Tropical Forests and People Research Centre

Can natural regeneration be a cost-effective restoration strategy in the upland Philippines?

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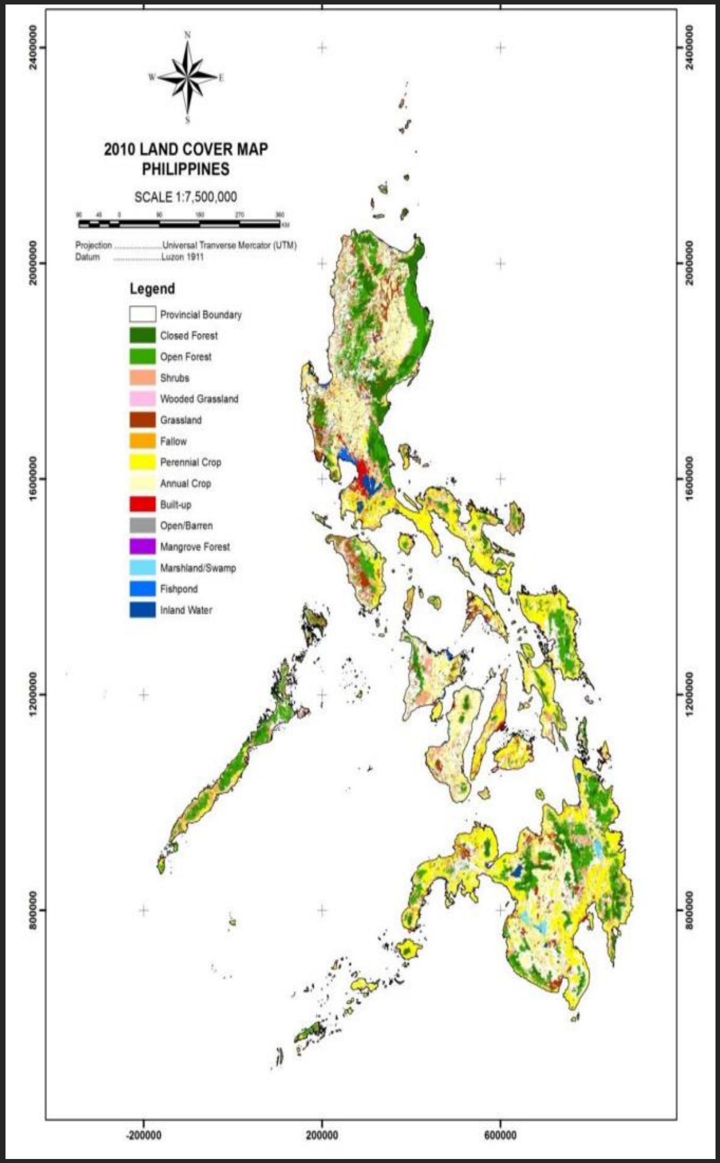
The Philippines

- Forest area – 7.17 million ha (24% of the total land);
- One of the worlds ‘17 mega-biodiversity countries’/‘34 global biodiversity hot-spots’ with about 20, 000 endemic species;
- Experienced one of the highest rates of deforestation in the Southeast Asia;
- A pioneer countries to introduce massive reforestation program to address the issue of forest loss and degradation (Chokkalingam et al. 2006);
- 7620 plant species (77% endemic) (Sodhi et al. 2004)



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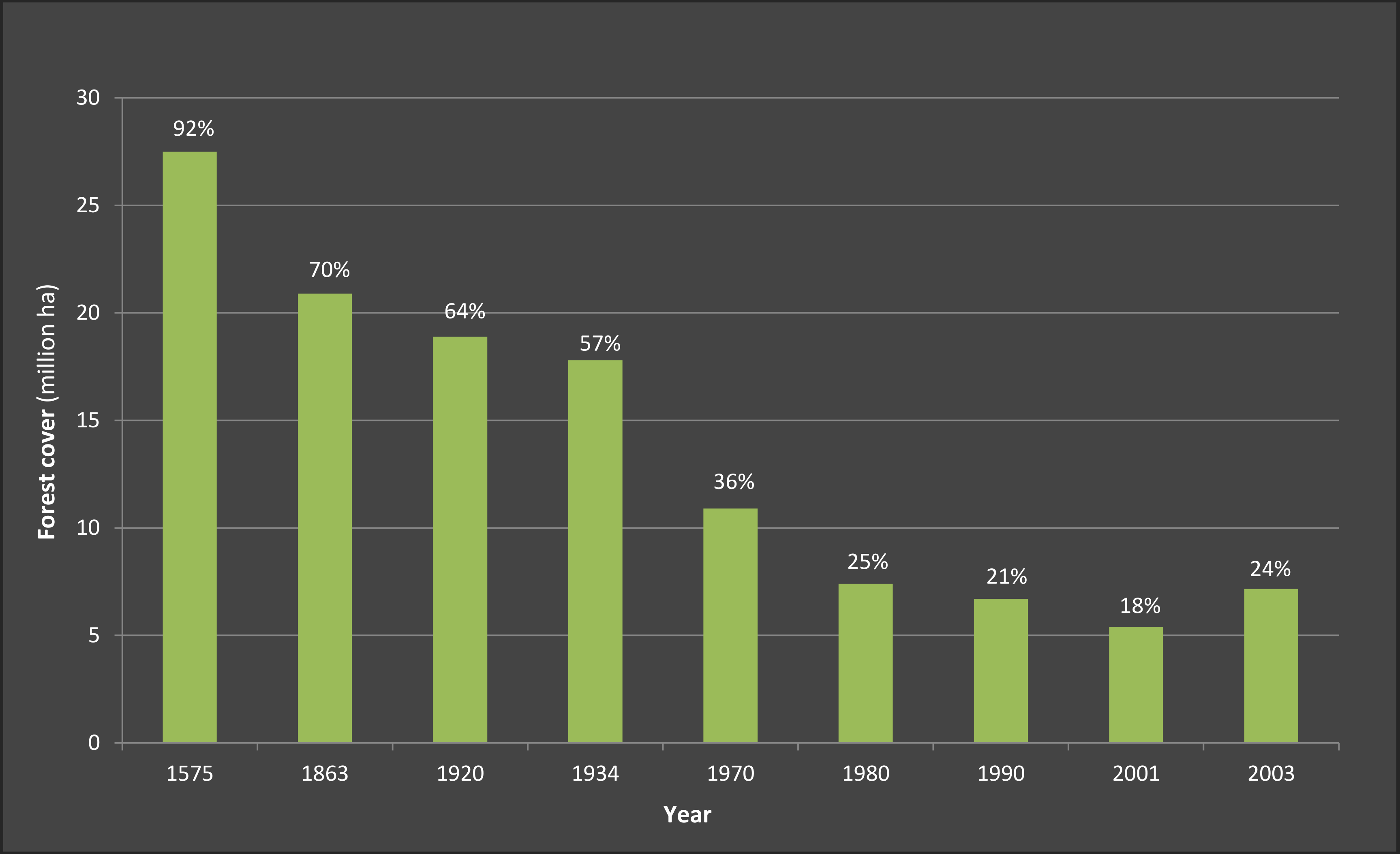
S
2010 LAND COVER MAP
PHILIPPINES
SCALE 1:7,500,000
Projection ....Universal Tranverse Mercator (UTM)
Datum ....Luzon 1911
Legend
Provincial Boundary
Closed Forest
Open Forest
Shrubs
Wooded Grassland
Grassland
Fallow
Perennial Crop
Annual Crop
Built-up
Open/Barren
Mangrove Forest
Marshland/Swamp
Fishpond
Inland Water
2400000
2000000
1600000
1200000
800000
-200000
200000
600000

Trends of primary forest loss in the Philippines



Source: RMPFD 2003

Background

- In the Philippines, a large area of forest are now degraded due to logging and shifting cultivation aka *kaingin*;
- Forest area are determined based on slope/accessibility;
- Access to NGP is limited (with many trial and errors) and many areas are vulnerable to natural calamities including typhoon;
- Community participation is key to success with direct link to food/nutrition/livelihood security;

Cont..

- NR – 93% of the total forest restoration (P Durst);
- ANR – competition with grass;
- Use of fast growing exotics with little consideration to local community needs.

Past reforestation projects in the Philippines

Project/program	Duration	Key features/ objectives
National Forestation Program (NFP)	1986-2000	Reforest about 300,000 hectares by 1992
Low Income Upland Communities Project (LIUCP)	1989-2003	Sustainable development and management of critical watersheds
The Community Forestry Program (CFP)	1989-1999	Plantation development under Forestry Stewardship initiative
The Integrated Social Forestry Program (ISFP)	1982-	Participatory management of the upland using people-oriented forestry programs
Forestland Management Agreement (FLMA)	1989-1995	
Industrial Forest Management Agreement (IFMA)	1993-	
Socialized Industrial Forest Management Agreement (SIFMA)	1994-	Sustainable development and use right of small forest tract approved by DENR to a juridical person/body
The Community-Based Forest Management Program (CBFMP)	1995-	Promote sustainable forest governance to ensure the sustainability of forest resources and equitable distribution of access to and benefits from them
The Community-Based Resource Management Program (CBRMP)	1999-	

The National Greening Program (NGP) and eNGP

- Massive forest rehabilitation program and largest reforestation projects so far;
- Executive order no 26, issued on February 2011;
- Aim: to reforest 1.5 million hectares of degraded forest by planting 1.5 billion trees in critical watersheds of the country;
- Time period: 6 years (2011-2016);
- Implementing/responsible agency: DENR

Key priorities/aim of NGP

- As a climate change mitigation option by enhancing forest carbon stock;
- Food security, environmental stability, biodiversity conservation;
- Reduction of poverty:
  - Providing alternative livelihood activities for marginalized upland and lowland households;
  - Seedling production, care, maintenance of newly planted trees;

Research question

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"Can natural regeneration in disturbed upland forest landscapes can provide biodiversity and carbon co-benefits (comparable to old growths), and what implications they have for land-use policy development?"

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The impacts of shifting cultivation on secondary forests dynamics in tropics: A synthesis of the key findings and spatio temporal distribution of research

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ABSTRACT

Shifting cultivation has been attributed to causing large-scale deforestation and forest degradation in tropical forest-agriculture frontiers. This view has been embedded in many policy documents in the tropics, although, there are conflicting views within the literature as to the impacts of shifting cultivation. In part, this may be due to the complex nature of this land use making generalizations challenging. Here we provided a systematic map of research conducted on shifting cultivation in tropics. We first developed a literature search protocol using ISI Web of Science that identified 401 documents which met the search criteria. The spatial and temporal distribution of research related to shifting cultivation was mapped according to research focus. We then conducted a meta-analysis of studies ($n = 73$) that focused on forest dynamics following shifting cultivation. A bias in research on anthropology/human ecology was evident, with most research reported from the tropical Asia Pacific region (215 studies). Other key research foci were – soil nutrients and chemistry (72 studies), plant ecology (62 studies), agricultural production/management (57 studies), agroforestry (35 studies), geography/land-use transitions (26 studies). Our meta-analysis revealed a great variability in findings on selected forest and environmental parameters from the studies examined. Studies on ecology were mainly concentrated on plant diversity and successional development, while conservation biology related studies were focused on birds. Limited impacts of shifting cultivation on some soil essential nutrients were also apparent. Apart from the intensity of past usage site spatial attributes seems critical

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Tropical secondary forests regenerating after shifting cultivation in the Philippines uplands are important carbon sinks

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In the tropics, shifting cultivation has long been attributed to large scale forest degradation, and remains a major source of uncertainty in forest carbon accounting. In the Philippines, shifting cultivation, locally known as *kaingin*, is a major land-use in upland areas. We measured the distribution and recovery of aboveground biomass carbon along a fallow gradient in post-*kaingin* secondary forests in an upland area in the Philippines. We found significantly higher carbon in the aboveground total biomass and living woody biomass in old-growth forest, while coarse dead wood biomass carbon was higher in the new fallow sites. For young through to the oldest fallow secondary forests, there was a progressive recovery of biomass carbon evident. Multivariate analysis indicates patch size as an influential factor in explaining the variation in biomass carbon recovery in secondary forests after shifting cultivation. Our study indicates secondary forests after shifting cultivation are substantial carbon sinks and that this capacity to store carbon increases with abandonment age. Large trees contribute most to aboveground biomass. A better understanding of the relative contribution of different biomass sources in aboveground total forest biomass, however, is necessary to fully capture the value of such landscapes from forest management, restoration and conservation perspectives.

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Co-benefits of biodiversity and carbon sequestration from regenerating secondary forests in the Philippine uplands: implications for forest landscape restoration

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ABSTRACT

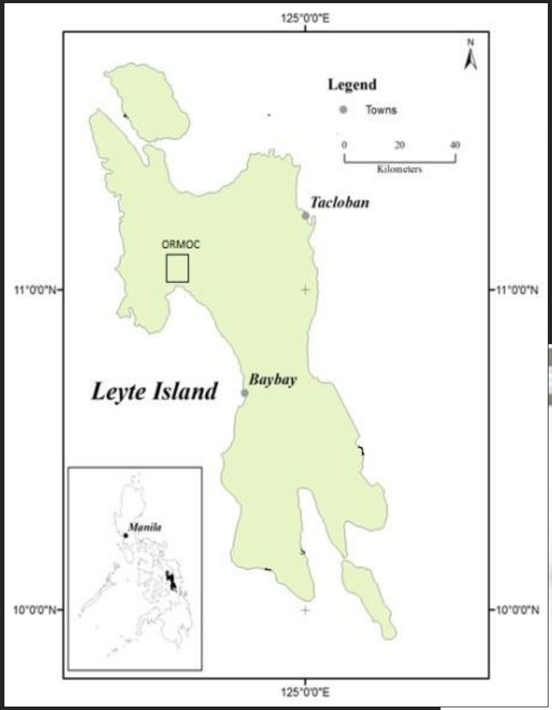
Shifting cultivation is a widespread practice in tropical forested areas that policy makers often regard as the major cause of forest degradation. Secondary fallow forests regrowing after shifting cultivation are generally not viewed as suitable for biodiversity conservation and carbon retention. Drawing upon our research in the Philippines and other relevant case studies, we compared the biodiversity and carbon sequestration in recovering secondary forests after shifting cultivation to other land uses that commonly follow shifting cultivation. Regenerating secondary forests had higher biodiversity than fast growing timber plantations and other restoration options available in the area. Some old plantations, however, provided carbon benefits comparable the old growth forest, although their biodiversity was less than that of the regenerating forests. Our study demonstrates that secondary forests regrowing after shifting cultivation have a high potential for biodiversity and carbon sequestration co-benefits, representing an effective strategy for forest management and restoration in countries where they are common and where the forest is an integral part of rural people's livelihoods. We discuss the issues and potential mechanisms through which such dynamic land use can be incorporated into development projects that are currently financing the sustainable management, conservation, and restoration of tropical forests.

Key words: community forestry; forest degradation; reforestation; shifting cultivation; trade-off.

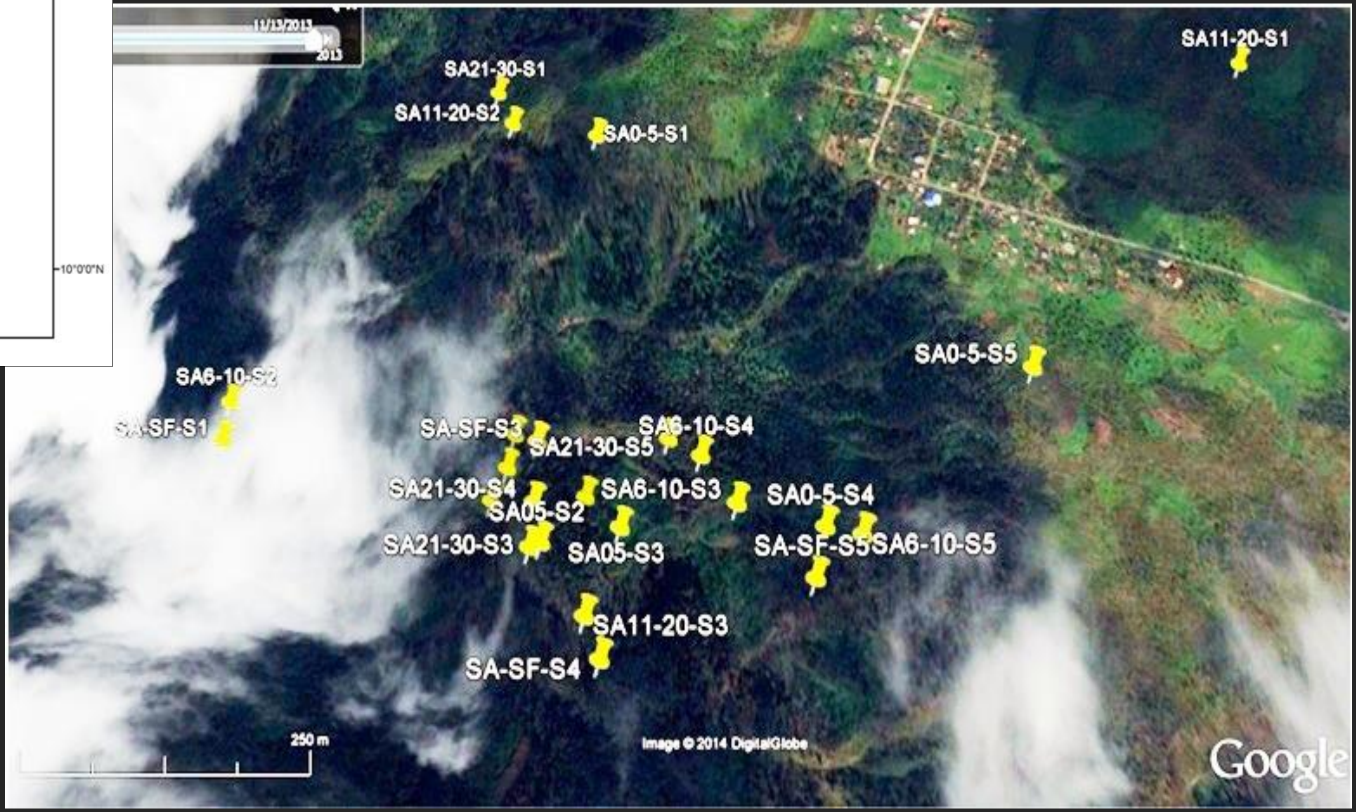
Methodology

- Modified Gentry plot approach: transect (50 m x 5 m) surveys in 20 *kaingin* sites (> 1 ha), and in secondary forests (n=5);
- 4 transects from each sites of the following fallow categories,
  - *Less than 5 years*
  - *More than 5 years and less than 10 years*
  - *More than 10 years and less than 20 years and*
  - *More than 20 years and less than 30 years under fallow*

Study area



Barangy Gaas, Ormoc, Leyte Island



Methodology – *cont.*

Vegetation survey (@ transect level) **-**

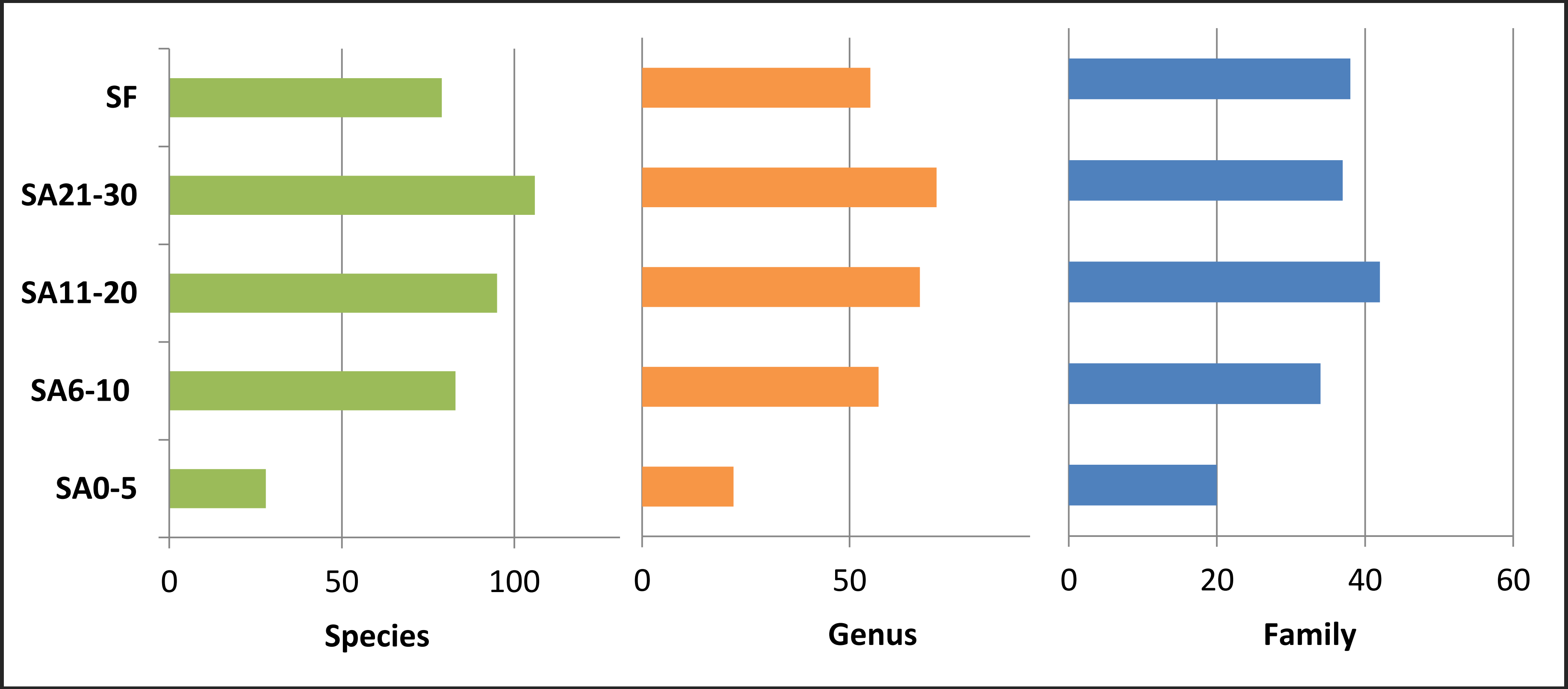
- diameter of standing tree (≥ 5 cm at dbh); (***N = 2918***)
- height of individuals, and respective position in transect (X/Y);
- diameter and length of dead trees (freshly cut; moderately decomposed, rotten, burnt; standing/lying on ground) with dbh ≥ 5 cm (***N = 1281***);

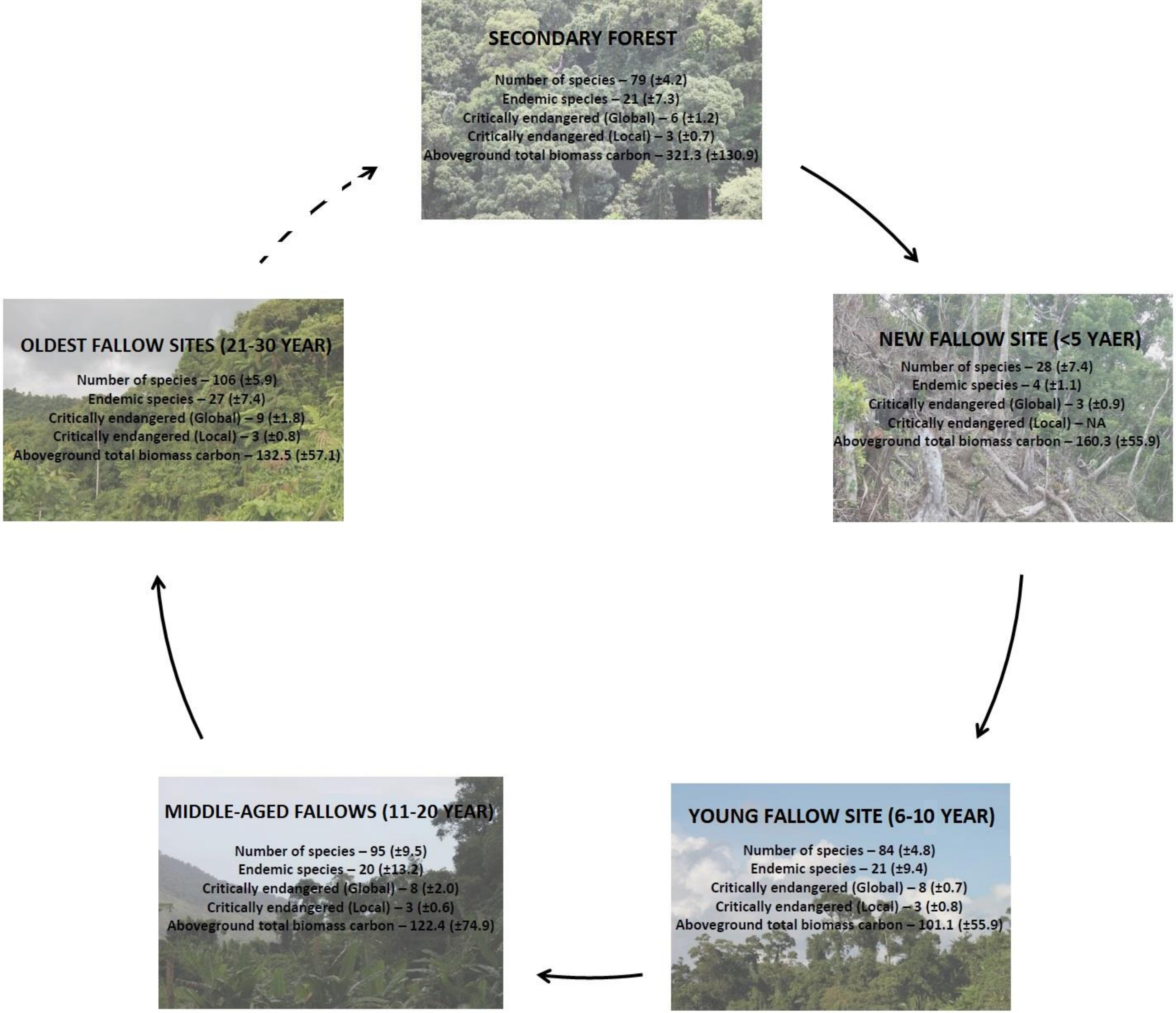
Site parameters –

- fallow age, patch size, GPS coordinates, elevation, distance, slope, LAI, topographic position, adjacent land-use/cover, disturbances.

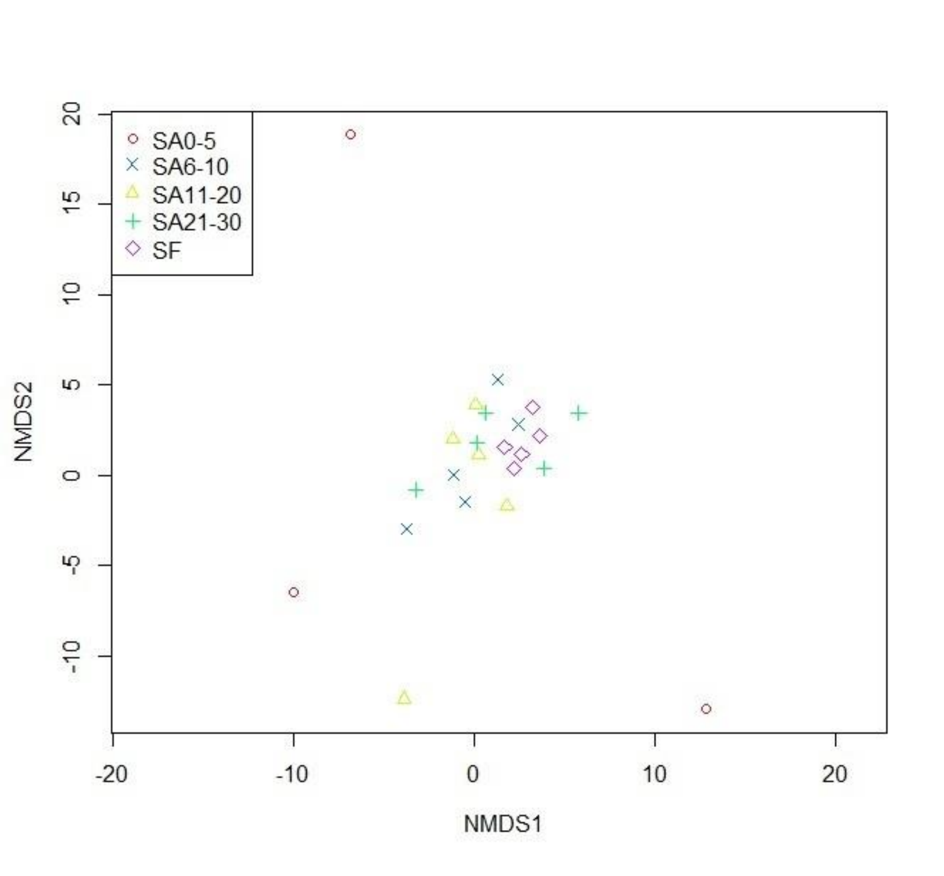
Study finding

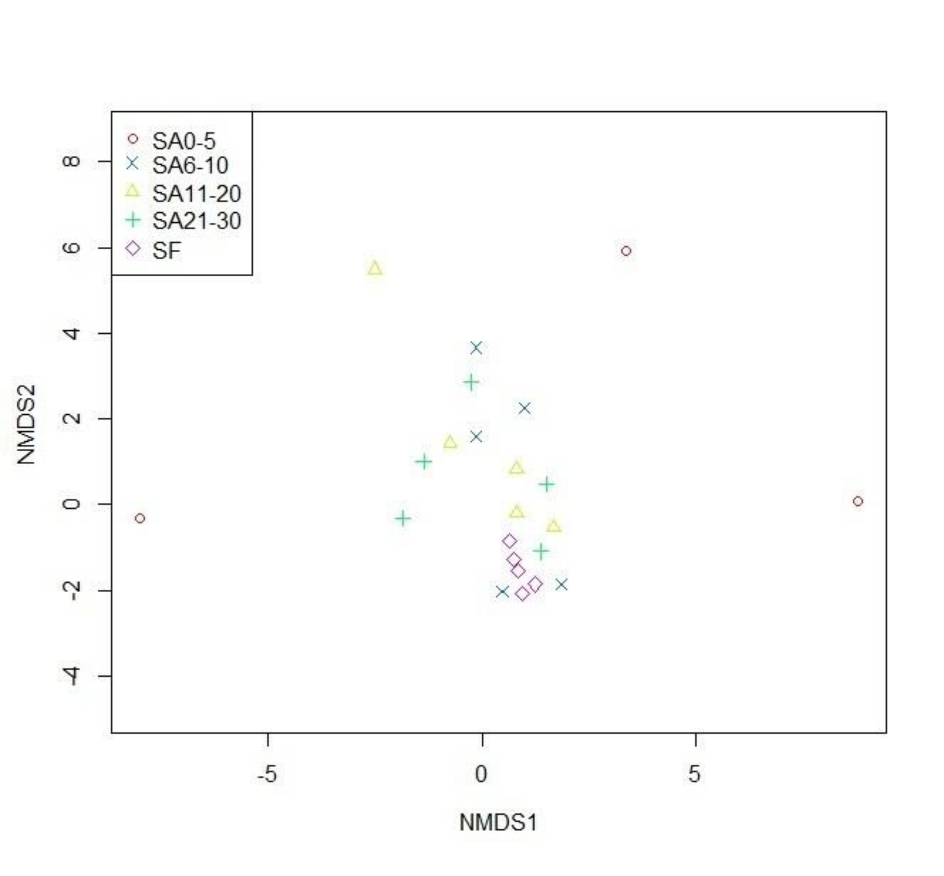
- 131 species belonging to 86 genera and 46 families;
- 12 late successional/climax; 58 intermediate; 61 pioneer species
- Moraceae (14 species); Dipterocarpaceae (10 species)




SECONDARY FOREST
Number of species – 79 (±4.2)
Endemic species – 21 (±7.3)
Critically endangered (Global) – 6 (±1.2)
Critically endangered (Local) – 3 (±0.7)
Aboveground total biomass carbon – 321.3 (±130.9)
NEW FALLOW SITE (<5 YAER)
Number of species – 28 (±7.4)
Endemic species – 4 (±1.1)
Critically endangered (Global) – 3 (±0.9)
Critically endangered (Local) – NA
Aboveground total biomass carbon – 160.3 (±55.9)
YOUNG FALLOW SITE (6-10 YEAR)
Number of species – 84 (±4.8)
Endemic species – 21 (±9.4)
Critically endangered (Global) – 8 (±0.7)
Critically endangered (Local) – 3 (±0.8)
Aboveground total biomass carbon – 101.1 (±55.9)
MIDDLE-AGED FALLOWS (11-20 YEAR)
Number of species – 95 (±9.5)
Endemic species – 20 (±13.2)
Critically endangered (Global) – 8 (±2.0)
Critically endangered (Local) – 3 (±0.6)
Aboveground total biomass carbon – 122.4 (±74.9)
OLDEST FALLOW SITES (21-30 YEAR)
Number of species – 106 (±5.9)
Endemic species – 27 (±7.4)
Critically endangered (Global) – 9 (±1.8)
Critically endangered (Local) – 3 (±0.8)
Aboveground total biomass carbon – 132.5 (±57.1)

Species compositional similarities

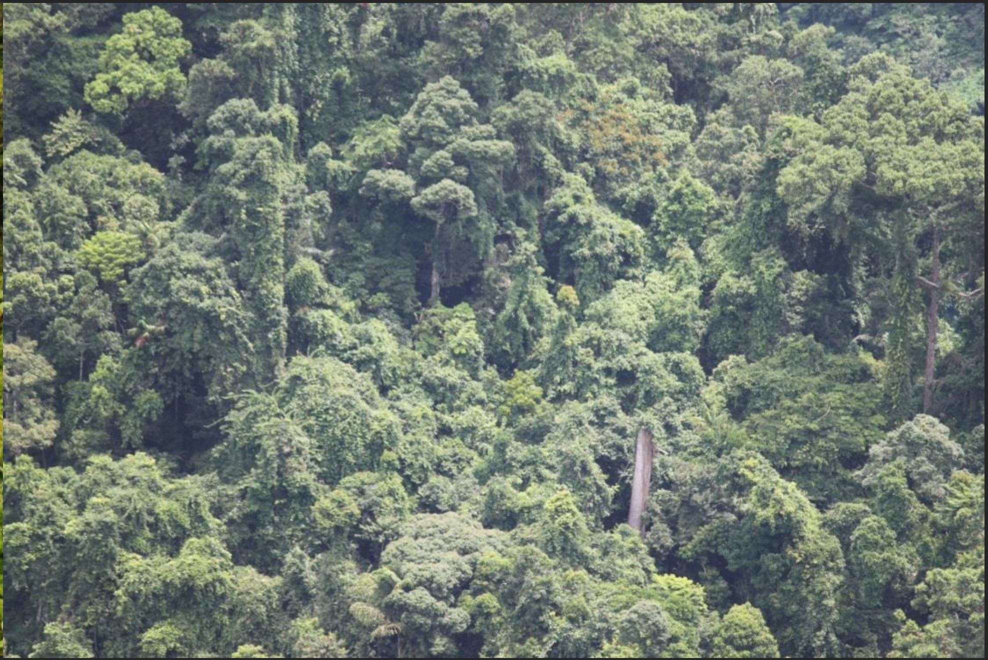




A newly opened site for *kaingin* in the area

A ~ 20 years *kaingin* fallow site

A ~ 30 years *kaingin* fallow site



An old-growth forest site without any *kaingin*

Biodiversity and aboveground carbon stocks in common upland land-cover/use in the Philippines uplands

Land-use	Biodiversity[1]	Carbon[2]	Additionality[3](Δ)		Age[4]	C sequestration	Source
			Δ Biodiversity	*Δ Carbon*		(Mg C ha^{-1})	
Old-growth forest	**79**	**321.3**	**-**	**-**	**-**	**NA**	1
Post-*kangin* forest							
New fallow	28	160.3	-51	-160.9	5	-	1,2
Young fallow	84	101.1	+5	-220.2	10	-	1,2
Middle-aged	95	122.4	+16	-198.9	20	-	1,2
Oldest fallow	106	132.5	+27	-188.8	30	-	1,2
Dipterocarp forest	NA	221	-	-100.3	NA	-	3
Grasslands							
Imperata sp.	0	8.5	-79	-312.8	1	0*	3
Sacharrum sp.	0	13.1	-79	-308.2	1	0 *	3
Plantations							
Swietenia macrophylla	1	264	-78	-57.3	NA	-	4
Acacia sp.	1	81	-78	-240.3	NA	-	3
Oil palm	1	55	-78	-266.3	9	6.1	5
Rice paddy	0	3.1	-79	-318.2	1	0*	3

Concluding remarks

- Comparable biodiversity in areas with NR (abandoned after *kaingin*) and low biodiversity value of other land-use/restoration options;
- In disturbed areas C sequestration and storage mainly determined by fallow age, and it may take as much as 30 years to recover ~40% C as in the oldgrowth forests;
- Regenerating secondary forests can be a cost effective restoration strategy in the Philippines and may provide superior benefits than other land-use/state supported restoration;
- Incorporation of REDD+ and CDM options in fallow areas can be beneficial for both small-holder rural farmers and for the local environment.


Thanks
Photo credits: S.A. Mukul