# Restoration and Ecosystem Health Assessment of Degraded and Rehabilitated Forests

By:

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# *Introduction*

- The Joint Research Project on Rehabilitation of Tropical Rainforest Ecosystem started in July 1990 with Universiti Putra Malaysia (UPM) and Yokohama National University, Japan.

- Located in a 100 ha site situated in UPM's Bintulu campus under the sponsorship of Mitsubishi Corporation, Japan.

- Based on the success in restoration of native forest land in Japan and of some field surveys conducted in different forests of South East Asian countries since 1978.

- The scientific basis for the success of this project is based on the concept of vegetation association by Prof. Akira Miyawake from Yokohama National University (YNU) and the concept of accelerating natural regeneration by Prof. Dr. Nik Muhamad Majid of Universiti Putra Malaysia (UPM).

# Objectives

•Assess the health of rehabilitated forest using interdisciplinary approaches to quantitatively and qualitatively measure the indicators of forest health, hence the sustainability of forest resources. More specifically, this project aims to:

•Conduct and integrate research findings in areas such as soil science, plant physiology, water balance, biodiversity and microclimatic conditions to indicate the health of the rehabilitated forest.

•Cost benefit analysis of rehabilitated forest.

•Compare the health of primary forest and rehabilitated forest

# Pioneers

## *Prof. Dr. Akira Miyawaki*

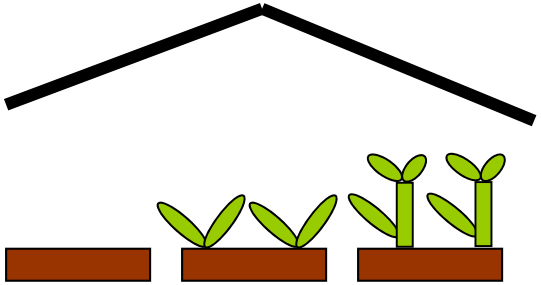
- Born in Okayama Prefecture in 1928.
- Holds a degree in biology from Hiroshima University.
- Served as professor and director of the Institute of Environmental Science and Technology at Yokohama National University.
- Currently, as a professor emeritus at Yokohama National University and Director for International Studies in Ecology, Japan

**Concept : Accelerating natural vegetation**

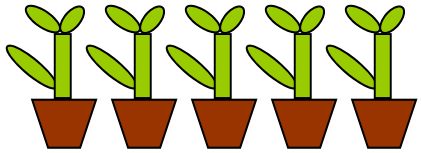
## *Prof. Dr. Nik Muhamad Majid*

- 34 years in Forestry Faculty, UPM
- Awarded a number of international (U.S. Academy of Science, IRDRC (Canada), Winrock, Mitsubishi Corp., JISE, FFPRI, CIFOR etc.) and national research grants (Esso Malaysia, Petronas, Ministry of Science and Technology etc)
- Produced more than 200 research papers in forest rehabilitation, forest soils and agroforestry.

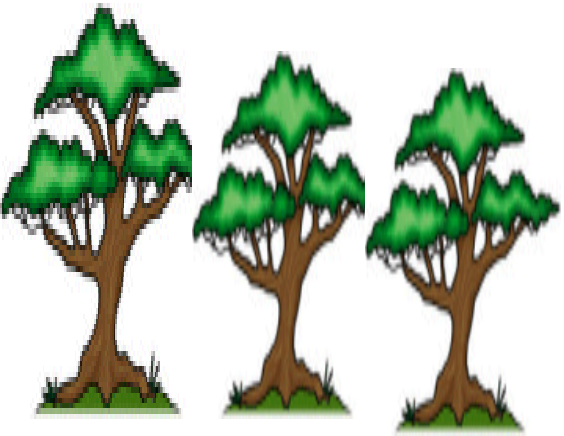
# The Method

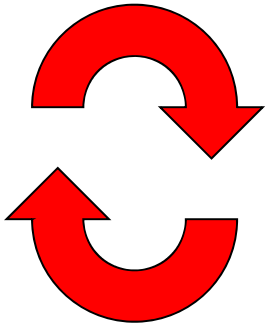


Collect seedlings in their natural environment

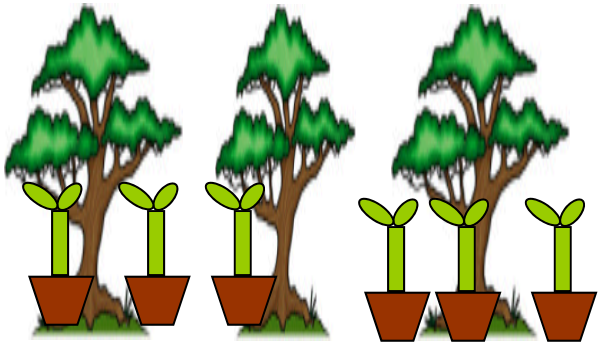


Nursing under shade (60% shade then 40%)

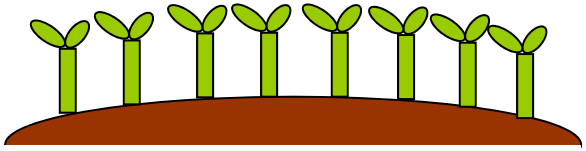




Germinate seeds from natural forests



Adapt to the natural environment in existing forest



Field planting

# Planting Activities

| No. | SITE/AREA | YEAR | PLOT SIZE | NUMBER OF RESEARCH PLOTS | TOTAL SEEDLINGS PLANTED |
|---|---|---|---|---|---|
| 01 | Nursery | 1990-2003 | 1.50ha | 8 plots | 4,453 |
| 02 | Phase One | 1990-1991 | 3.43ha | 36 plots | 143,697 |
| 03 | Phase Two | 1991-1992 | 3.70ha | 11 plots | 50,764 |
| 04 | Phase Three | 1992-1993 | 6.30ha | 3 plots | 83,882 |
| 05 | Phase Four | 1993-2003 | 30.15ha | 42 plots | 62,187 |
| 08 | Phase Five | 2004-2008 | 20.8 ha | 34 plots | 41,458 |
| TOTAL | | | 65.88 ha | 134 plots | 386,441 |

# Site 1: Bintulu, Sarawak

| | Family | Species | | Family | Species |
|---|---|---|---|---|---|
| 1 | Anarcadiacea | 5 | 13 | Lecythidaceae | 1 |
| 2 | Annonaceae | 1 | 14 | Leguminosae | 4 |
| 3 | Apocynaceae | 1 | 15 | Melastomataceae | 1 |
| 4 | Bombacaceae | 3 | 16 | Meliaceae | 1 |
| 5 | Burseraceae | 2 | 17 | Moraceae | 4 |
| 6 | Compositae | 1 | 18 | Myrtaceae | 9 |
| 7 | Dipterocarpaceae | 56 | 19 | Oxalidaceae | 1 |
| 8 | Ebenaceae | 1 | 20 | Sapindaceae | 2 |
| 9 | Euphorbiaceae | 2 | 21 | Sapotaceae | 3 |
| 10 | Guttiferae | 5 | 22 | Simaroubaceae | 1 |
| 11 | Icacinaceae | 1 | 23 | Thymelaeaceae | 1 |
| 12 | Lauraceae | 3 | 24 | Ulmaceae | 1 |

**Until year 2008, 386,441 forest tree seedlings from 110 tree species**

Compost in the holes

Mixed species

## The Planting

“Mixed species and random planting” with a planting density of three seedlings per meter square.

Don’t forget !! Mulching.

# Site 1: Bintulu, Sarawak

Before planting

6 months

1 year

2 years

8 years

19 years

# *The Progress*

The planted trees are from 110 native species.

26 plots have been established for research.


**Planting Ceremony**
**an**
**Annual Event**

Planting ceremony has increased public awareness on forest management.

UPM

UNIVERSITI PUTRA MALAYSIA

BERILMU BERBAKTI

# Regenerating forest the Miyawaki way

By Hamdan Ismail

CLOSE ATTENDANCE...Saplings being placed underneath dense netting to cut out between 40 percent to 60 percent of sunlight.

Over the last 10 years, an experimental project to regenerate tropical rainforest atop a 50-hectare site along one side of Jalan Tanjung Kidurong, Bintulu has been kept low profile. While the industrial development in the division are being well-heralded, this project has been carried out with little publicity but yet produces encouraging results that placed Bintulu on the world map of effective forest conservation method. From a cleared barren site left after being used for shifting cultivation, the land underwent extensive transformation in just over a decade to re-emerge into a growing forest of over 300,000 trees from 113 species.

It all started when a Japanese ecological forestry expert who had devoted almost 40 years of his life on reforestration projects decided that he can make the impossible happen if he put his mind to it. Dr Akira Miyawaki, nicknamed "Mr Seven" for being up and on the job by 7am, was a professor at the Yokohama National University. He was conducting vegetation ecological research in waki was confident that the project would succeed. Through the fund from Mitsubishi Corperation and the strong support from the Sarawak Government, the project made its initial step forward on 1 April 1990. The parties involved then were UPM and the Yokohama National University of Japan. By 1 April 1994, the partnership between the Japanese Center for International Studies in Ecology (JISE), UPM and Universiti Malaysia Sarawak (UNIMAS) was formed to continue with the project and scheduled to run until 31 March 2045. For Miyawaki, it was also a dream come true after searching and going in and out of tropical forests in Thailand, Indonesia and Malaysia, in search of an opportunity to verify his theories about tropical forest regeneration through experimental research.

According to his primary theory, the best forest management technique is no management at all. His approach was to plant seedlings of as many main trees of potential natural vegetation as possible, using mainly canopy tree species native to the region of the project. Only the first three years are required for placed under a less den that that would cut to 40 percent of sun another two month

The saplings w placed in an ex another one month to en the natur prior to be nated pla be tended c three years. Fron management would nature.

Miyawaki's method pro motes the restoration and recovery of native forests that offers biodiversity in its most natural forms, fulfilling the many functions of natural ecosystem including absorption of carbon dioxide and soil erosion protection. As the main tree species are selected from natural forests, the origi nal ecosystem including small soil animals are

Ecology Symposium (Houston, August 1995)

# Projek pemulihan hutan asli berjaya

: 03-20569381/20569362 Fax: 03-22834440

Berita Harian

Alam Sel





# Forest rehabilitation project a success

SIGNS OF SUCCESS ... (from left) Amir Hafidz, Rasimoen and a staff member at the site of the forest regeneration project.

By Hamdan Ismail

BINTULU – A joint research project between Universiti Putra Malaysia (UPM), Universiti Malaysia Sarawak (Unimas) and the Japanese Center for International Studies in Ecology (JISE) on the rehabilitation of tropical rainforest ecosystem here has been producing positive results.

This project, which is sponsored by the Mitsubishi Corporation, started in 1991 on a 50 hectare land along Jalan Kidurong here.

The project site manager, Encik Amir Hafidz Mohd Taha said between July 1991 and 2030 some 300,000 trees from 113 species had been planted successfully.

The method of planting is applied by Dr Akira Miyawaki, a former professor at the Yokohama National University, and it has regenerated the forest on a site formerly used for shifting cultivation," he said during a tour of the site, yesterday.

Through this method, Dr Miyawaki believed that the process of regenerating tropical forest ecosystem would take about 50 years to complete, against the natural process of reforestation that would take 200 years.

The project was officially started by the then Industrial Development Minister, Daro Sri Amar Haji Johari Tun Ugeng in 1991 and was the first in the world to utilise the Miyawaki method.

Since the commencement of the project, an annual tree-planting ceremony were held in the presence of Dr Miyawaki in the effort to promote environmental and forest conservation awareness, especially among students.

Apart from local residents, the tree-planting activities also involved Japanese university undergraduates and non-governmental organisations.

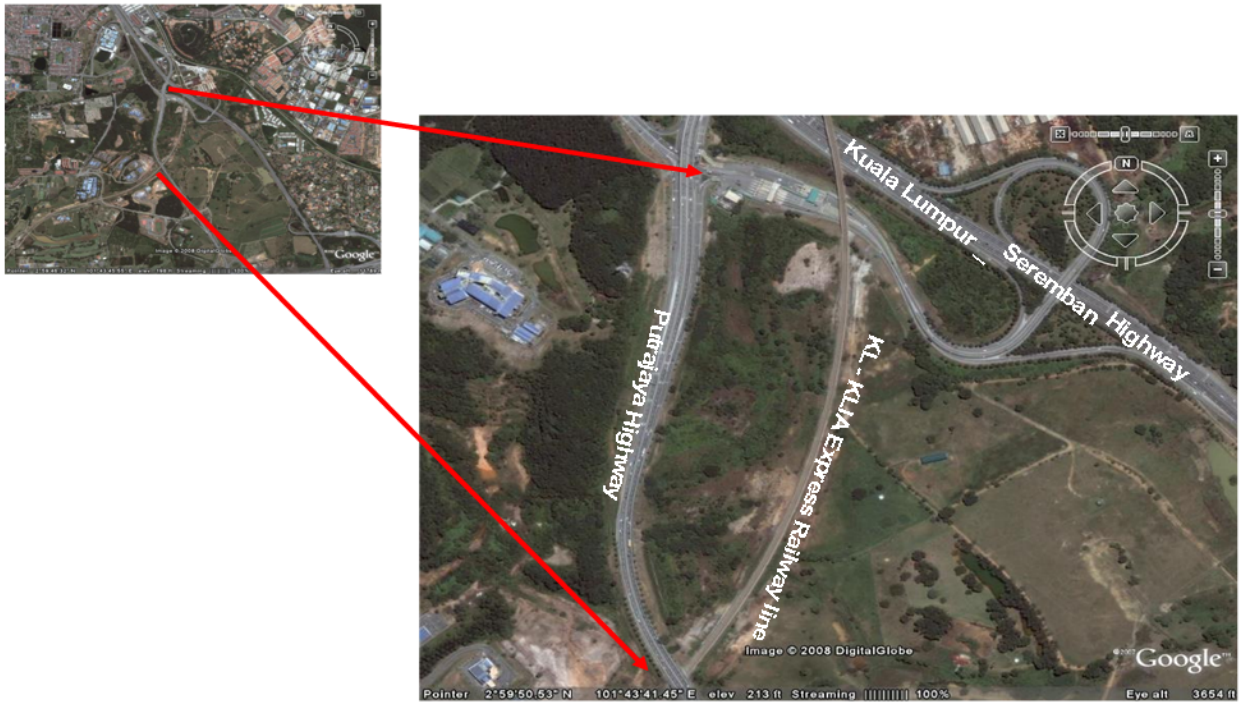
Describing the site of the project as suitable for learning tropical forest eco-system, Amir Hafidz said that schools interested to in conducting field trips or participate in tree planting are welcomed.

Those interested can contact him at 013-8486016 or the project site office at 086-314752 and 336252, fax 086-314752 or e-mail amirhafidz@jaring.my or amirhafidz@yahoo.com.

Meanwhile, JISE Director for planning department, Mr Yoshiaki Hasimoto said the joint-research project would continue until 2045 and between these mid-2045 and between these mid-Year to five million yen had been spent annually to maintain it.

"This project had been successfully carried out in our first attempt to regenerate rainforests," he added. Apart from the site here, Mitsubishi and JISE had also embarked on similar project in the Amazon forest in Belem, Brazil.

# Site 2: Serdang, Selangor

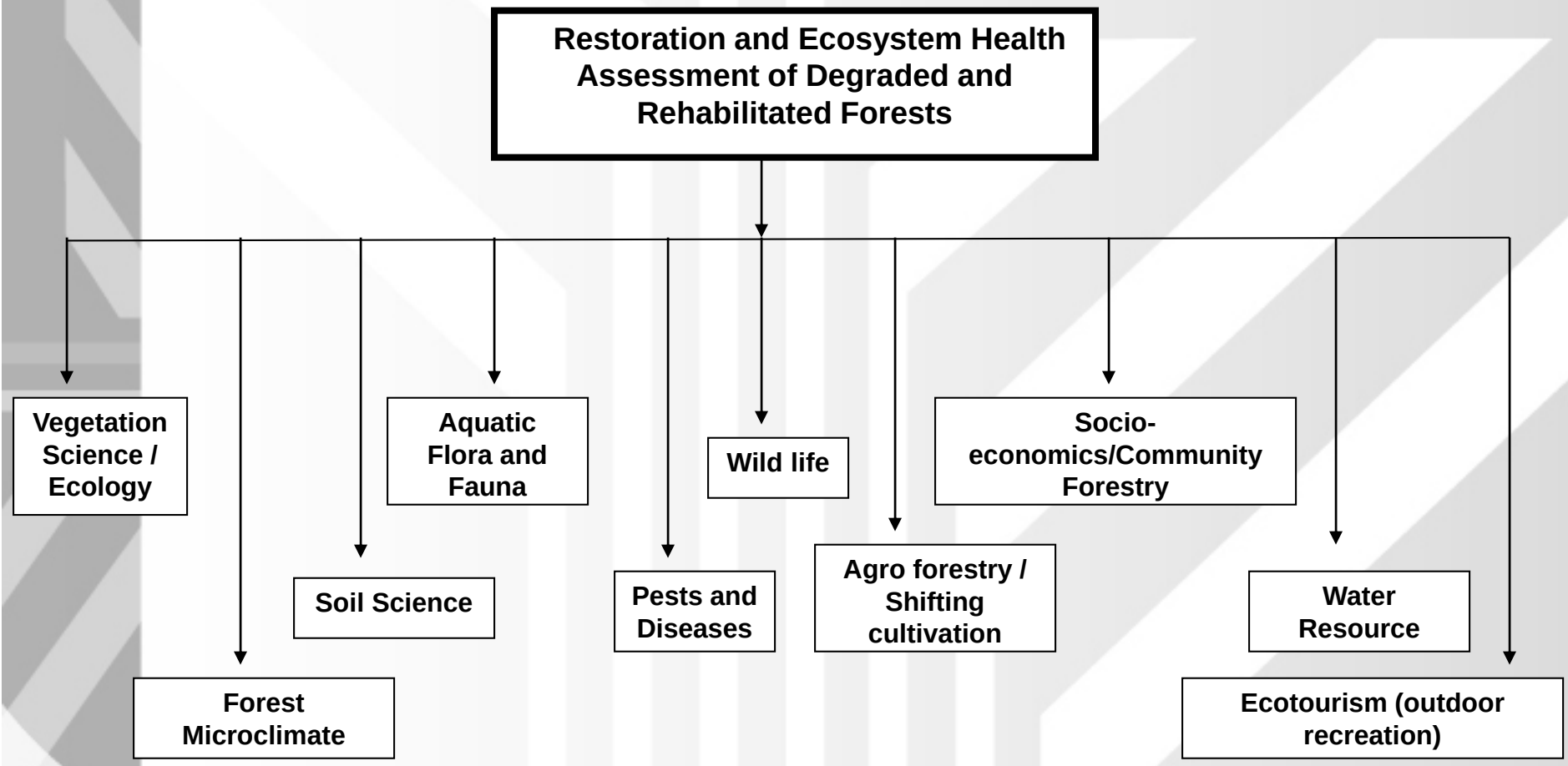



Location of the proposed model forest in UPM, Serdang, Selangor, Malaysia

# Activities

- Tree-planting Ceremony (2008)

# Research Thrust Areas



# *Current Research Projects*

- Growth performance of planted indigenous tree species on rehabilitated forest
- Abundance of wildlife species in UPM-Mitsubishi forest rehabilitation Project.
- The effects of environmental factors on frugivorous bats reproductive status in the UPM Bintulu Campus forest.
- Nutrient cycling in a rehabilitated forest stand .
- A study of commercial seedlings and saplings in regenerated forest .
- Growth performance among 5 selected light demanding species for 5 different age stands in Rehabilitated Forest.
- Invasive woody plants in different age stands of a rehabilitated forest .
- Invasive herbs at 4 selected age stands of Forest Rehabilitation Project.
- Diversity and population changes of beetles associated with forest rehabilitation.
- Greenhouse gas emission.
- Effects of acid deposition on soil properties and vegetation.

# Current Research Projects

- Physiological ecology of various species in a planted tropical forest .
- Impact of forest establishment of degraded land on hydrologic regime.
- Use of different ages of planted forest by wildlife .
- Microclimatic responses to forest rehabilitation as a model forest .
- Changes in insect community in a rehabilitated forest and insect pests affecting the planted trees.
- A study on humic acids carbon and nitrogen of a rehabilitated forest for understanding of soil sequestration in relation to forest health.
- Characterizing properties of soils under planted forest in Malaysia with special reference to forest soil/health status.
- Economic valuation of forest resources in the rehabilitated model forest project .
- Study on estimation of stand volume and growth of rehabilitated forest at Bukit Nyabau, Bintulu.
- Soil microbial properties of the rehabilitated forest at UPM Bintulu Campus, Sarawak.

# *Participating Agencies*

- Mitsubishi Corporation, Japan
- Yokohama National University, Japan
- Forestry and Forest Products Research Institute, Japan
- Japanese Institute for Study on Ecology

You are welcomed to initiate your research projects in this unique rehabilitated forest

# Thank You

*Domo arigato gozaimashita*

"We do not inherit the forest from our forefathers; we merely borrow them from our children".