

RAINFORESTATION FARMING: AN ALTERNATIVE TO FOREST RESTORATION

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ABSTRACT

Efforts to preserve the biodiversity of the Philippine islands and to simultaneously sustain human food production led to the development of a "Closed Canopy and High Diversity Forest Farming System", popularly termed "Rainforestation Farming". This system aims to replace the more destructive forms of "kaingin" or slash and burn practices, form a buffer zone around primary forests, protect biodiversity, help maintain the water cycle and provide farmers with a stable and higher income.

Rainforestation Farming works on the hypothesis that a farming system is increasingly more sustainable the closer its physical structure and species composition are to the original rainforest. This scheme utilises native tree species, particularly dipterocarps and high premium tree species, while incorporating fruit trees and agricultural crops in accordance with farmers' need.

Wildlife, such as birds, reptiles, arthropods and mammals, readily inhabited the newly established forest. In the sixth year after establishment, the Samar taretic hornbill (*Penelopides samarensis*) and flying lemur (*Cynocephalus volans*) from nearby forest visited the farm regularly. The highly diverse tree plantation allowed re-establishment of arthropods, Philippine tarsier (*Tarsius syrichta*), birds and lizards which derived food, nesting places and moist cool microclimates from the newly formed ecosystem.

INTRODUCTION

Rainforestation Farming technology was developed by the ViSCA-GTZ Applied Tropical Ecology Program. The aim of rainforestation is to replace the more destructive forms of "kaingin" or slash and burn practices, form a buffer-zone around primary forests, conserve biodiversity, help maintain the water cycle and provide farmers with a stable and higher income.

To save and protect biodiversity of the Philippine rainforest, the reforestation scheme utilises local tree species. Research was conducted to determine which local tree species could thrive well in different soil and climatic conditions, while applying the basic principles of tree farming. This system also attempted to develop a farming system that closely resembles the structure of a natural Philippine rainforest ecosystem.

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METHODOLOGY

In 1992, a 7-hectare demonstration farm and nursery were developed to establish a "Closed Canopy and High Diversity Forest Farming System" in co-operation with the Department of Environment and Natural Resources (DENR) and several departments at ViSCA. The objective was to develop a farming system that closely resembles the structure of a natural Philippine rainforest ecosystem. Species monitoring was conducted to analyse and assess the impact of the structural diversity, provided by the re-established forest, on the abundance and diversity of mammals, birds, reptiles and arthropods. A preliminary assessment was done to determine which organisms were found within the farm. Subsequently, artificial nests for insects were set up randomly. The distance between nests ranged from 50-55 metres along the slope. Artificial nests for birds, on the other hand, were hung randomly on trees within the area.

Likewise, arthropod sampling was undertaken on three dipterocarp species, namely Apitong (*Dipterocarpus warburgii*), Dalingdingan (*Hopea plagata*) and Red Lauan (*Shorea negrosensis*). Sample trees in the Rainforestation farm were approximately 5-6 years old with an average height of 3 metres.

After setting-up artificial nests, qualitative and quantitative observations were made to monitor the number of organisms attracted to the nests. The number of birds, insects and the individual number of species attracted to every artificial nest were recorded. For arthropods, one or two individuals (depending on the population) represented by each species attracted to the nests were collected and preserved in 70% ethyl alcohol for sorting. Birds were not collected but rather identified in the field using binoculars, upon which sketches were created to show the body proportions and indicate colour patterns.

Arthropods found in the dipterocarp trees were collected through aerial net trapping and beating and were then brought to the laboratory for processing and identification. Those contained in the leaf litters were extracted through Tullgren funnel extraction before preserving in 70% ethyl alcohol for classification. Specimens were sorted according to site and tree species. The abundance of each arthropod species was recorded for each tree species with their respective sampling method. From the pooled data, some ecological indices were calculated to describe the arthropod community structure for each tree species.

RESULT HIGHLIGHTS

Among the various forest tree species in Leyte, some dipterocarps as well as premium and fast growing tree species were screened for their applicability in the rainforestation farming scheme. During the first year of tree farming, sun-loving tree species, as listed in Table 1, were planted at a close distance of 2 x 2 meters, allowing the canopy to close quickly and favour straight bole growth due to the competition for light. In the second year, shade-loving trees (Table 2) were planted under the established pioneer trees. The list in Table 2 includes highly valued timber trees of the family Dipterocarpaceae. Likewise, shade-tolerant crops such as ubi (*Dioscorea* spp), gabi (*Colocasia* spp), pineapple (*Ananas*

RAINFORESTATION FARMING

spp), takudo (*Xanthosoma* spp), abaca (*Musa textiles*), mushrooms and a variety of ornamental plants such as orchids, anthurium, aroids and Zingibers can be incorporated.

It is necessary during planting to group the trees according to shape types (BALZER, 1994) in order to achieve a high diversity of compatible trees which are less competitive for resources than their adjacent trees but optimise the available resources through their tightly interwoven community structure. In addition, it is a good strategy to avoid pest outbreaks if the immediate neighbouring trees are not of the same species and the planting scheme aims for maximum diversity.

Table 1. Light-loving Philippine forest tree species tested for Rainforestation Farming at Project site in ViSCA arranged in systematic order of families recommended for first year of planting.

Official Local Name	Scientific Name	Family
Anabiong	<i>Trema orientalis</i>	Ulmaceae
Gumihan	<i>Artocarpus sericicarpus</i>	Moraceae
Agoho	<i>Casuarina equisetifolia</i>	Casuarinaceae
Mountain Agoho	<i>Casuarina nodiflora</i>	Casuarinaceae
Bitanghol	<i>Calophyllum blancoi</i>	Clusiaceae
Bitao	<i>Calophyllum inophyllum</i>	Clusiaceae
Toog	<i>Petersianthus quadrialatus</i>	Lecythidaceae
Tindalo	<i>Azelia rhomboidea</i>	Caesalpinaceae
Kariskis	<i>Albizia lebbekoides</i>	Caesalpinaceae
Ipil	<i>Intsia bijuga</i>	Caesalpinaceae
Bahay	<i>Ormosia calvensis</i>	Fabaceae
Narra	<i>Pterocarpus indicus</i>	Fabaceae
Akleng-parang	<i>Albizia procera</i>	Mimosaceae
Rain tree	<i>Samanea saman</i>	Mimosaceae
Bagras	<i>Eucalyptus deglupta</i>	Myrtaceae
Malabayabas	<i>Tristania decorticata</i>	Myrtaceae
Talisay	<i>Terminalia catappa</i>	Combretaceae
Talisay Gubat	<i>Terminalia foetidissima</i>	Combretaceae
Kalumpit	<i>Terminalia microcarpa</i>	Combretaceae
Malugai	<i>Pometia pinnata</i>	Sapindaceae
Bogo	<i>Garuga floribunda</i>	Burseraceae
Dao	<i>Dracontomelon dao</i>	Anacardiaceae
Lamio	<i>Dracontomelon edule</i>	Anacardiaceae
Amugis	<i>Koordersiodendron pinnatum</i>	Anacardiaceae
Danupra	<i>Toona sureni</i>	Meliaceae
Philippine Teak	<i>Tectona philippinensis</i>	Verbenaceae
Lingo-lingo	<i>Vitex nuzanhowii</i>	Verbenaceae
Banai-banai	<i>Radermachera pinnata</i>	Bignoniaceae
Hindang	<i>Myrica javanica</i>	Myricaceae

Table 2. Shade-loving Philippine forest tree species tested for Rainforestation Farming at Project site in ViSCA arranged in systematic order of families recommended for second year of planting.

Official Local Name	Scientific Name	Family
Palosapis	<i>Anisoptera thurifera</i>	Dipterocarpaceae
Hagakhak	<i>Dipterocarpus warburgii</i>	Dipterocarpaceae
Bagtikan	<i>Parashorea malaanonan</i>	Dipterocarpaceae
Manggachapui	<i>Hopea acuminata</i>	Dipterocarpaceae
Dalingdingan	<i>Hopea foxworthyi</i>	Dipterocarpaceae
Gisok-gisok	<i>Hopea philippinensis</i>	Dipterocarpaceae
Yakal-kaliot	<i>Hopea malibato</i>	Dipterocarpaceae
Almon	<i>Shorea almon</i>	Dipterocarpaceae
White Lauan	<i>Shorea contorta</i>	Dipterocarpaceae
Guijo	<i>Shorea guiso</i>	Dipterocarpaceae
Yakal-malibato	<i>Shorea malibato</i>	Dipterocarpaceae
Red Lauan	<i>Shorea negrosensis</i>	Dipterocarpaceae
Mayapis	<i>Shorea palosapis</i>	Dipterocarpaceae
Tangile	<i>Shorea polysperma</i>	Dipterocarpaceae
Talakatak	<i>Castanopsis philippinensis</i>	Fagaceae
Ulaian	<i>Lithocarpus pruinosa</i>	Fagaceae
Kamagong	<i>Diospyros philippinensis</i>	Ebenaceae
Dungan	<i>Heritiera sylvatica</i>	Sterculiaceae
Kulatingan	<i>Pterospermum obliquum</i>	Sterculiaceae
Balobo	<i>Diplodiscus paniculatus</i>	Tiliaceae

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Among the herbivores, the flying lemur (*Cynocephalus volans*), which feeds exclusively on leaves of jackfruit (*Artocarpus heterophyllus*), the big hornbill (*Bucerus hydrocorax semigaleatus*), a fruit eating bird and the Philippine tarsier (*Tarsius syrichta*), the smallest and only true carnivore among the primates, were among the first wildlife regularly heard and observed at the forest edges of the Rainforestation Farming sites.

Birds (Table 3), reptiles, rodents and arthropods (Table 4) readily inhabited the newly regrown forest ecosystems. A maximum high diversity was achieved by planting 166 different tree species with adjacent trees being different species.

Biodiversity protection and preservation was achieved in Rainforestation Farming system in two ways:

- through propagation and planting of endangered tree species
- creation of suitable habitat for a variety of macro-organisms and provision of a microclimate to which the species migrate from adjacent forests.

With the major primary producers actively planted, the other components of the nutrient cycle, like herbivores, predators and decomposers, were consequently favoured.

RAINFORESTATION FARMING

Biodiversity, therefore, increased with the number of tree species planted, with structural diversity growing over time.

Table 3. Birds observed within the Rainforestation Farming area from January 1997 to December 1998.

Family	Scientific Name	Common Name
Columbidae	<i>Treron vernens</i>	Pink-necked green pigeon
	<i>Phapitreron leucotis</i>	White eared brown dove
	<i>Ptilinopus occipitalis</i>	Yellow-breasted fruit dove
	<i>Macropygia phasianella</i>	Reddish cuckoo dove
	<i>Streptopelia chinensis</i>	Spotted dove
	<i>Chalcophaps indica</i>	Common emerald dove
Psittacidae	<i>Loriculus philippensis</i>	Philippine hanging parrot
Cuculidae	<i>Cacomantis merulinus</i>	Plaintive cuckoo
	<i>Centropus bengalensis</i>	Lesser coucal
Caprimulgidae	<i>Eurostopodus macrotis</i>	Great-eared nightjar
Apodidae	<i>Collocalia esculenta</i>	Glossy swiftlet
	<i>Mearnsia picina</i>	Philippine needletail
	<i>Hirundapus celebensis</i>	Purple needletail
	<i>Cypsiurus balasiensis</i>	Asian palm-swift
Alcedinidae	<i>Halcyon smynesis</i>	White-throated kingfisher
	<i>Halcyon chloris</i>	White-collared kingfisher
Meropidae	<i>Merops philippinus</i>	Blue-tailed bee eater
Bucerotidae	<i>Penelopides samarensis</i>	Samar tarictic hornbill
Capitonidae	<i>Megalaima haemacephala</i>	Coppersmith barbet
Pycnonotidae	<i>Pycnonotus goiaver</i>	Yellow-vented bulbul
	<i>Hypsipetes philippinus</i>	Philippine bulbul
	<i>Oriolus chinensis</i>	Black-naped oriole
Muscicapidae	<i>Hpothymis azurea</i>	Black-naped monarch
Laniidae	<i>Lenius cristatus</i>	Brown shrike
Sturnidae	<i>Aplonis panayensis</i>	Asian glossy starling
	<i>Sarcops calvus</i>	Coletto
Nectariniidae	<i>Anthreptes melacensis</i>	Plain-throated sunbird
	<i>Nectarinia sperata</i>	Purple-throated sunbird
	<i>Nectarinia jugularis</i>	Olive-backed sunbird
Dicaeidae	<i>Dicaeum bicolor</i>	Bicoloured flowerpecker
	<i>Dicaeum australe</i>	Red-keeled flowerpecker

Table 4. Summary of observed organisms from the artificial bird nests installed at the Rainforestation Farming Demonstration Farm, FORI, ViSCA, Baybay, Leyte in 1997-1998.

Organisms	ARTIFICIAL NESTS USED ¹				
	AW1	AW2	AB1	AB2	AB3
Insects – Formicidae	*	*	*	*	*
Rhinotermitidae	*	*	*		
Gryllotalpidae			*		
Gryllidae				*	
Tipulidae	*	*			
Vespidae				*	
Spiders – Lycosidae		*			
Salticidae		*			*
Thomisidae				*	
Reptiles- Gekkonidae		*	*	*	*
Scincidae	*	*		*	*
Pythonidae	*				
Rodent - Sciuridae			*	*	

¹Artificial nests used: AW1 - small, wooden nest; AW2 - big, wooden nest; AB1 - small, brick nest; AB2 - big, brick nest; AB3 - biggest, brick nest; * - present

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