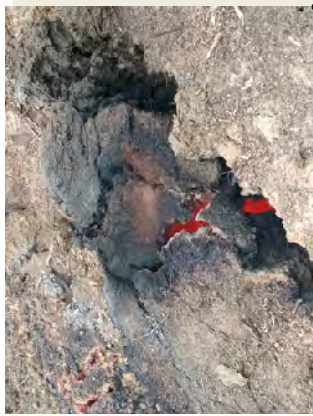




Peat Fire under the Ground



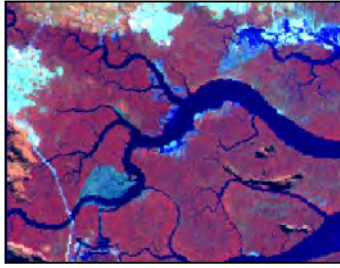
on 4 September 2002
near Tr-09 Indonesia



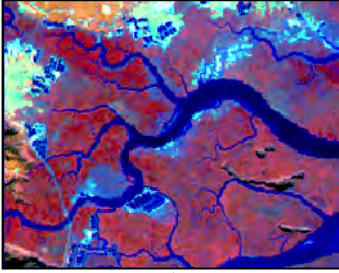
Degradation of mangrove forest caused by shrimp farm



Land use change (deforestation) and consequently degradation



4 Feb. 1989



14 April 1997



DEFORESTATION



DEGRADATION

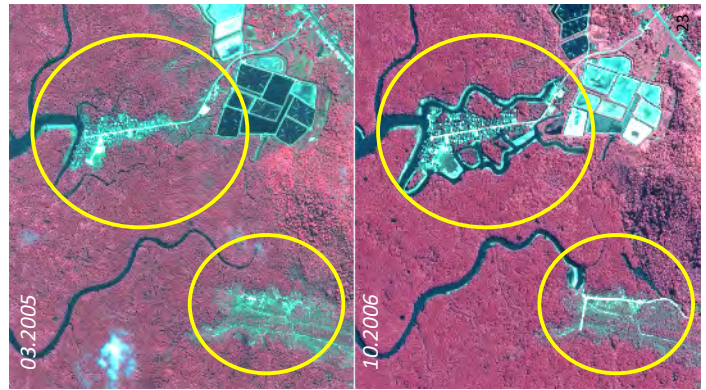


Development in mangrove forests

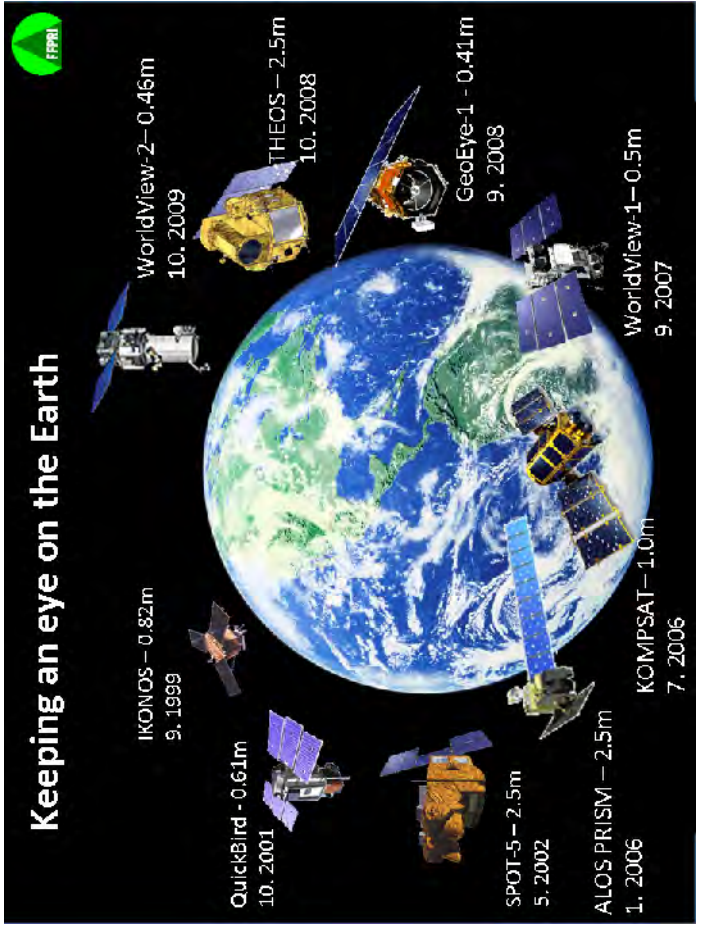
- Often found in mangrove forests in developing countries.
- Development by construction of shrimp farms
- It is necessary to monitor degradation of surrounding mangrove forests caused by water pollution, when necessary.

Development of mangrove forests in Ranong, Thailand

© DigitalGlobe



Keeping an eye on the Earth



IKONOS - 0.82m
9. 1999

QuickBird - 0.61m
10. 2001

SPOT-5 - 2.5m
5. 2002

ALOS PRISM - 2.5m
1. 2006

KOMPSAT-1.0m
7. 2006

WorldView-1 - 0.5m
9. 2007

GeoEye-1 - 0.41m
9. 2008

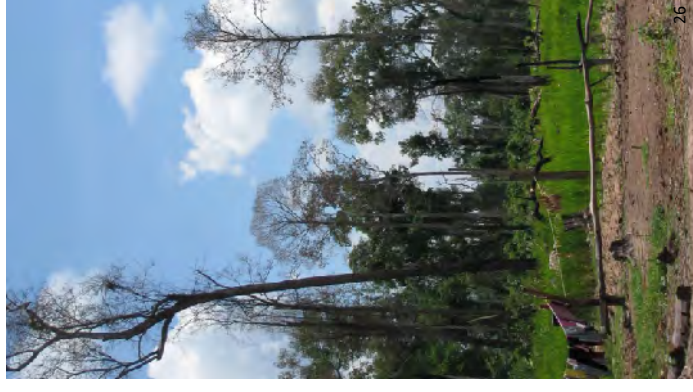
THEOS - 2.5m
10. 2008

WorldView-2 - 0.46m
10. 2009

Which approach do you select?



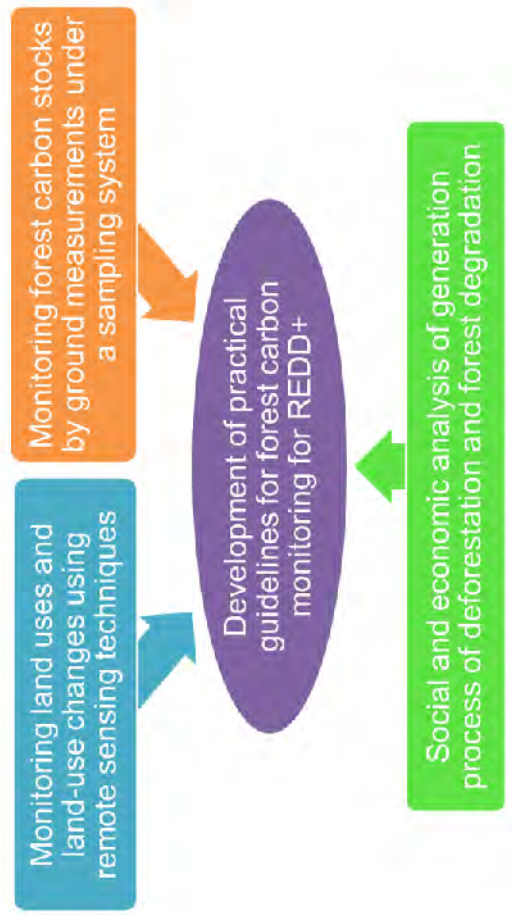
25



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.

Research Items



27

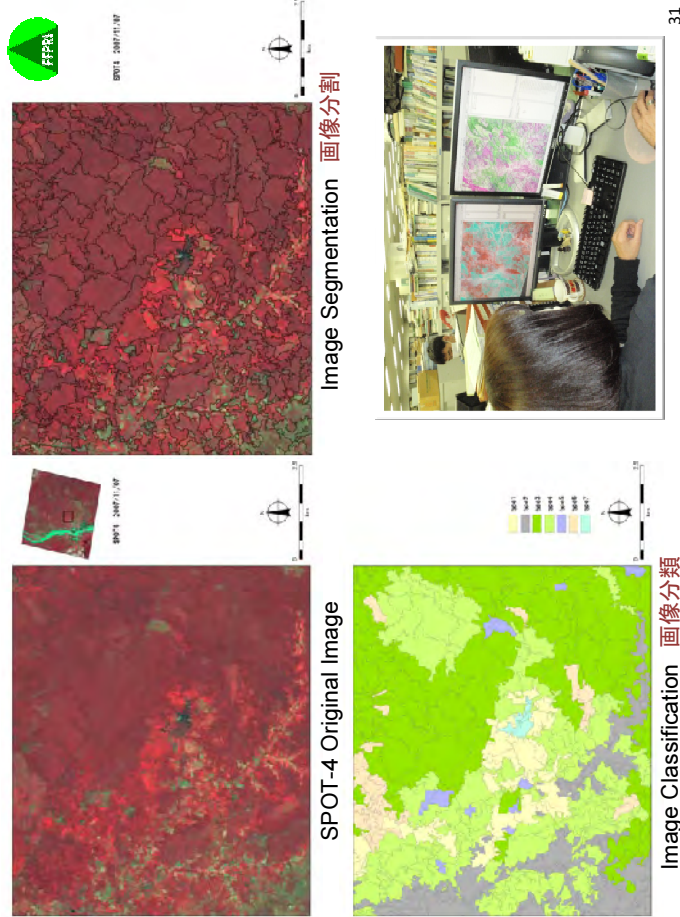
Research Cooperation for Development of Methodology

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

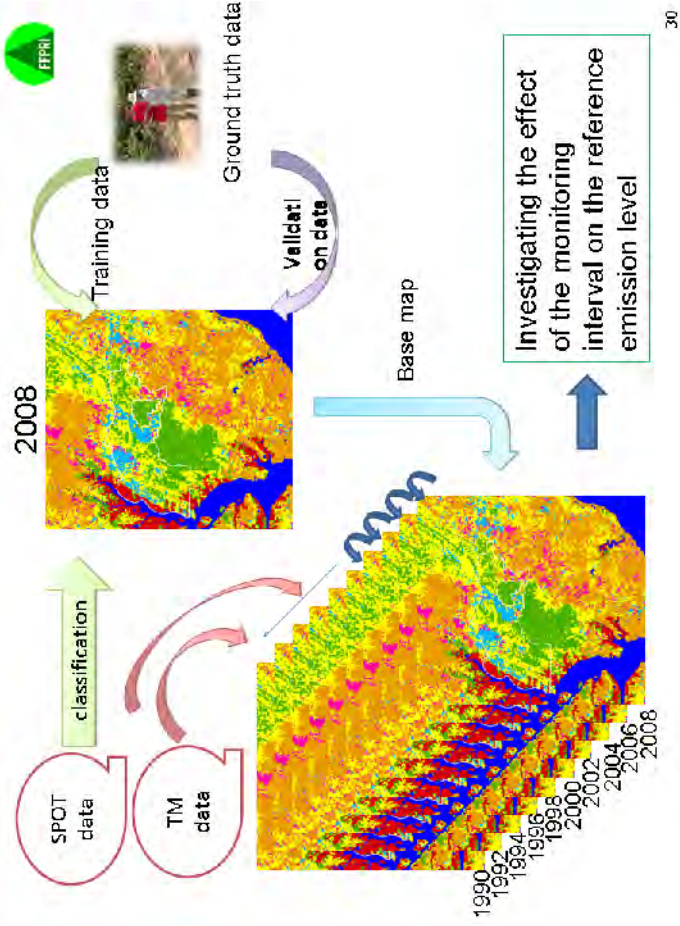
28

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

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Setting of Classification class

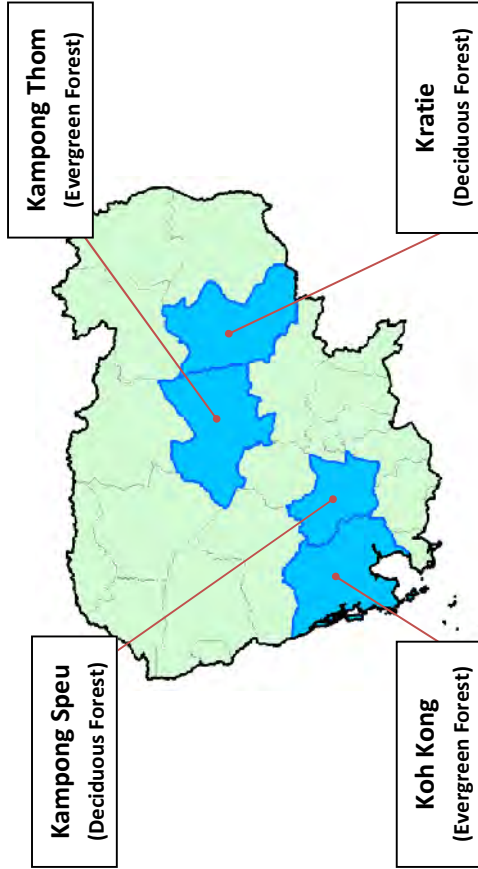
Total carbon stock = \sum (Forest area, x Averaged carbon stock_i)

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

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Target Area of Field Survey in Cambodia



A4-222



Plot number of field survey in Cambodia

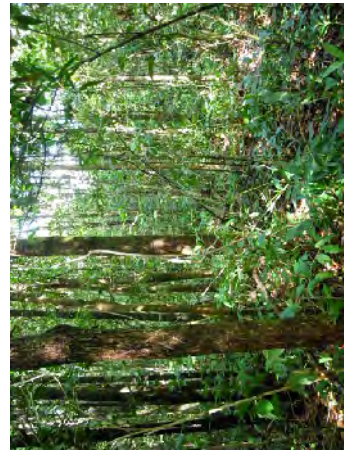
	Koh Kong	Kampong Speu	Kampong Thom	Kratie	Total
Evergreen Forest	40	1	33	11	85
Semi-Evergreen Forest	7	3	13	0	23
Deciduous Forest	1	21	3	32	57
Other Forest	0	3	0	0	3
Total	48	28	49	43	168

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Typical Forest in Each Province in Cambodia

Koh Kong



V = 328.6 m³/ha
Evergreen Forest
Plot ID : KK-R-032

Kampong Speu



V = 152.2 m³/ha
Deciduous Forest
Plot ID : KS-B-R-032

35

Kampong Thom



V = 205.9 m³/ha
Evergreen Forest
Plot ID : KT-C-R-002

Kratie



V = 142.6 m³/ha
Deciduous Forest
Plot ID : KR-A-R-007

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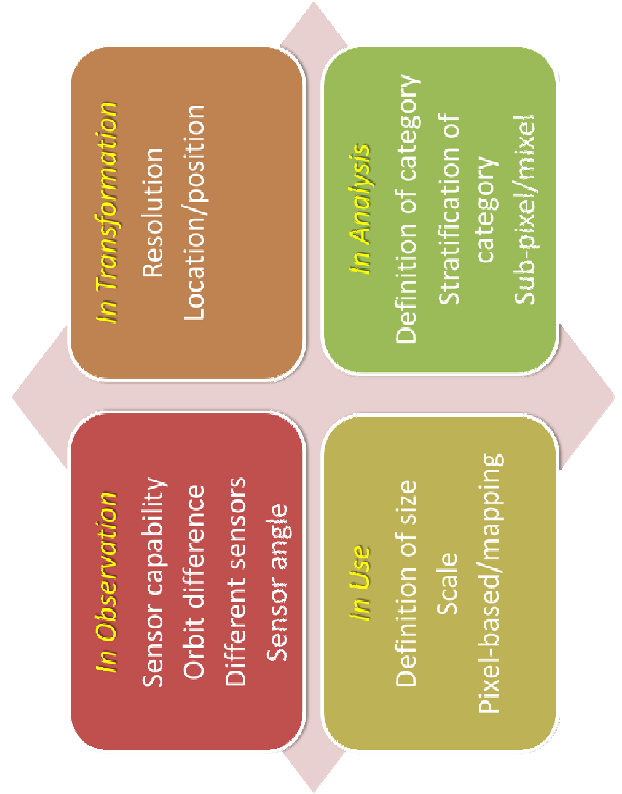


Survey Items for remote sensing analysis

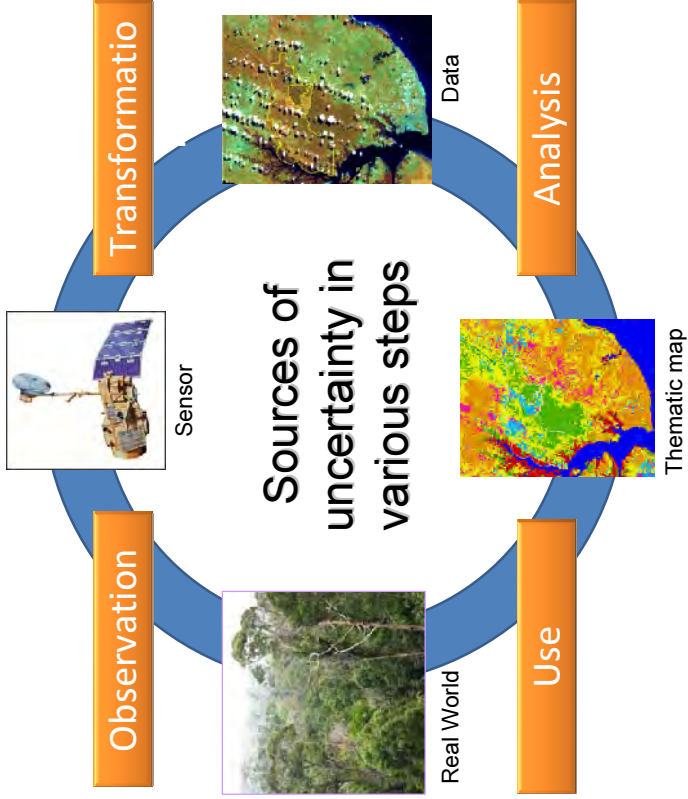
	Survey Item	Survey Equipment
1	Position at the center of the plot	GPS, Altimeter
2	Slope direction and inclination	Clinometer
3	Average tree height of the upper story	Vertex
4	Forest type / Crown density	-
5	Dominant tree species of the upper story	-
6	Count trees by Bitterlich method	Simple Relascope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

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Uncertainty in various steps



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Uncertainty in definition - for category or class of classification -

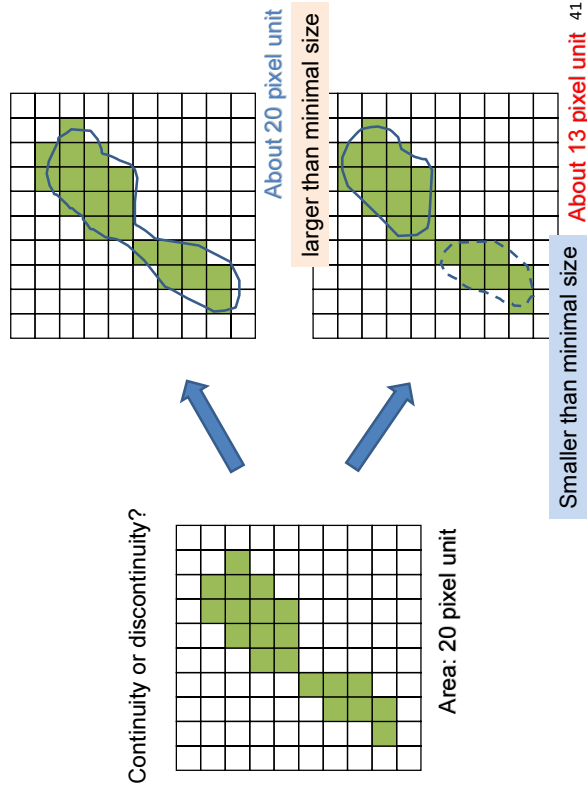
- Some land surface cannot be assigned to a certain category
- Gap between definition of category and remote sensing observation



40



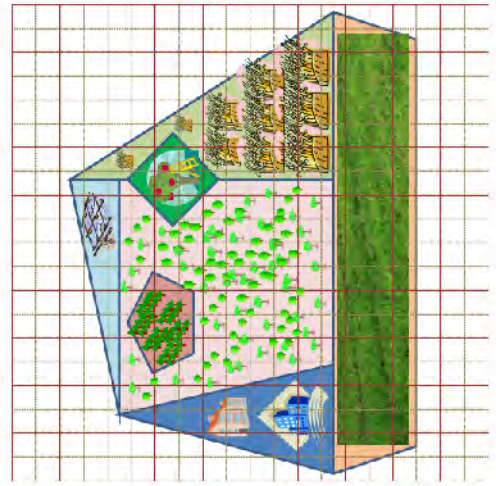
Uncertainty about definition - minimal size and continuity -



41



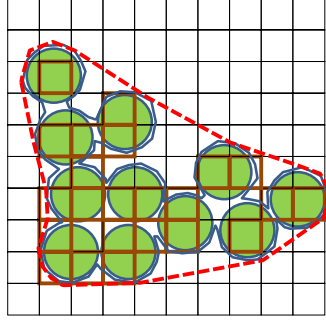
Further issues: Spatial resolution and mixel



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Uncertainty of boundary



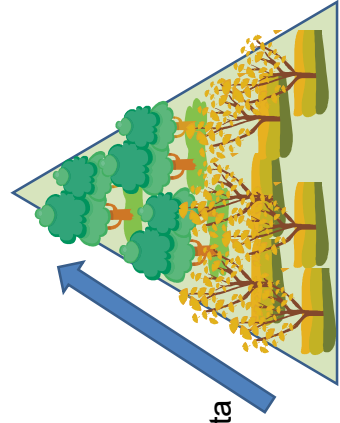
- Boundary cannot be decided certainly
- Rule of recognition is required
- Effect on area estimate of category

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Further issues: Phenology or seasonality

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



Dryness (in tropical seasonal forest)

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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



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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.

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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

FUTURE HARVEST

CIFOR
Center for International Forestry Research

CGIAR
Global Crop Improvement Initiative

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

CIFOR
Center for International Forestry Research

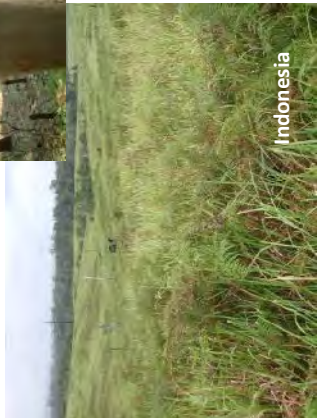
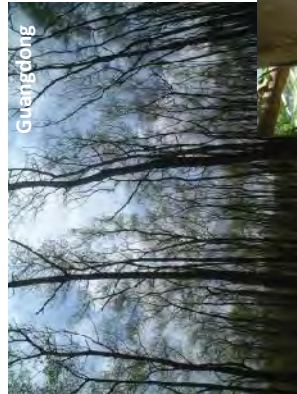
CGIAR
Global Crop Improvement Initiative

FUTURE HARVEST

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

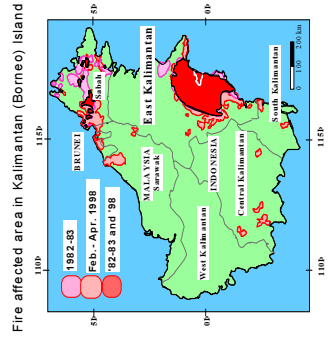
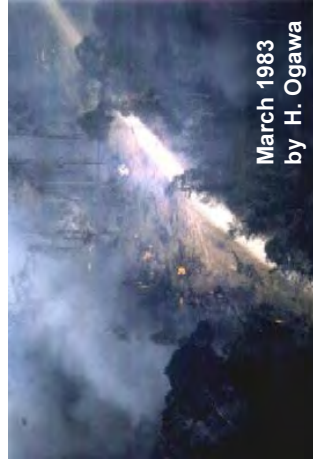
**CIFOR Research Team
Review of Forest Rehabilitation
Lessons from the past**

- Takeshi Toma
- Wil de Jong
- Ani Nawir
- Cesar Sabogal
- Unna Chokkalingam
- Tini Gumartini
- Everaldo Almeida
- Abel Meza Lopez
- Chiharu Hiayama
- 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?



Fire affected area in Kalimantan (Borneo) Island



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

TRAUMA of TOMA

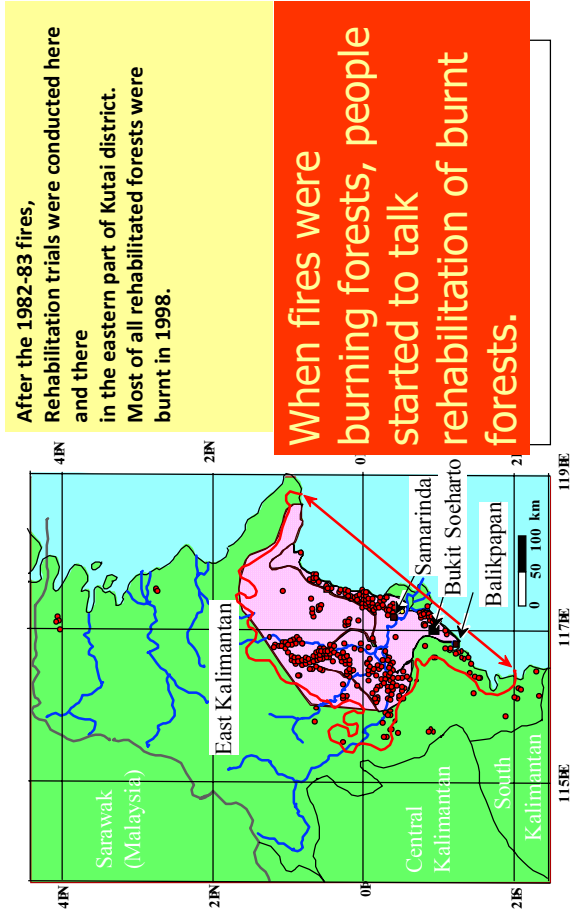


Figure 1. Fire affected areas in East Kalimantan, Indonesia.

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)



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.

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.

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

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.

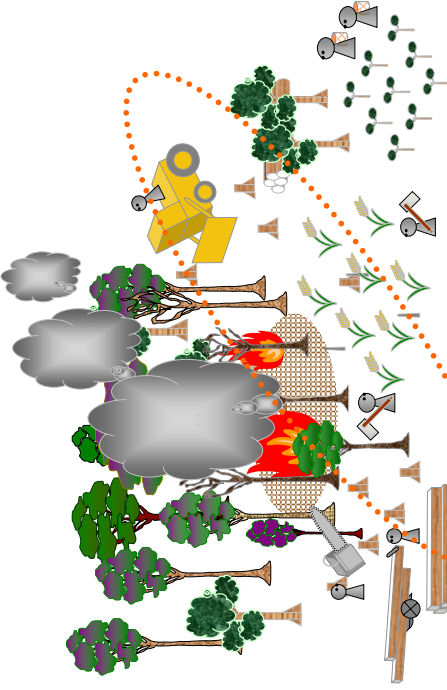


The causes usually are also the continuing disturbances threatening sustainable rehabilitation activities.

Crucial factors for Sustainable rehabilitation initiatives

- project design in ensuring multiplier effects can be generated;
- good forestry extension to ensure adoption by communities;
- enabled policy frameworks;
- well-planned funding mechanisms to effectively use the reforestation funds;
- an effective mechanism to reconcile the land status before the project starts.

Rehabilitation



Assimilate CO₂ from the atmosphere
Reduce risks of forest fire, emission of CO₂

Communities are expected to have greater roles in rehabilitation initiatives.

- Designing the right economic and social incentives becomes important.
- Project derived **economic and livelihood benefits, generated from ecological improvements**, tend to sustain in the long-term more than the benefits from project-based economic opportunities.

Research project D0902 by Global Environment Research Fund, the Ministry of the Environment, Japan

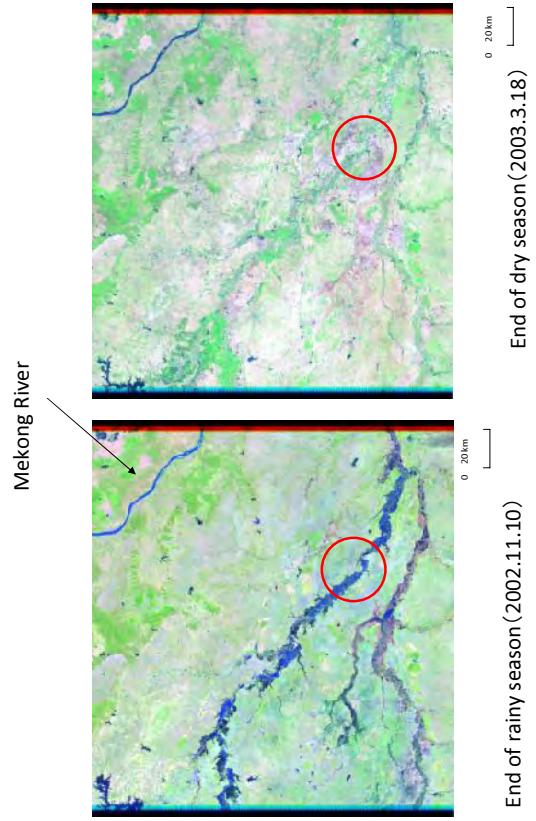


Studies on the conservation measures of swamp forests through sustainable use of ecological resources by local communities

**Aims to derive scientific background to support
Community participation for
swamp forest conservation**

- targets: Swamp forests supporting livelihood
- Mangroves and riparian swamp forests
- Eco-tone with periodical flooding by tide and water level rise
- Rich and diverse ecological incentives as a background of livelihood
- Nutrient transfer beyond ecosystems supports fishery resources

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A4-231

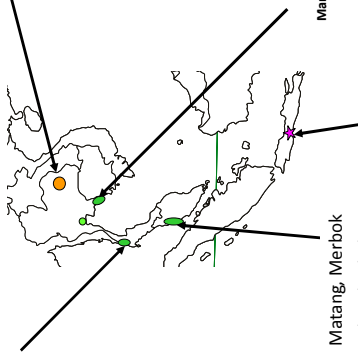


Ranong

Mangroves including Tsunami over region



Main sites



Matang, Merbok

Mangrove charcoal production

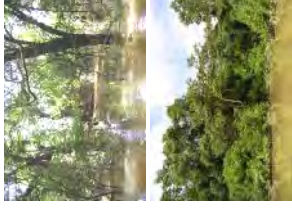


CIFOR

Centre for international forestry research @ Bogor



Tributary of Mekong river, Yasothon & others riparian swamp



Mangrove at Thai Gulf Trat & others



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Before flood
(2004.June)



Flooding
(2004. August)