FROM FARM TO FOREST

Presentation of two methods for restoring native forests:
That Dr. Akira Miyawak and Dr. Stephen Elliott.

November 1, 2012 · by Sylvia Ramos · in Reforestation Project, Trees and Shrubs.
by Sylvia Ramos, birdwatchers and bird photographer. Blog: http://mindingthefarm.wordpress.com
Additional information from Benjamin Lisan, engineer.

When people think of planting trees, they usually think of either landscaping or tree farming. Landscaping is like interior decoration, but with plants. The goal is to create beautiful surroundings using plants, natural features like rocks, water, and fish and also man-made features like fences, and buildings. Landscaping usually requires a lot of care and maintenance. Tree farming usually involves planting one species of trees for the purpose of producing lumber. In the Philippines, popular species for tree farming are fast-growing exotics such as *mahogany* and *gemelina*.
At the farm, we plan to do reforestation. The goal of reforestation is to restore the complex and diverse life forms that co-exist in a natural forest. These include not just trees but also birds, insects, soil animals, trees and under storey plants. Once a natural forest is established, it does not require any upkeep or maintenance. It is possible to see positive changes in 6-11 years, such as: (from "*Rainforestation: A Paradigm Shift in Forest Restoration in the Philippines for Sustainability and Climate Change Mitigation*" by Paciencia P. Milan, PhD, University Professor Visayas, State University, presented during the Mindanao Rainforest Restoration Forum)

- improvement of soil chemical properties
- improvement of soil structure and water holding capacity
- improvement of soil organic matter and soil color (darker is better)
- improvement of nutrient status
- improvement of biological activity
- improvement of microclimate (cooler)

TWO INTERESTING METHODS
There are many different reforestation methods. The two that sound most interesting and promising are the **Miyawaki Method** and the **Framework Species Method of Dr. Stephen Elliott**. These two methods seem to have high success rates in short periods of time.

FRAMEWORK SPECIES METHOD
The Framework Species Method was developed in Australia and has been used in northern Thailand since 1994. About 30 species of trees are selected as the "framework species". The ultimate goal however is to have even more species at the site that will be brought in by the birds, insects, and animals that were attracted by the framework species.

STAGES OF SITE DEGRADATION:
In this method, a site is categorized as Stage 1, 2, 3, 4, or 5. Each stage requires a different restoration approach. Stage one has the least degradation, Stage 5 has the most degradation

- Stage 1 – there are a lot of regeneration sources at the site.
  Intervention: protect existing vegetation from fire and harvesting, protect wildlife from hunting
- Stage 2 – more trees have been removed, weed are beginning to take over. Fewer species at the site
  Intervention: protection, weeding, applying fertilizer.
- Stage 3 – weeds are dominating site, sources of natural regeneration are insufficient, fire risk is high. There are still some remnant trees and some wildlife to act as seed dispersers.
  Intervention – same as Stage 2, but with additional tree planting of framework species
- Stage 4 – no trees as seed sources remaining.
  Intervention: same as Stage 3, but with more species of trees at high density, such as in the Miyawaki method. This is expensive and intensive and mainly applicable to small, urban sites.
- Stage 5 – even weeds have a hard time growing, soil erosion is significant.
  Intervention: plant whatever can grow, even exotic species to help rebuild the soil. Then, move to Stage 4 or 3.

CRITERIA FOR SELECTING FRAMEWORK SPECIES TREES

This is Dr. Elliott's definition of a framework species tree: "Framework Species are indigenous forest tree species that
enhance natural forest regeneration and accelerate biodiversity recovery." The trees must meet the following criteria:

- must survive well when planted in deforested areas
- must have dense spreading crowns to shade out weeds
- should attract seed-dispersing animals by producing fruit, nectar, nesting sites, and perching sites
- if possible, must be resistant to fire

FRAMEWORK SPECIES SUCCESS STORY

Excerpt from talk given by Dr. Steve Elliott. FORRU is the Forest Restoration Research Unit at Chiang Mai University.

FORRU's results using framework species have been very encouraging. Approximately six years after planting, the structure of the forest can almost be recovered, with stratification of large pioneers and smaller climax species. Species diversity also increases. At a demonstration site, for example, Dr. Elliott's team planted 30 framework tree species that fostered the recruitment of an additional (non-planted) 72 tree species within 8-9 years. Moreover, within three years mammals began to return (pigs, deer) and bird diversity jumped from 30 species before planting to 87 species six years later, representing 63% of the bird community of the nearest natural forest.

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Additional information can be found at the FORRU website.

NOTES FOR THE FARM:

- This method would work very well if there is remaining natural forest nearby, up to 10 km of the farm.
- Frequent weeding is necessary for up to 2 years after planting.
- Trees are randomly positioned across the site.
- Average distance between adjacent trees is 1.8 m (about 3,086 trees per hectare!). Density can be reduced if naturally established tree seedlings are present.
- Naturally established trees should be protected

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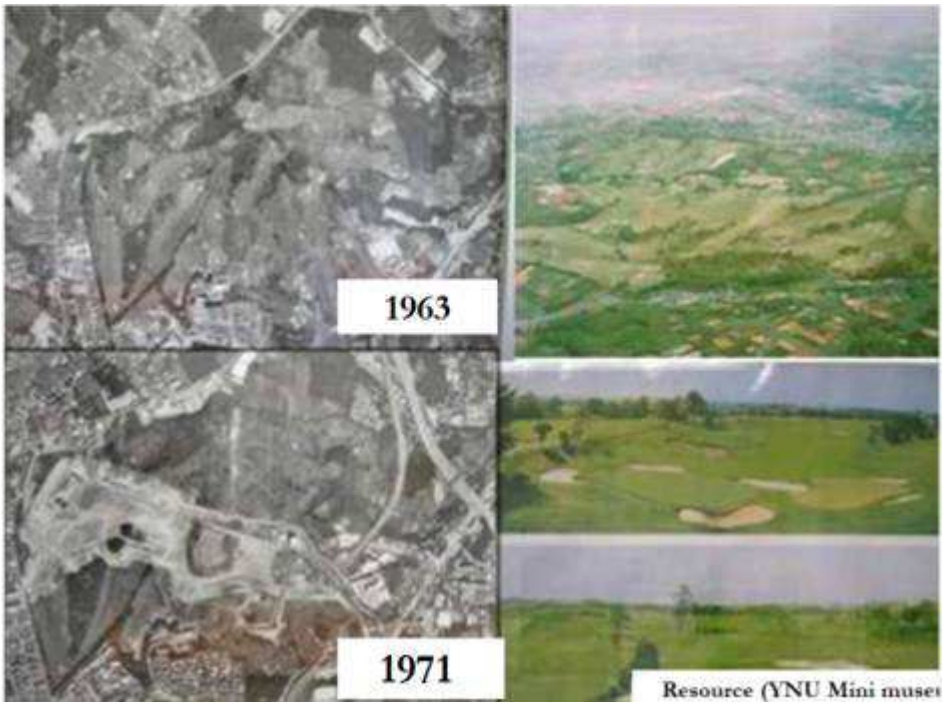
MIYAWAKI METHOD

The Miyawaki Method of forest restoration was developed by Dr. Akira Miyawaki in the 1960's after studying nature conservation and restoration in Germany under Professor Reinhold Tuexen. One of his early forest restoration project was at the Yokohama National University where a golf course with no intact forests was restored.



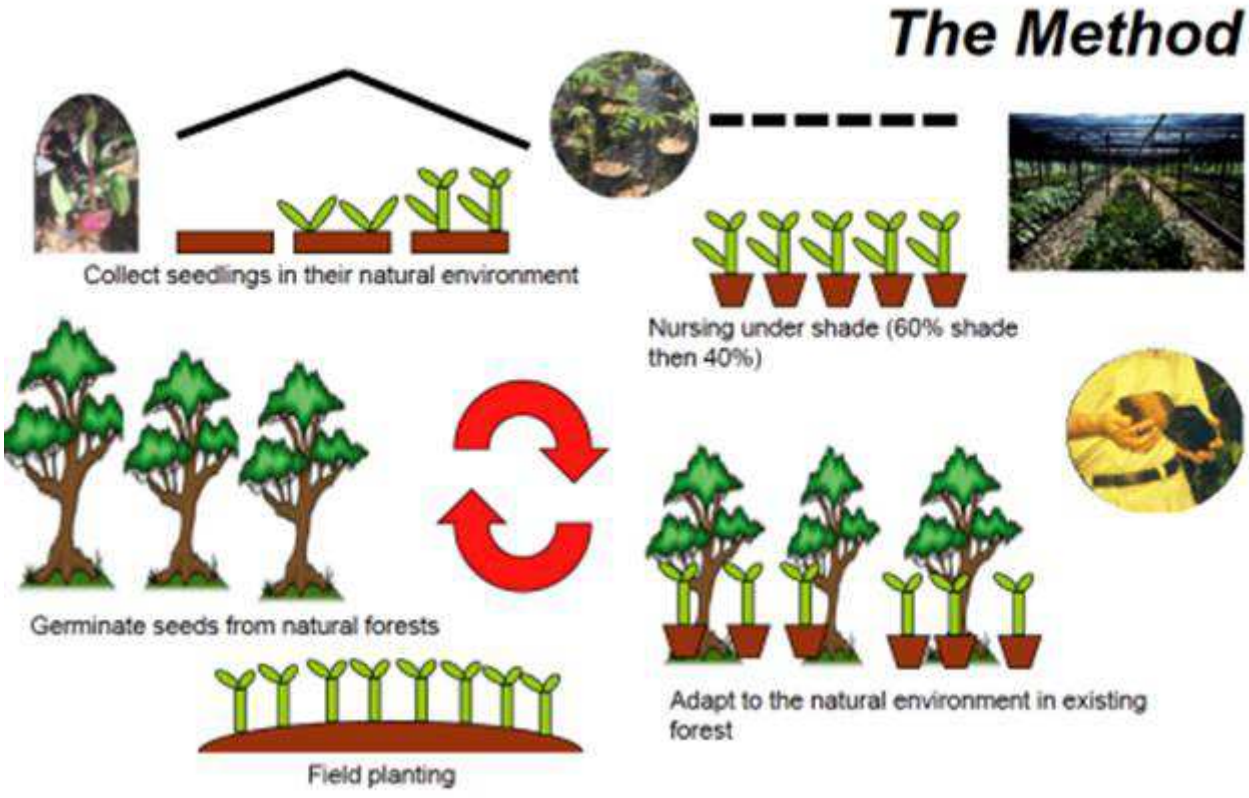
The site was originally the Hodogaya Country Club, the first golf course in Japan

2010 photos from "Thirty-seven Years of Restoration Results and Future Prospects for the Miyawaki Method by Kazue Fujiwara & Akira Miyawaki Prof. Emerita YNU & Prof. YCU, kazue@ynu.ac.jp "

The Miyawaki Method has since spread from Japan to other countries, mostly in Asia but also in Mediterranean countries.

FEATURES OF MIYAWAKI METHOD

- Dense Plantation – saplings are planted closely together to promote faster growth due to competition for light among the species. Recommended are 2-3 saplings per square meter or up to 12,000 saplings per hectare. In a natural forest, plants should be able to compete, edure, and co-exist.
- Mix of species – selection of the species to be planted is key. The ideal would be to plant the native canopy species that are most likely to have been growing naturally at the site. Try to imagine what the site was like before people came into the picture and plant those species.
- Well-prepared potted saplings – According to Dr. Miyawaki, most native species have strong tap roots. This makes them hard to transplant, so the seeds are started out in pots for easier transplanting. The saplings are ready to transplant when their roots fill up the pot and they are about 50-80 cm tall. The potted saplings are then taken to the site and left to acclimatize for up to 4 weeks before they are planted.
- Real vs Fake Plants – Dr. Miyawaki describes plants as either real or fake. Fake plants may look beautiful, but require a lot of care and maintenance. They are also less likely to survive storms and bad weather. Native plants are the real plants . They only require maintenance such as mulching, weeding and watering for the first two years. He said that if a plant still requires maintenance after 5 years, it is a fake plant!

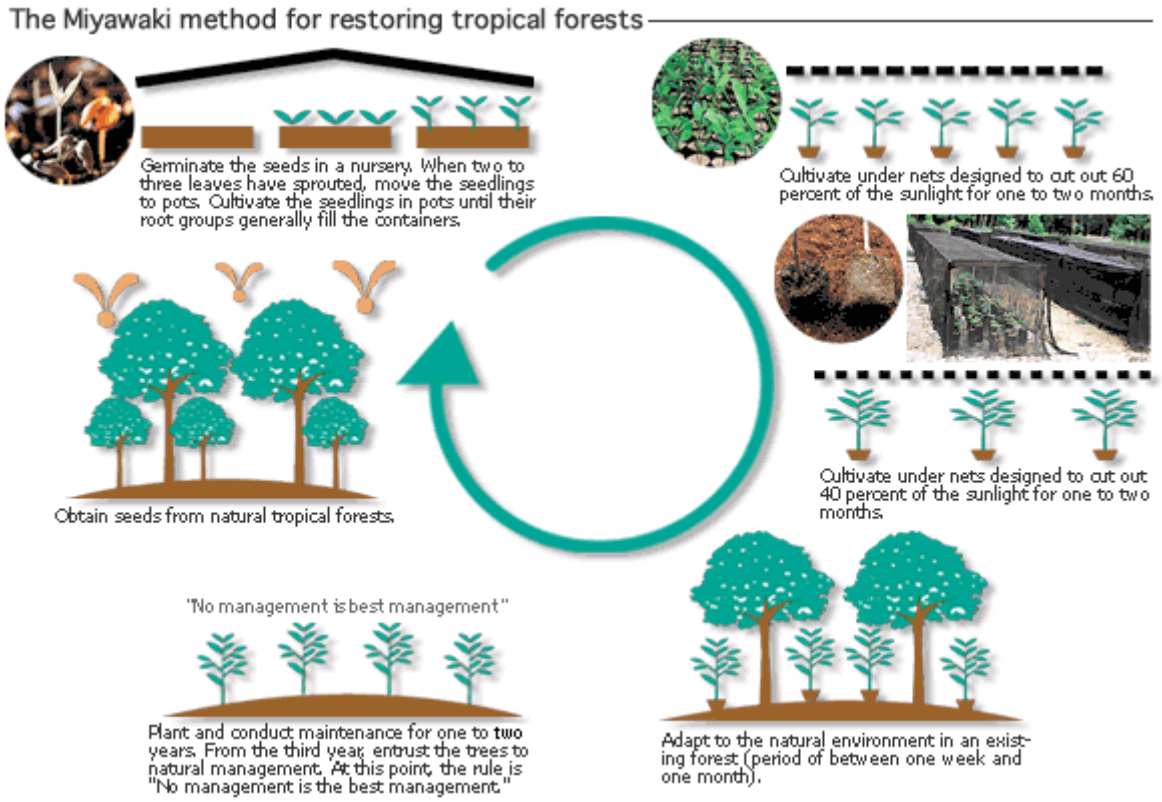


Miyawaki Method

Miyawaki Planting Method
Mixed species and random planting with a planting density of threee seedling per meter square.

Miyawaki Method, before and after
Photos from "Restoration and Ecosystem Health Assessment of Degraded and Rehabilitated Forests by Prof. Drk. Nik Muhamad Majid Faculty of Forestry Universiti Putro Malaysia"

The following illustrations are from the Mitsubishi Corporation website:



The Miyawaki Method

Source : http://www.mitsubishicorp.com/jp/en/csr/contribution/earth/activities03/activities03-02.html

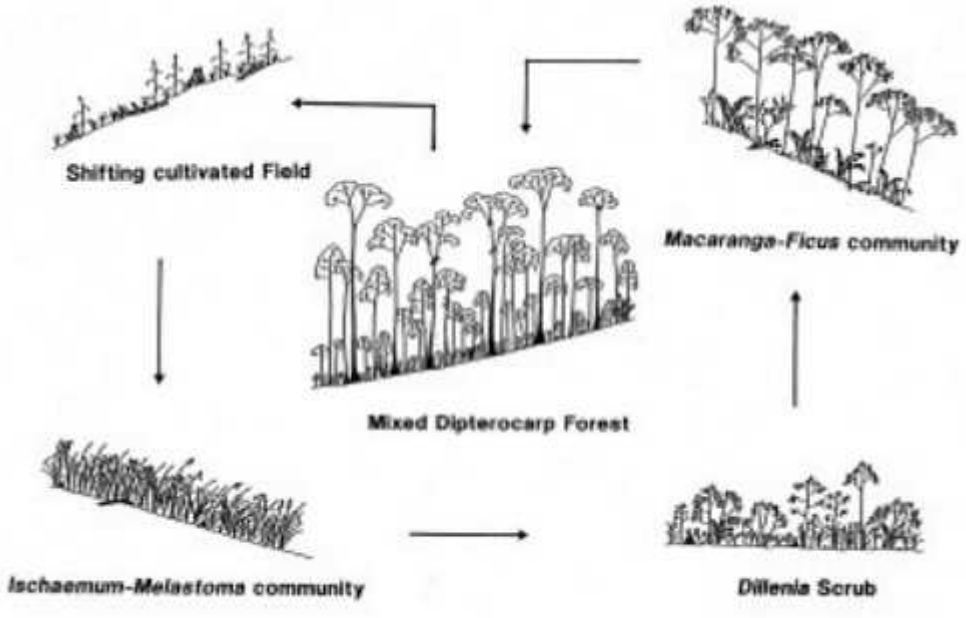


Fig. A succession of vegetation in the order:natural forest—shifting cultivated field—secondary grassland—scrub—young secondary forest in the vicinity of Bintulu, Sarawak, Malaysia.

1) Mixed *Dipterocarp* Forest, 2) Shifting cultivated Field, 3) *Ischaemum-Melastoma* community, 4) *Dilfenia* Scrub, 5) *Macaranga-Ficus* community

Fig. A succession of vegetation in the order-natural forest – Shifting cultivated field – secondairy grassland - scrub - young secondary forest in the vicinity of Bintulu, Sarawak, Malaysia.

Secondary succession diagram of burned natural forest, Malaysia.

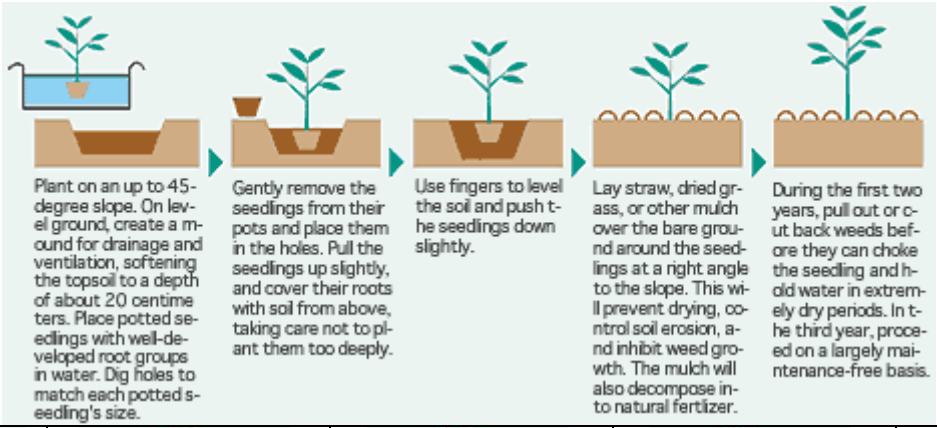
Source : http://www.af-info.or.jp/blueplanet/doc/essay/2006essay-miyawaki.pdf

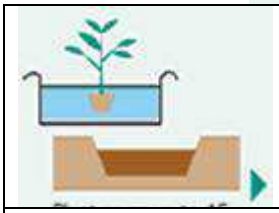
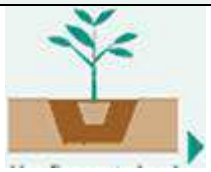
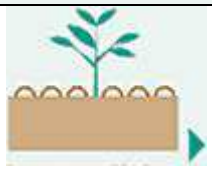
How to Establish your own Native Tree Nursery

Since the germination potential of seeds begins to deteriorate about two weeks after they fall, they are immediately gathered and planted in seed beds.

When the germinated plants have produced two to six leaves, they are transplanted from the seed beds to pots.

When the plants are 30 to 50 centimeters tall and have root systems that fill the pots, the next stage is intensive, mixed planting at the rate of two to three plants per square meter. However, potted plants cannot be trans-planted immediately. In a tropical forest, each tree over 50 meters tall is surrounded by a throng of about 1,500 descendants. The plants need to become acclimatized in this natural environment, so the pots are set out in a suitable location, such as adjacent to the existing forest, for a period of between one and four weeks, depending on the species of tree and weather conditions at the time. They are then moved to the area to be reforested and are planted in a natural fashion.



				
Plant on an up du 45 degree slope. On level group, create a mound for drainage and ventilation, softening the topsoil to a depth of about 20 centimeters. Place pottend seedling with well developed root groups in water. Dig holes top match each potted seedling's size.	Gently remove the seedling from their pots and place them in the holes. Pull the seedling up slightly, and cover their roots with soil from above, talking care not to plant them too deeply.	Use finger to level the soil and push the seedling down slightly.	Lay straw, dried grass, or other mulch over the bare ground around the seedling at a right angle to the slope. This will prevent drying, control soil erosion, and inhibit weed growth. The mulch will also decompose into natural fertilizer.	During the first two years, pull out or out back weeds before they can choke the seedling and hold water in extremely dry periods. In the third year, proceed on a largely maintenance-free basis.

How To Plant Potted Seedlings with the Miyawaki Method

Source : http://www.mitsubishicorp.com/jp/en/csr/contribution/earth/activities03/activities03-03.html

SUITABLE TREES FOR THE PHILIPPINES

This is the list of trees for planting at Yokohama Tires in Clark, Pampanga using the Miyawashi Method. The soil at the site "was found to be low in water-holding capacity and depleted of nutrients as a result of volcanic ash. In this case, site preparationrequired first scrapping the ash and then enhancing the topsoil with compost and chicken dung. Dr. Edwino Fernando helped choose the species best suited for planting, and was assisted by 900 people from the surrounding communities in the planting process. The trees have shown phenomenal growth in less than two years, with some having grown as tall as 6.5 M."

from: ISBN 978-9962-614-22-7 Vol 1 No 1, 2012, Conference Proceedings Mainstreaming Native Species-Based Forest Restoration

Trees list for Philippine :

1.	Amugis (*Koodersiodendron pinnatum*)	17.	Kamagong (*Diospyros blercoi*) 18.
2.	Amuyong (*Goniothalarnus amuyon*)	18.	Lamio (*Dracontomelon edule*)
3.	Balakat (*Zizigium talmai*)	19.	Ligote (*Syzygium polycephaloides*)
4.	Balakat gubat (*Balakata luzoniensis*)	20.	Mabunot (*Gomphandra luzoniensis*)
5.	Banuyo (*Wallaceodendron celebicum*)	21.	Magabuyo (*Celtis luzonica*)
6.	Bignai (*Antidesma bunius*)	22.	Makaasim (*Syzygium nitidum*)
7.	Bitaog (*Calophylum inophyllum*)	23.	Malaipil (*Afzelia bomeensis*)
8.	Bolon (*Platymitra arborea*)	24.	Molave (*Vitex parviflora*)
9.	Dao (*Dracontomelon dao*)	25.	Palosapis (*Anisoptera thurifera*)
10.	Duklitan (*Pouteria duclitan*)	26.	Panglomboien (*Syzygium simile*)
11.	Dungon (*Hentiera sylvatica*)	27.	Saplungan (*Hopea plagata*)
12.	Ilang-ilang(*Cananga odorata*)	28.	Tagotoi (*Palaquium foxworthyi*)
13.	Ipil (*Intsia bijuga*)	29.	Toog (*Petersianthus quadrilatus*)
14.	Kalantas (*Toona calantas*)	30.	White lauan (*Shorea contorta*)
15.	Kalingag (*Cinnamomum mercadoi*)	31.	Malabuho (*Sterculia oblongata*)
16.	Kalumpit (*Terminalia microcarpa*)	32.	Balinghasai (*Buchanania arborescens*)

Preliminary list of species recommended for planting trees in Yokohama, Clark, Pampanga (*Yokohama Tires* Tree Planting List).

Sources : http://mindingthefarm.files.wordpress.com/2012/11/screen-shot-2012-11-01-at-10-17-36-am.png & http://mindingthefarm.files.wordpress.com/2012/11/guide_to_rainforestation_timber_species1.pdf

A list of planted trees for reforestation in Malaysia

No.	Species Name				
1	*Shorea atrinervosa*	18	*Shorea parvifolia*	35	Cotylelobium malayanum
2	*Shorea balanocarpoides*	19	*Shorea puauciflora*	36	Cotylelobium melanoxylon
3	*Shorea beccariana*	20	*Shorea rubella*	37	Upuna borneensis
4	*Shorea brunnescens*	21	*Shorea scaberrima*	38	Vatica cuspidata
5	*Shorea crassa*	22	*Shorea scabrida*	39	Vatica mangachapoi
6	*Shorea dasyphylla*	23	*Shorea venutosa*	40	Vatica nitens
7	*Shorea domatiosa*	24	*Hopea beccariana*	41	Vatica venulosa
8	*Shorea gibbosa*	25	*Hopea bracteata*	42	Dracontomelon dao
9	*Shorea glaucescens*	26	*Hopea kerangasensis*	43	Gluta wallichii
10	*Shorea laxa*	27	*Hopea pentanervia*	44	Mangifera pajang
11	*Shorea leprosula*	28	*Parashorea parvifolia*	45	Parishia insignis
12	*Shorea macrophylla*	29	*Parashorea smythiesii*	46	Parishia maingayi
13	*Shorea macroptera*	30	*Dryobalanops aromatica*	47	Pentaspadon motleyi
14	*Shorea maxwelliana*	31	*Dryobalanops beccarii*	48	Neouvaria acuminatissima
15	*Shorea mecistopteryx*	32	*Dipterocarpus rigidus*	49	Alstonia angustifolia
16	*Shorea multiflora*	33	*Dipterocarpus stellatus*	50	Alstonia angustiloba
17	*Shorea ovata*	34	*Cotylelobium burckii*		

Source : http://www.mitsubishicorp.com/jp/en/csr/contribution/earth/activities03/activities03-01.html

A list of planted trees for reforestation in Brazil

No.	Species Name				
1	*Euterpe oleracea*	16	*Inga alba*	31	*Eugenia cumuni*
2	*Calophyllum angulare*	17	*Cassia mangium*	32	*Eugenia moleccensis*
3	*Virola guianensis*	18	*Diplotropis purpurea*	33	*Cariniana integrifolia*
4	*Virola surinamensis*	19	*Swartizia leptopetala*	34	*Eschweilera matamata*
5	*Virola melinoni*	20	*Swartizia acuminata*	35	*Terminalia tanibouca*
6	*Ceiba pentandra*	21	*Cassia alata*	36	*Rizophora mangue*
7	*Bombax spruceanum*	22	*Simaruba amara*	37	*Bagassa guianensis*
8	*Ochroma pyramidae*	23	*Trattinickia burserifolia*	38	*Brosimum ovatifolium*
9	*Sterculia speciosa*	24	*Cedrella glaziovii*	39	*Joannesia princeps*
10	*Theobroma sylvestris*	25	*Carapa guianensis*	40	*Hevea brasiliensis*
11	*Theobroma grandiflorum*	26	*Swietenia macrophylla*	41	*Aspidosperma desmanthum*

12	*Macrobium bifolium*	27	*Cedrella odorata*	42	*Cordia goeldiana*
13	*Pterocarpus amazonicus*	28	*Cedrella fissilis*	43	*Tabebuia serratifolia*
14	*Macrolobium acaciaefolium*	29	*Tapirira guianensis*		
15	*Ormosia getuilana*	30	*Spondias lutea*		

Source : http://www.mitsubishicorp.com/jp/en/csr/contribution/earth/activities03/activities03-04.html

The website Rainforest Information Portal has a downloadable list of native Philippine trees divided into 5 groups:

- Table 1 Sun demanding indigenous tree species recommended in Production, Restoration and Urban Areas with volcanic soil.
- Table 2 Shade tolerant local forest tree species recommended in Production, Restoration and Urban Areas with volcanic soils.
- Table 3 Sun demanding forest tree species that efficiently shade out weeds if planted closely.
- Table 4 Sun demanding forest tree species recommended in limestone areas.
- Table 5 Indigenous forest trees recommended for habitat restoration/wildlife conservation with reproductive parts eaten by some animals based on field observations.

Guide_to_Rainforestation_Timber_Species pdf

Structure of tropical rainforest

Source : http://www.mitsubishicorp.com/jp/en/csr/contribution/earth/activities03/activities03-03.html

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Blog by **Sylvia Ramos**, ornithologist and photographer of birds : http://mindingthefarm.wordpress.com