an original paper prepared by myself based on my intensive field study at **Lawachara National Park**, Moulvibazar, Bangladesh; to submit as a requirement for the partial fulfillment of **M. Sc. (thesis)** degree in the Department of Forestry and Environmental Science at School of Agriculture and Mineral Sciences of Shahjalal University of Science and Technology, Sylhet, Bangladesh. This paper has not been submitted or considered elsewhere for achieve any other degrees. I also confirmed that, the views expressed in this paper is my personal and do not necessarily reflect those of Department of Forestry and Environmental Science of SUST or of the other funding. Finally, I authorize the reproduction or citation of the publication for educational or other non-commercial purpose provided the source is fully acknowledged.

Reg. No. 2005621006
July, 2009

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Author
July, 2009

Dedication

Dedicated to my beloved parents
and younger brother, Munim;
who always inspired me in
all my good endeavors!

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Acronyms

CBD - **Convention on Biological Diversity**

CBNRM - **Community Based Natural Resource Management**

CDM - **Clean Development Mechanism**

FAO - **Food and Agricultural Organization of the United Nations**

FD - **Forest Department**

HHs - **Households**

ICRAF - **World Agroforestry Center** (based at Nairobi, Kenya)
(*Previously*; International Center for Research in Agroforestry)

IUCN - **The World Conservation Union** (based at Cambridge, UK and Gland, Switzerland)
(*Previously*; International Union for Conservation of Nature and Natural Resources)

LNP - **Lawachara National Park**

MDG's - **Millennium Development Goals**

MI - **Management Intensification**

NGO - **Non Government Organization**

NP - **National park**

NTFP - **Non Timber Forest Products**

PA - **Protected Area**

RF - **Reserved Forest**

Tk. - **Taka** (Bangladeshi currency; exchange rate with US$ = 69.3 Tk. approx.)

WRI - **World Resource Institute** (based at Washington, D.C., US)

Abstract

Agroforestry is an age-old land-use practice in the tropics that has recently been promoted as a strategy for biodiversity conservation while sustaining local livelihoods in and around areas with high conservation value. However their conservation value is not equal or simply not all agroforestry land-use/systems hold the same potential for biodiversity conservation. Recent biodiversity experiments on key biodiversity indicator species (i.e., plants, birds, butterflies, ants, beetles, large mammals etc.), mostly held in tropical America's and few in central Asia on *Coffee*, *Cacao* and *Rubber* agroforestry systems shows a remarkable shift in diversity and distribution patterns of species along agroforestry land-uses as well as in an management intensification gradient. In Bangladesh, similar experiments have rarely been performed to assess the ecological suitability of existing agroforestry systems maintained either by indigenous forest communities traditionally or by local residents that have developed through market intensification, technological development and local supports in the last years. To check the ecological performance of four distinct agroforestry land-use including 2/3 indigenous developed system in around Lawachara National Park; a stronghold of country's remaining biodiversity, I conducted an intensive ecological survey during early 2008 to mid 2009. Four agroforestry land-uses including one non regular practice were identified through transect work and literature survey. The studied agroforestry land-uses were; traditional *betel-leaf* agroforestry maintained primarily by *Khasia* ethnic community, lemon or fruit-tee (horticulture) based agroforestry maintained by *Tripura* community, pineapple agroforestry in the hill slopes and short-term shifting cultivation in degraded site by *Garo* people (before establishment of new plantation). I surveyed a total of fifty 10m X 10m plots (10 X 4 different agroforestry land-uses and 10 X 1 from forests or old-growth plantations as control) for measuring tree and sapling diversity and understand to understand the allocation of woody biomass. Besides, 200 (50 X 4 from each 10m X 10m plots) subplots of 2m X 2m size were also studied for tree regeneration, herb, shrub and other plant functional group study. 25 soil samples up-to 20cm depth were also collected alternately to get estimates of the soil parameters of studied agroforestry land-uses and of forests. Analysis and lab works suggests that some of the agroforestry like betel-leaf agroforestry can really play effective conservation role and hold similar conservation value as forests. Also management intensification has impacts on plants assemblage in the site. Detail and long term study however require to fully understanding the relation.

Key-words: agroforestry land-use; plant diversity; conservation value; management intensification.