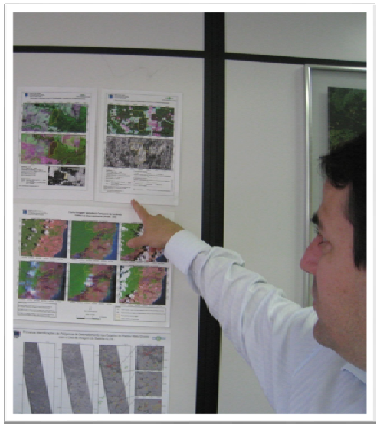
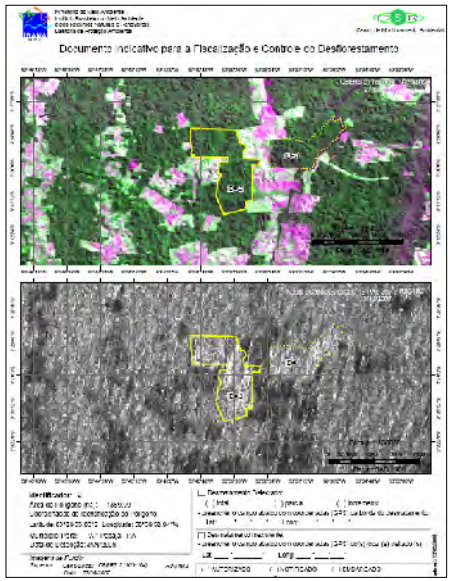
Surveillance of illegal loggings in the Amazonas using a Japanese satellite

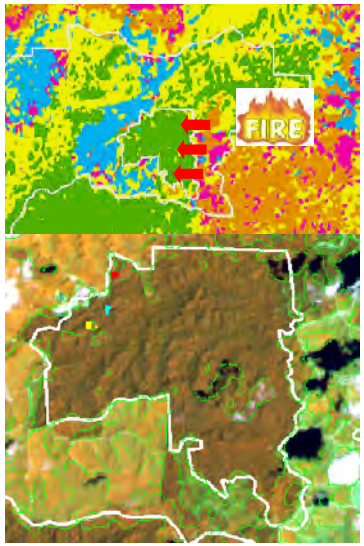




Monitoring of forest degradation

- Various causes of degradation
  - Illegal logging
  - Forest fire
  - Intolerable shifting slash-and-burn cultivation
  - Impact of development
- It is necessary to develop monitoring methods in accordance with each cause

Forest degradation caused by selective loggings



Forest Fire

- Types of fire
  - Canopy fire
  - Surface fire
    - Ex. Tropical seasonal forests in dry season
  - Peat fire
- Fire intensity
- Development vs. Restoration

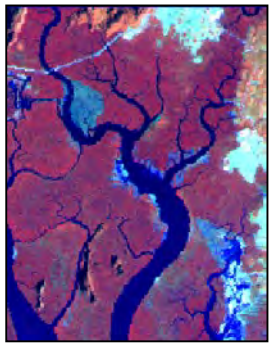
Peat Fire under the Ground

on 4 September 2002
near Tr09 Indonesia

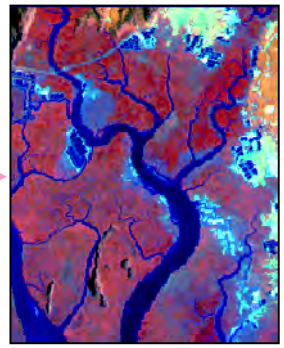
21

Degradation of mangrove forest caused by shrimp farm

Land use change (deforestation) and consequently degradation



4 Feb. 1989



14 April 1997

DEFORESTATION

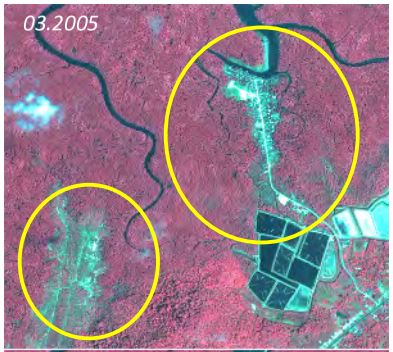
DEGRADATION

22

A4-219

Development in mangrove forests

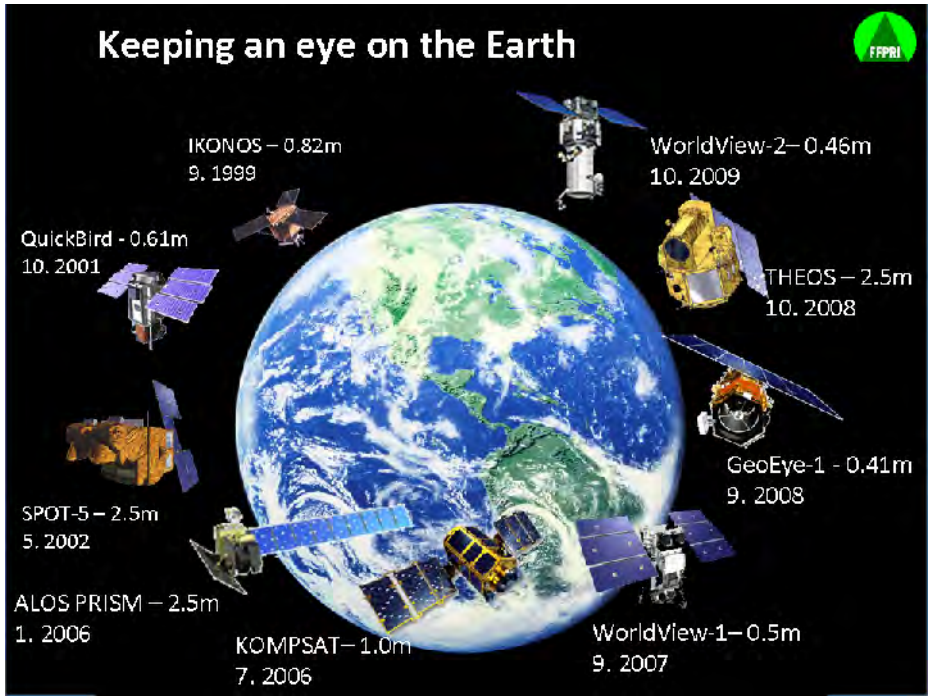
- Often found in mangrove forests in developing countries.
- Development by construction of shrimp farms
- It is necessary to monitor degradation of surrounding mangrove forests caused by water pollution, when necessary.



Development of mangrove forests in Ranong, Thailand

© DigitalGlobe

23



Which approach do you select?

25

Development of an REDD MRV System

- REDD+ is identified as one of the most effective means to reduce GHG emission in the post-Kyoto climate change negotiation.
- A reliable and credible system of measurement, reporting and verification (MRV) of forest carbon changes is a cornerstone of any national REDD+.
- An MRV system should follow the international requirements and also be adapted to the country's specific conditions, e.g. vegetation, economy, culture, institution and/or the deforestation/degradation drivers.

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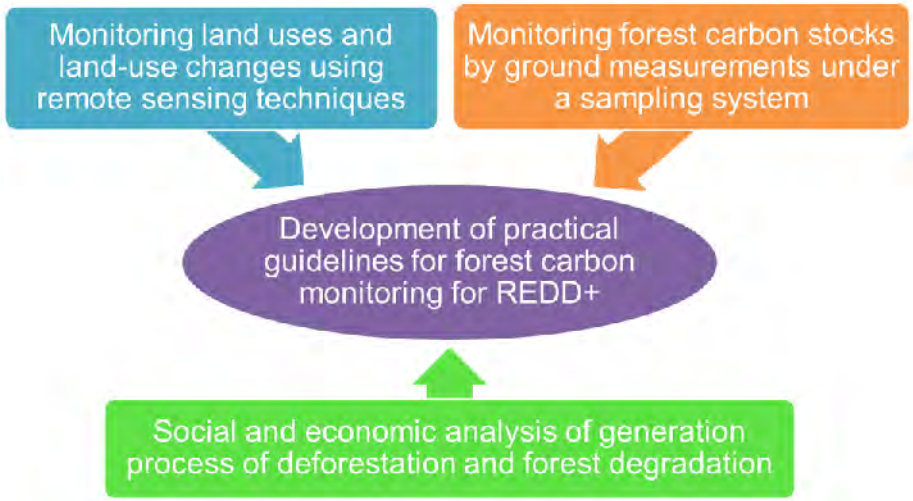
Research Items



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Research Cooperation for Development of Methodology

- Cambodia (Tropical Seasonal Forest)
  - Forestry Administration
- Peninsula Malaysia (Tropical Rain Forest)
  - Forest Research Institute Malaysia (FRIM)
- Paraguay
  - Asuncion National University
  - SEAM
  - INFONA

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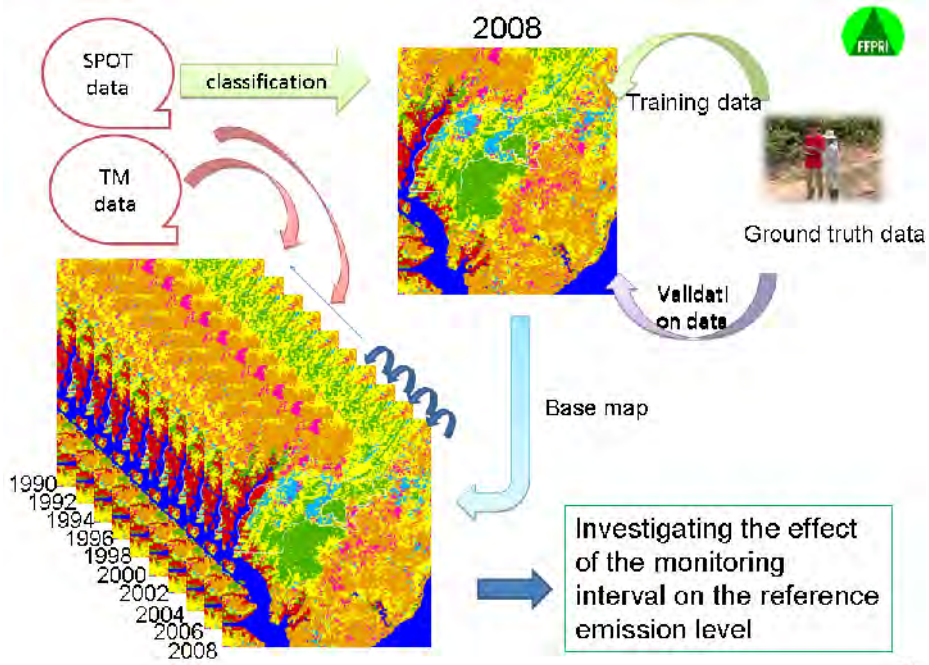
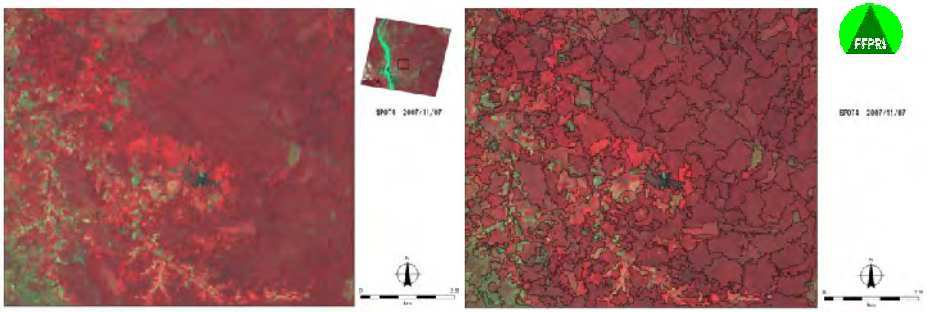
Monitoring land uses and land-use changes using remote sensing techniques





SPOT-4 Original Image

Image Segmentation 画像分割

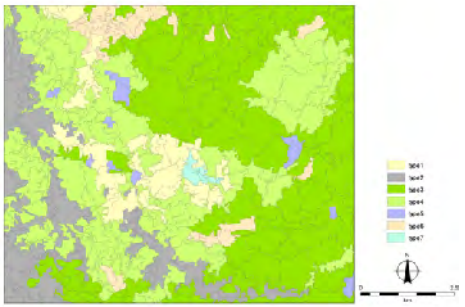


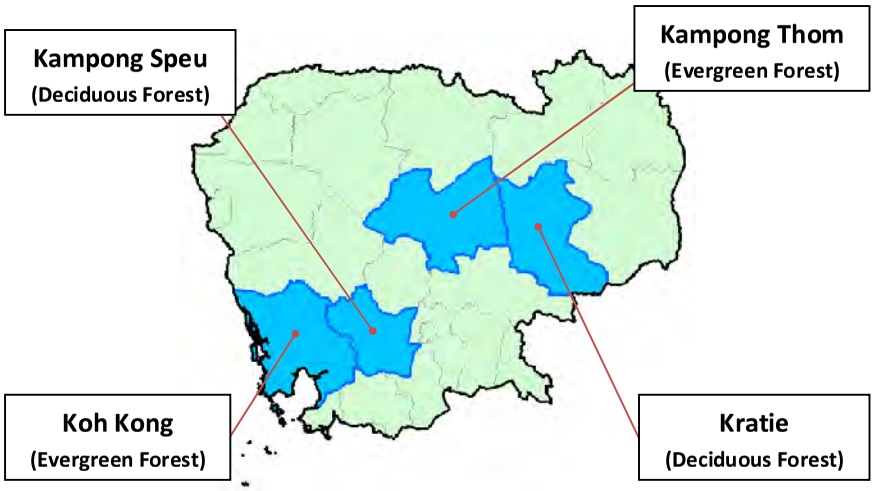
Image Classification 画像分類

Setting of Classification class

Total carbon stock = Σ (Forest area$_i$ x Averaged carbon stock$_i$)

Forest type \ Disturbance		No / light	Midium	Heavy
Cambodia	Malaysia			
Evergreen forest	Lowland forest			
Semi-evergreen forest	Hill forest			
Deciduous forest	Mountane forest			
Other forest	Mangrove / peat swamp			

Target Area of Field Survey in Cambodia



Plot number of field survey in Cambodia

	Koh Kong	Kampong Speu	Kampong Thom	Kratie	Total
Evergreen Forest	40	1	33	11	85
Semi-Evergreen Forest	7	3	13	0	23
Deciduous Forest	1	21	3	32	57
Other Forest	0	3	0	0	3
Total	48	28	49	43	168

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A4-222

Typical Forest in Each Province in Cambodia

Koh Kong

V = 328.6 m^3/ha
Evergreen Forest
Plot ID : KK-R-032

Kampong Speu

V = 152.2 m^3/ha
Deciduous Forest
Plot ID : KS-B-R-032

35

Kampong Thom

V = 205.9 m^3/ha
Evergreen Forest
Plot ID : KT-C-R-002

Kratie

V = 142.6 m^3/ha
Deciduous Forest
Plot ID : KR-A-R-007

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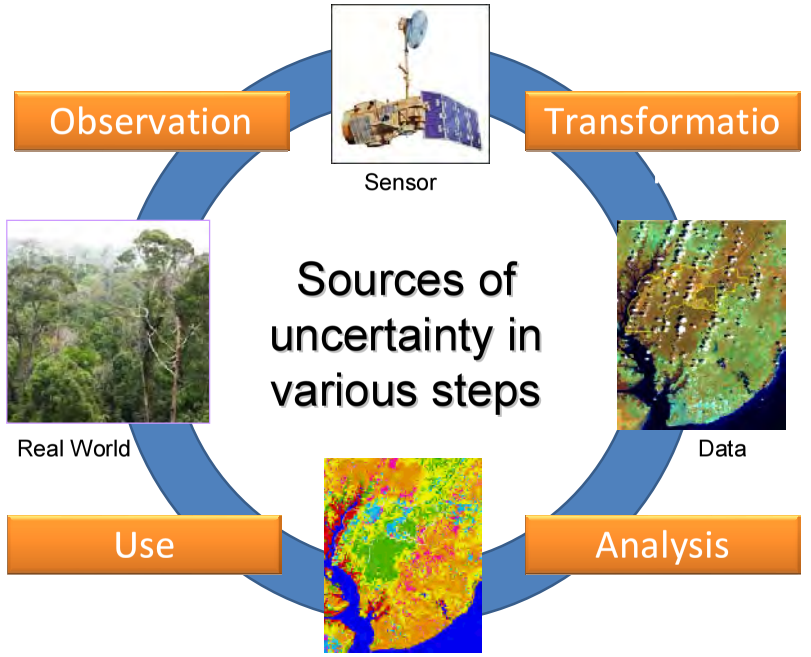
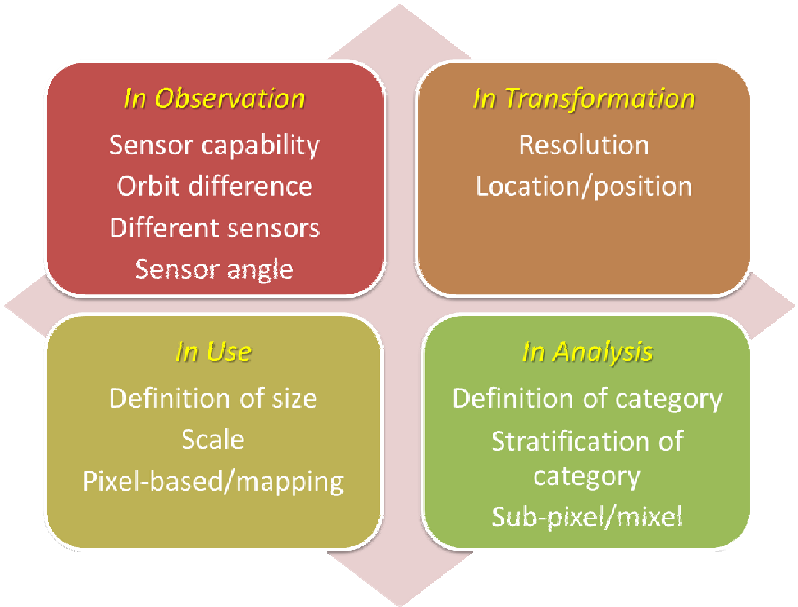
Survey Items for remote sensing analysis

	Survey Item	Survey Equipment
1	Position at the center of the plot	GPS, Altimeter
2	Slope direction and inclination	Clinometer
3	Average tree height of the upper story	Vertex
4	Forest type / Crown density	-
5	Dominant tree species of the upper story	-
6	Count trees by Bitterlich method	Simple Relascope
7	DBH of counted trees	Diameter measure tape
8	Photos to check forest condition	Digital camera
9	Illust / Sketch of forest condition	-



Uncertainty in various steps

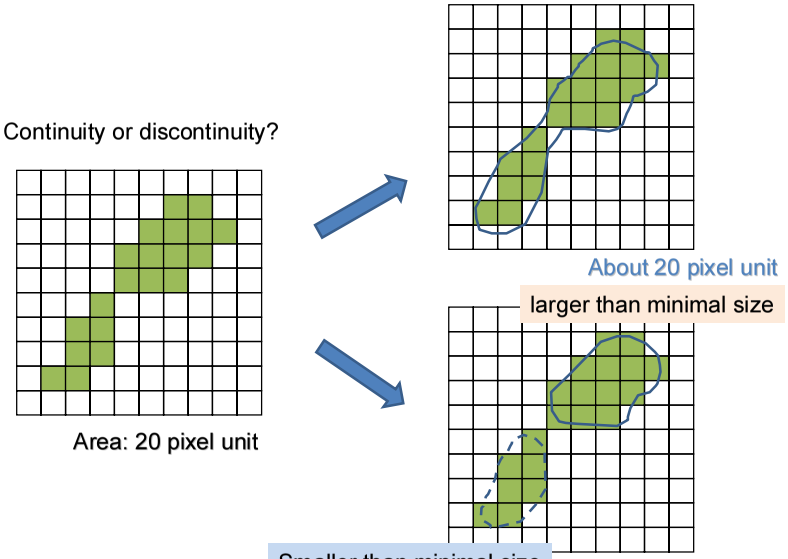


Uncertainty in definition
- for category or class of classification -

- Some land surface cannot be assigned to a certain category
- Gap between definition of category and remote sensing observation

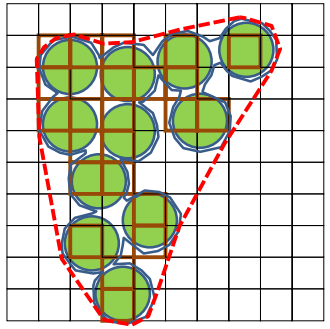
Uncertainty about definition
- minimal size and continuity -

Continuity or discontinuity?

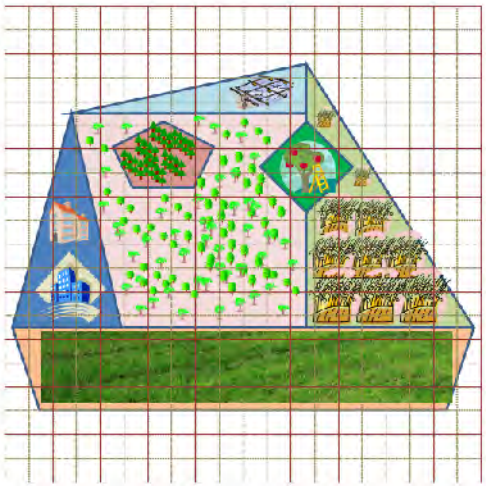


Uncertainty of boundary

- Boundary cannot be decided certainly
- Rule of recognition is required
- Effect on area estimate of category

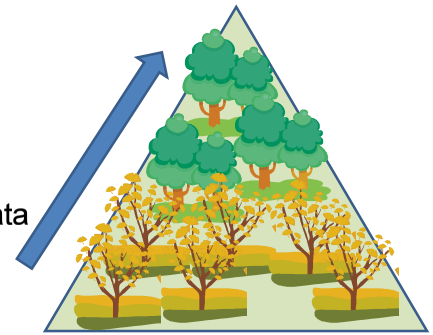


Further issues: Spatial resolution and mixel



Further issues: Phenology or seasonality

- Elevation
- Latitude
- Annual change of fallen leaves
- Probability of acquiring data



Dryness (in tropical seasonal forest)

Further issues: Agricultural land with trees

- Rubber plantation vs. plantation for timber production
- Shifting cultivation
  - Fallow land vs. abandoned area?
- Orchard vs. forest
- Similar reflectance of canopy surface

Points to use remote sensing

- To monitor changes in forest carbon stocks instead of those in forest area is required in the REDD monitoring.
- Consistency and credibility of the approach are key points for review by the third sector.
- It is essential to combine remote sensing with ground survey for estimation of carbon stocks and its changes.
- Possibility of detection varies depending on causes and degrees of forest degradation.
- Note that a monitoring approach applicable to each country will be different depending on forest conditions as well as available data and information in respective country.

Community forest management

1. Keys to Sustainable Rehabilitation of Degraded Tropical Forests:
Derived from the CIFOR's research
"Review of forest rehabilitation Initiatives - Lessons from the past"

2. Do environmental policies support community forest management?
a part of the Swamp forest research project

Dr. Takeshi TOMA
Bureau of International Partnership
Forestry and Forest Products Research Institute

Forests for the Future

- Jan 2001- March 2005
- CIFOR
- Rehabilitation of Degraded Tropical Forest Ecosystems

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FUTURE HARVEST

CIFOR is one of the 16 Future Harvest centres of the Consultative Group on International Agricultural Research (CGIAR)

Forests for the Future

Review of Forest Rehabilitation Initiatives: Lessons from the Past

CIFOR's REHAB research team &
National Partners

JAPAN

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FUTURE HARVEST

CIFOR is one of the 16 Future Harvest Centres
of the Consultative Group on International Agricultural Research (CGIAR)

CIFOR Research Team
Review of Forest Rehabilitation
Lessons from the past

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- Wil de Jong
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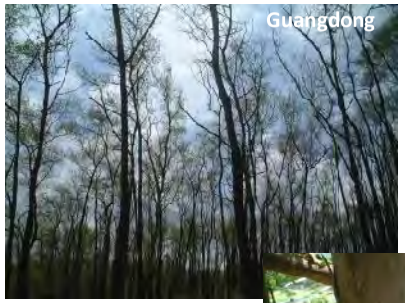
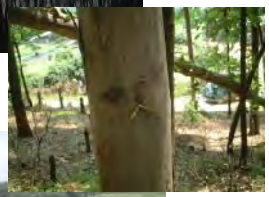
- Cesar Sabogal
- Unna Chokkalingam
- Tini Gumartini
- Everaldo Almeida
- Abel Meza Lopez
- Chiharu Hiyama
- Popi Astriani





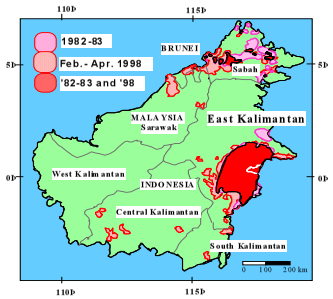
Background

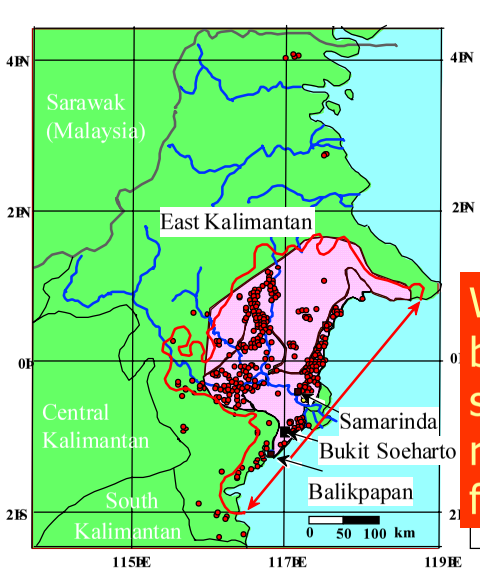
- Degraded forest land – large & growing
- Lots of rehab initiatives across tropics
- Mostly unsustainable
- Wasted money & effort
- What outcomes for people, environment, production?

The Lessons,
Toma has learnt from
the forest fires in
East Kalimantan,
Inodnesia

TRAUMA of TOMA

Fire affected area in Kalimantan (Borneo) Island





After the 1982-83 fires, Rehabilitation trials were conducted here and there in the eastern part of Kutai district. Most of all rehabilitated forests were burnt in 1998.

When fires were burning forests, people started to talk rehabilitation of burnt forests.

Figure 1. Fire affected areas in East Kalimantan, Indonesia.

In fact, many cases, the beneficiaries of forest rehabilitation projects subsequently burned the project area so that they could be re-employed in the process of replanting or rehabilitation.

For fire prone area, forest rehabilitation needs to have a measure for controlling fires. Otherwise, fires would occur and burn the planted area repeatedly.

Rehabilitation activities in Indonesia have a long-history of more than three decades, implemented in more than 400 locations.

alang-alang grassland.
Photo;Morikawa (1985)

2 to 3-year-old *S. macrophylla*
Photo;Morikawa (1985)

20-year-old *S. macrophylla*
Photo;Morikawa (2001)

South Sumatra Reforestation Project, MoF-Indonesia and JICA

Successful projects are characterised by

- the active involvement of local people
- the technical intervention used tailored to address the specific ecological causes of degradation that concern local people.

Sustaining the positive impacts beyond the project time is still the biggest challenge.

Rehabilitation efforts have been lagging behind the increasing rates of deforestation and land degradation.

- the complexities of the driving factors causing the degradation, which neither projects nor other government programmes have been able to simultaneously address.
- Initially, the rehabilitation initiatives were responding to straightforward issues of natural disasters caused by the expansion of agriculture.
- Currently, there are more complex driving factors of deforestation to be dealt with, such as illegal logging and forest encroachment.

Addressing the causes of deforestation and land degradation should be part of the project's priorities.

The causes usually are also the continuing disturbances threatening sustainable rehabilitation activities.