



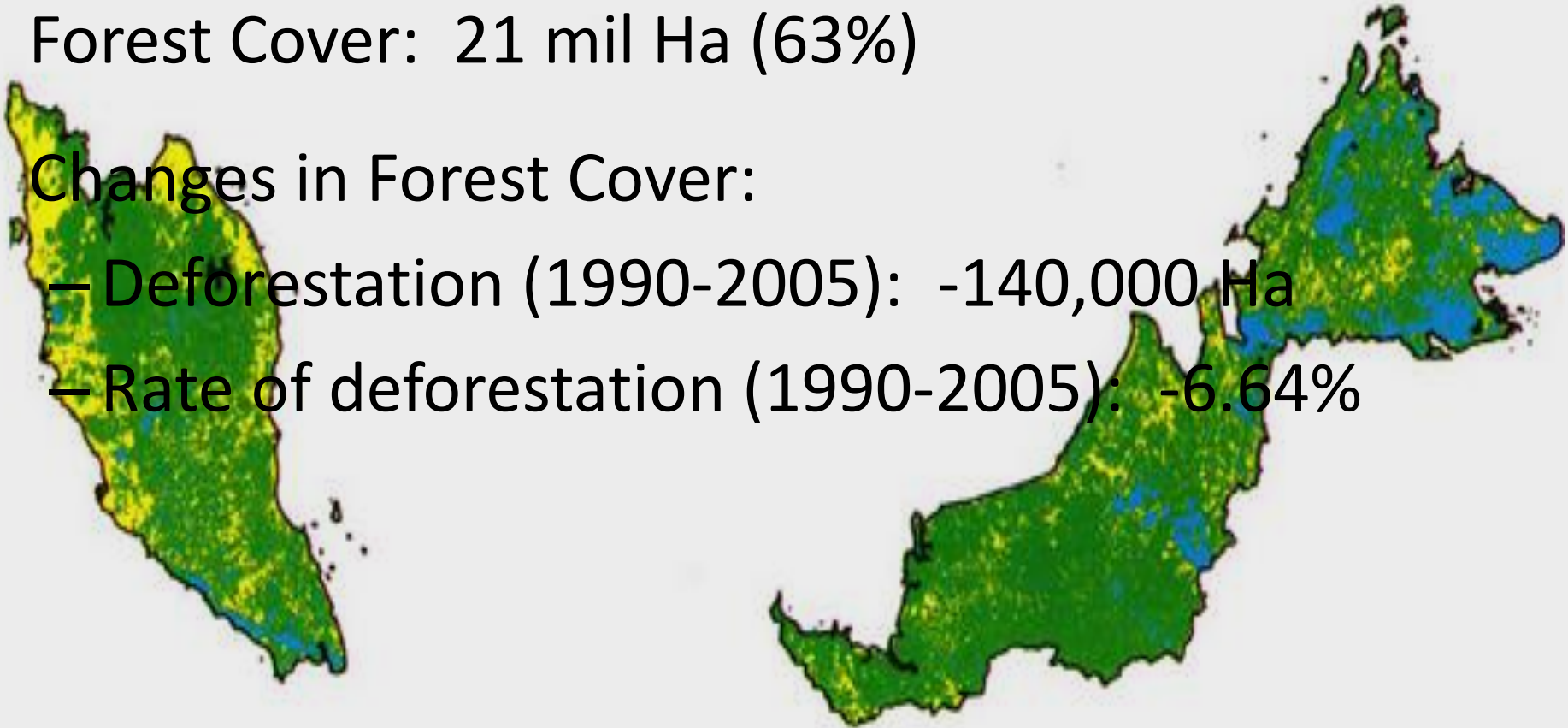
SAFEGUARDING THE SOCIAL AND ECONOMIC IMPORTANCE OF FOREST RESOURCES

Applications of Advance Technology



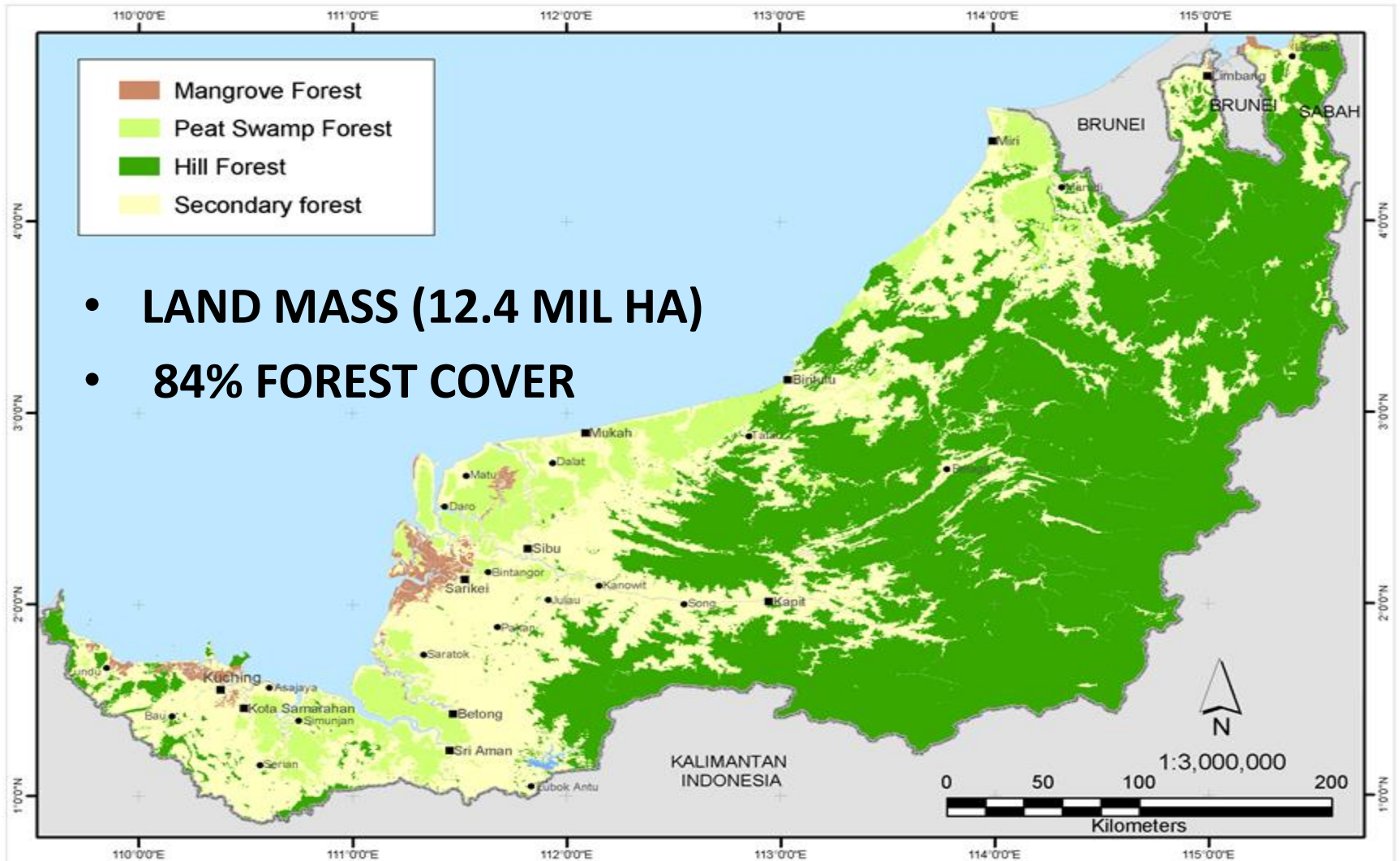
FORESTRY IN MALAYSIA

- Forest Cover: 21 mil Ha (63%)
- Changes in Forest Cover:
 - Deforestation (1990-2005): -140,000 Ha
 - Rate of deforestation (1990-2005): -6.64%



Source: FAO (2005)

FORESTRY IN SARAWAK



ECONOMIC IMPORTANCE OF FORESTRY SECTOR

- **Government revenue**
 - Royalty: RM 600-700 million
 - Foreign exchange: RM 6 billion
- **Employment**
 - DIRECT (~ 80,000)
 - Logging Industry, Downstream Processing & Manufacturing
 - INDIRECT
 - Service & manufacturing industry

SOCIAL IMPORTANCE OF FORESTRY

- Local Communities
 - Source of livelihood
 - Forest produce, source of water, food (animal & fish)
 - Traditional practices
 - Nomadic (Penan)
 - Farming
(other indigenous communities)
 - Ecosystem services
 - Recreation
 - Quality of environment



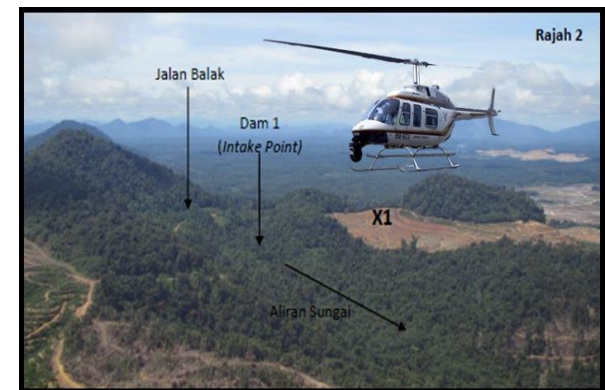
SOCIAL IMPORTANCE OF FORESTRY

- International Agenda
 - **Carbon sink**
 - Tropical forests
(high carbon intake)
 - **Mitigate climate change**
 - Surface runoff (flood)
 - Sequester carbon
(depleting ozone layer)



HOW TO ENSURE SUSTAINABILITY

- Sound forest management practices
 - Policy
 - Operations
 - Monitoring*
 - Valuing present worth of timber stand
 - Forest inventory
 - Carbon stocks
 - Ensure targets are achieved
 - (reforestation efforts)
 - Curb illegal activities
 - Encroachment in TPA
 - Management offences (not adhering to prescribed standards)



ADVANCE TECHNOLOGY FOR FOREST MONITORING

- Sarawak experience in hyperspectral sensing operations:

- Tasks

- ✓ Resource monitoring & inventory

- ✓ Aerial surveillance & enforcement

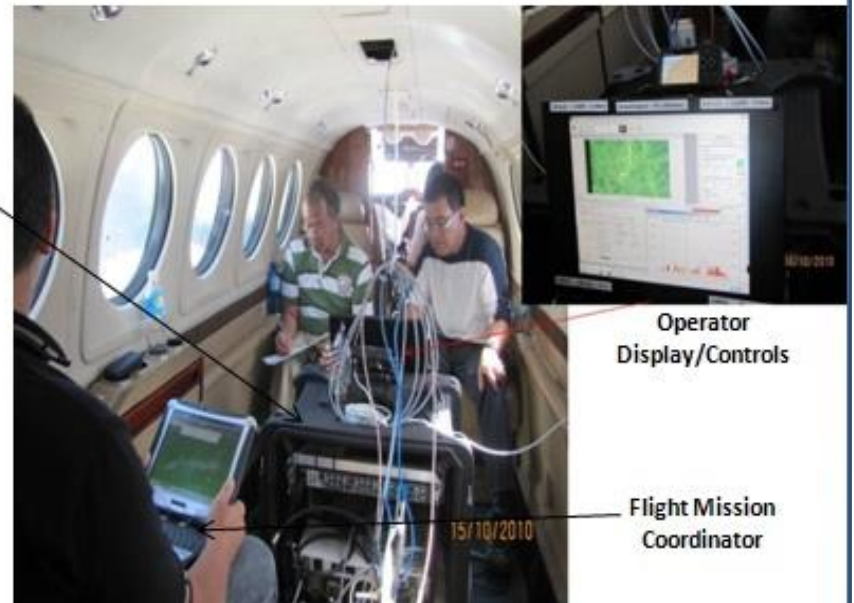
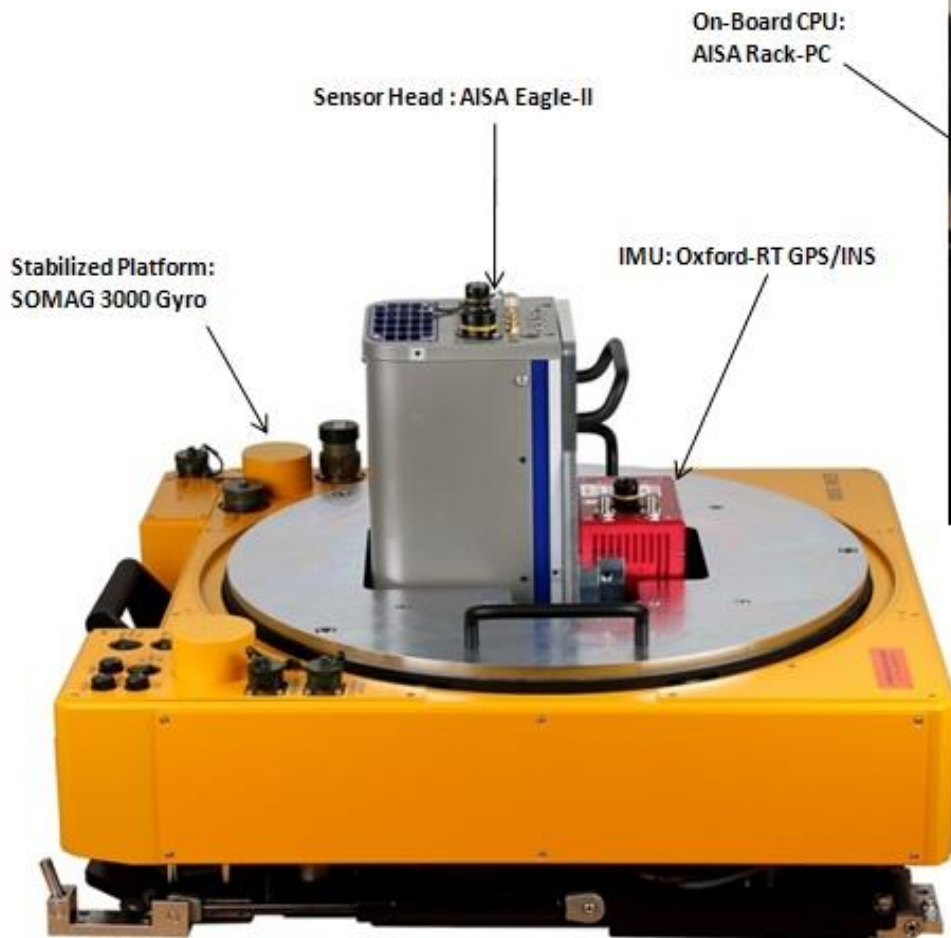
- Airborne system

- ✓ Fixed wing (large area mapping)

- ✓ Helicopter (enforcement)



AERIAL SURVEILLANCE AND ENFORCEMENT (AIRBORNE HYPERSPECTRAL IMAGING SYSTEM- AHIS)

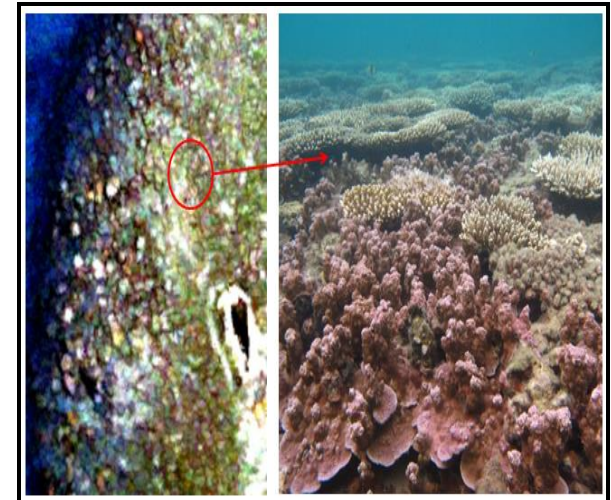
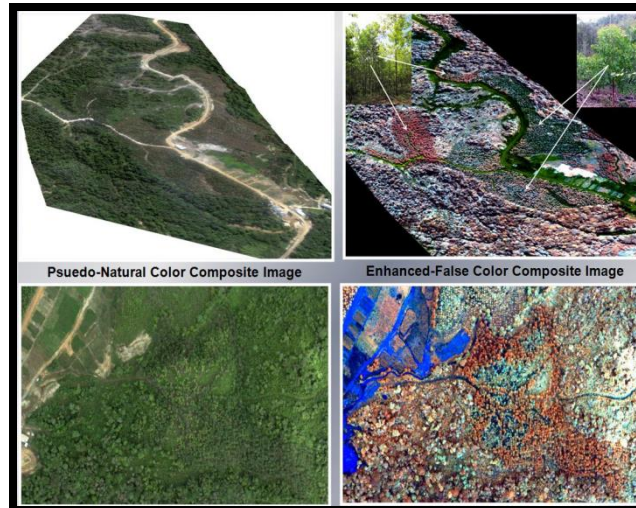
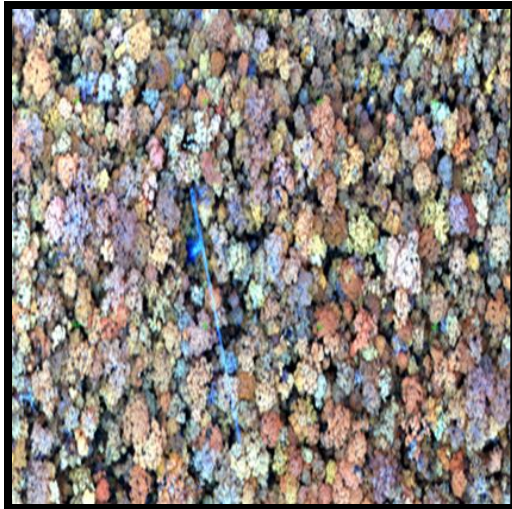


Airborne Platform (KingAir Beechcraft)

AERIAL SURVEILLANCE AND ENFORCEMENT (COMPACT AIRBORNE TACTICAL SYSTEM – CATS)



FUNDING FROM FEDERAL GOVERNMENT UNDER 10TH MALAYSIA DEVELOPMENT PLAN



Development of applications

...application development related to forestry operation and natural resource monitoring (P23 0990000 7003 & P23 0990000 7004)

SPECTRAL DATABASE OF MIXED DIPTEROCARP FORESTS




Navigation: [Logout](#) [Admin](#) [Home](#) [Samples](#) [Taxa](#) [Sensors](#)

Home » [Samples](#) » 100


View Entry #100

Endospermum diadenum
Sample Code: 17641

[← Previous Entry](#) | [Next Entry >](#)



Y641

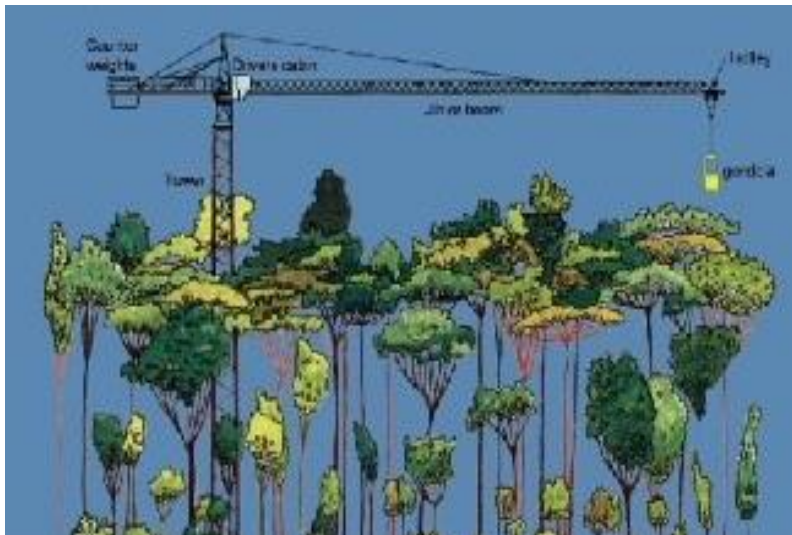


Forest Department, Sarawak State Forest Office, Kuching, Sarawak, Malaysia

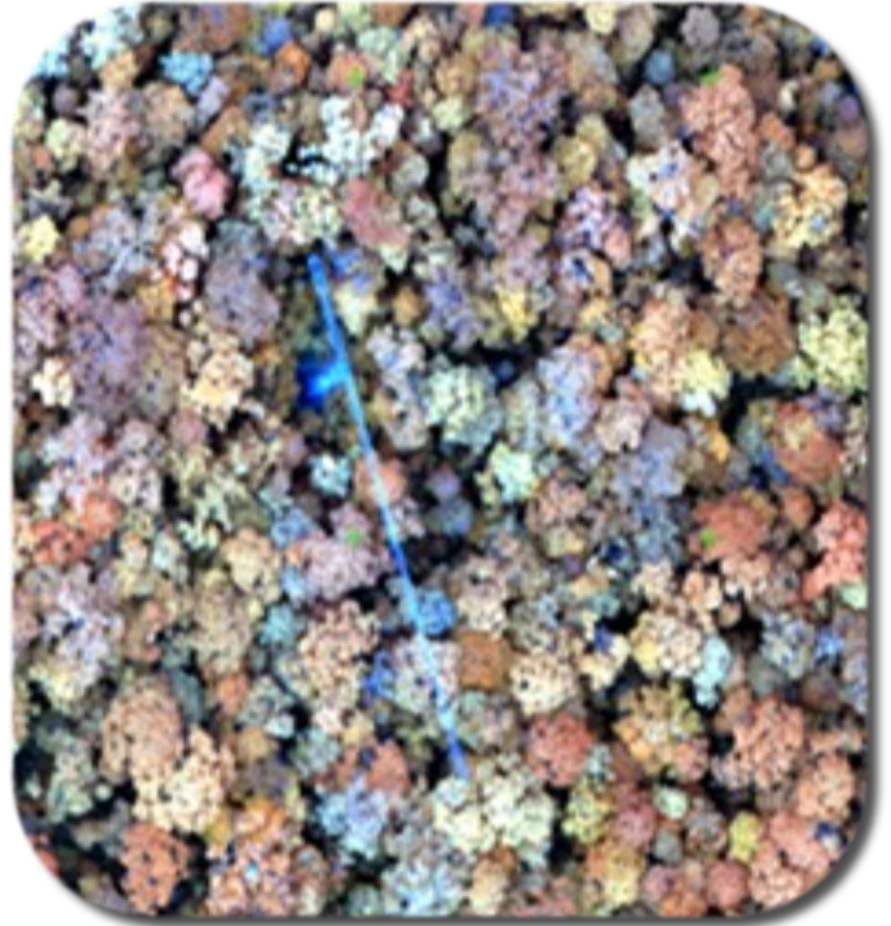
Operations:

- List Samples
- Create Samples
- Update Samples
- Delete Samples
- Manage Samples

Field	Value
Sample Code	17641
Tree Number	7641
Date (YYYY-MM-DD)	2012-07-06
Location	Lampir Hill, N.P.
Forest Type	Mixed Dipterocarp Forest
Latitude N	4.25125
Longitude E	114.03922222222
Species	Endospermum diadenum
Local Name	Terbuan
Sensor Type	EVC HR-1024
Sample Type	Canopy (airborne)
Soil Type	Not Set
Comment	
Leaf Photo	leaf_17641.jpg
Canopy Photo	canopy_17641(7641).jpg
Spectrum File	
Spec Data	100.jpg

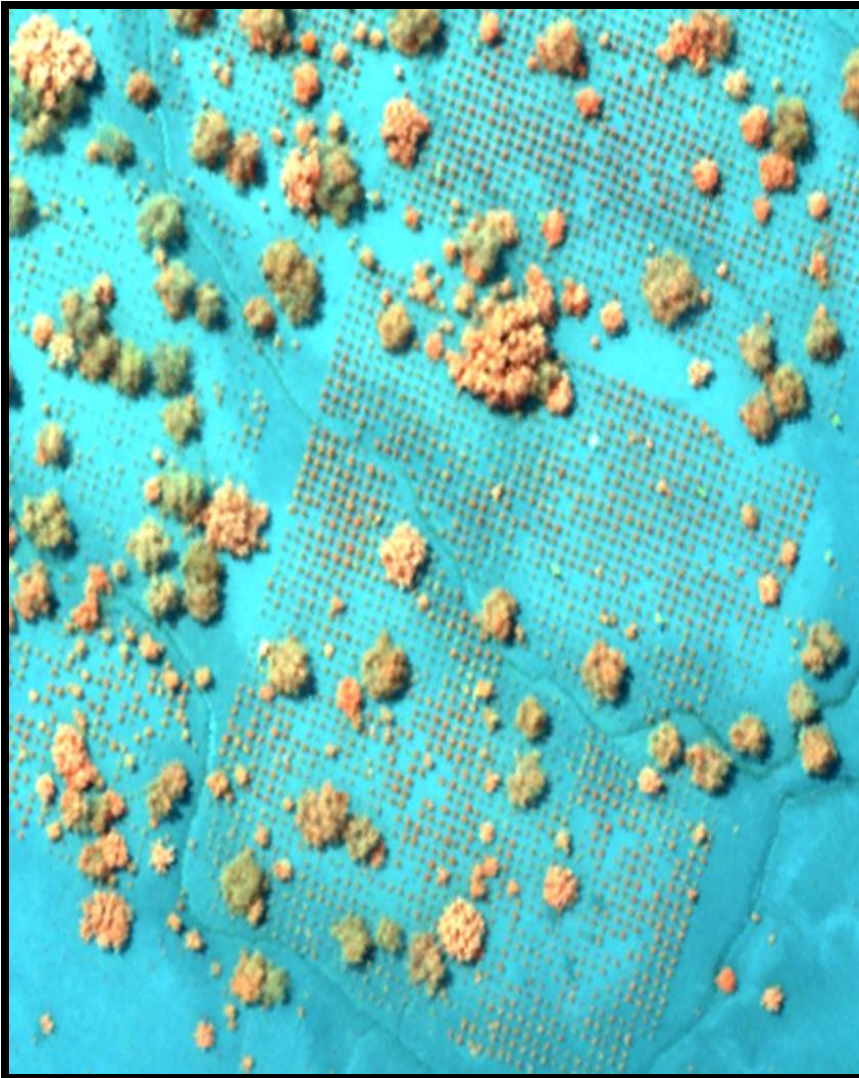


SPECTRAL DATABASE OF MIXED DIPTEROCARP FORESTS

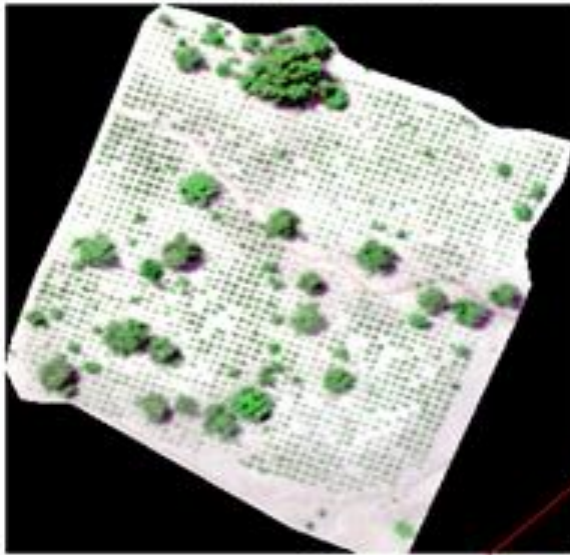


International collaboration with Stamford University (Carnegie Airborne Observatory) and Center of Tropical Forest Science to establish a spectral database of common tree species (canopy and emergent) in the mixed Dipterocarp forests of Sarawak.

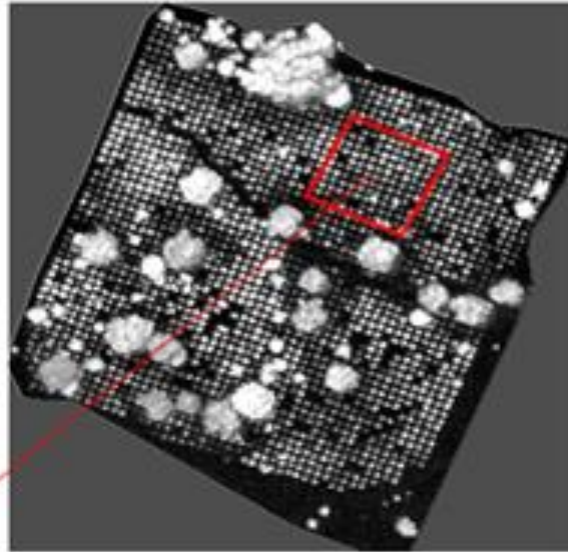
TRANSLATING EFFORTS IN MANGROVE PLANTING PROJECTS INTO TANGIBLE VALUE (CARBON PROJECTS & REDD+)



Original (input) image



Enhanced Image



Classified Image



The screenshot shows the "Biomass Estimator (Beta)" software interface. On the left is a 3D plot of the tree grid. The main window contains several control panels:

- Basic Mode:** Manual Mode selected.
- Execute:** A button with a dropdown menu showing "Population: 57", "Avg. Area: 1.76165", "Avg. Height: 3.00000", and "Avg. Biomass: 5.28439".
- Segment:** A dropdown menu set to "Method 1" and a text box set to "100 % Plotted".
- Recognition:** A section with various settings.
- Alometry:** A dropdown menu set to "HEIGHT" and a text box set to "Average 0 1".

On the right side, there are summary statistics and a data table:

- Total Biomass:** 512.840
- Size of Area:** 1256.4000 sqm
- Density:** 75.7420 trees / sqm

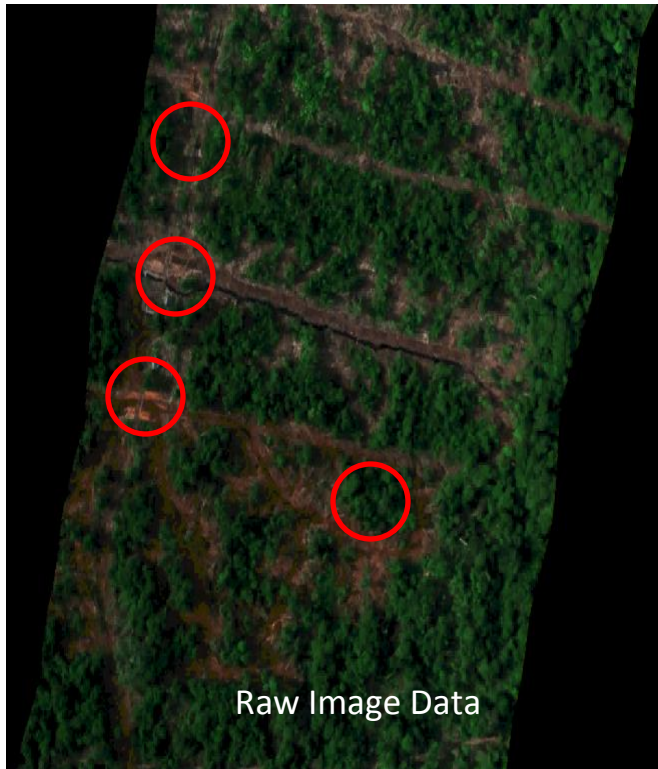
Buttons for "Load", "Export", and "Email" are located to the right of the statistics. Below is a table with columns: "Number", "Area", "Height", "Biomass", and "Lign".

Number	Area	Height	Biomass	Lign
0	1.44	3	4.32	
1	1.32	3	3.96	
2	1.44	3	4.32	
3	1.76	3	5.28	
4	0.96	3	2.88	
5	1.6	3	4.8	
6	2.24	3	6.72	
7	1.76	3	5.28	
8	1.76	3	5.28	
9	1.28	3	3.84	
10	1.76	3	5.28	
11	1.6	3	4.8	
12	1.28	3	3.84	
13	1.92	3	5.76	
14	1.76	3	5.28	
15	3.84	3	11.52	

Biomass & Carbon Estimation Tool (under review)

...software application to automate the processing of airborne hyperspectral data for estimating biomass and carbon stock that would then generate the value (carbon credits) of each individual stem at juvenile stage.

APPLICATION DEVELOPED FOR MONITORING ILLEGAL LOGGING



ATTRIBUTES



Forest Clearing Tool

Software program to analyze hyperspectral data for detecting timbers/logs and mapping clearings attributed to illegal logging activities

TRANSLATING RESEARCH TO REAL WORLD APPLICATION

(1)



Surveillance Report



Query/Feedback

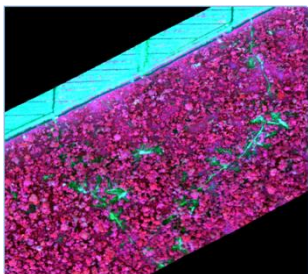
ADMINISTRATOR

(2)



GIS
License Status/ PEC

Field Investigation Request



Disseminate Tactical Info



Field Trekker

Disseminate Tactical Info



**Protection & Enforcement
Field Personnel**



TRANSLATING RESEARCH TO REAL WORLD APPLICATION



CHOICE OF PLATFORM



**Manned
(piloted)
aircraft**



**Optionally
piloted
aircraft**



<http://www.gatewing.com/X100>

The X100
revolutionary mapping



**Unmanned
aircraft
(drones/uav)**

CHOICE OF PLATFORM

➤ Costs

- Acquisition
- Operations & maintenance

➤ Availability of aircraft

- Shared facility

➤ Payload capacity

- Type of sensor (information derived)

➤ Operational requirements

- Approval/permits
- Airspace/Data integrity

MANNED AIRCRAFT (Fixed Wing/Helicopter)

SYSTEMS APPLICATION AND DEVELOPMENT UNIT



- Large area of coverage
(2000-5000 hectares/day)
- *weather dependent

- Operational costs
(RM3500-7000/hour)
- DCA approval sensor
installation (3-12 months)



UAV System

MAPPING MANGROVE RESTORATION ACTIVITIES



UAV Operations

DCA REGULATIONS

AIC

PHONE : 6-03-8871 4000
TELEX : PENAWA MA 30128
FAX : 6-03-8881 0530
AFTN : WMKKYAYS
COMM : AIRCIVIL
KUALA LUMPUR

MALAYSIA

AERONAUTICAL INFORMATION SERVICES
DEPARTMENT OF CIVIL AVIATION
LEVEL 1-4, PODIUM BLOCK,
NO. 27, PERSIARAN PERDANA,
PRECINCT 4,
62618 PUTRAJAYA
MALAYSIA

04 / 2008
18 FEB

UNMANNED AERIAL VEHICLE (UAV) OPERATIONS IN MALAYSIAN AIRSPACE

**Small
Aircraft**



UAV

- Payload capacity
- Registration (Air Worthiness)
- Operator qualification
- Operations
 - Flight plan (ATC issue notice to airmen)
 - Communications with ATC
 - Airspace (operational time frame/window)

AIC

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04 / 2008
18 FEB

UNMANNED AERIAL VEHICLE (UAV) OPERATIONS IN MALYSIAN AIRSPACE

1. Civil UAV registered in Malaysia must have:

- Certificate of Airworthiness (> 20kg MTOW)
- Permit to fly from DCA
- Insured to meet liabilities in event of accident
- Operator (Commander or Pilot) of UAV must hold valid PPL with proficiency in UAV operations.

2. Exception (small model aircraft for recreational purposes) with following prohibitions:

- No fly at controlled air space (high air traffic zone)
- Operational ceiling < 400ft a.g.l (approval from ATC for higher ceiling)
- Not allowed to conduct aerial work

3. UAV Operational requirements:

- UAV-p must be able to take immediate active control of aircraft
- Communications with ATC to report operations

MULTI-PURPOSE (SENSING) PLATFORM



...a turnkey airborne sensing solution that would serve the geospatial needs of various agencies in Malaysia. Key benefit of system is the ability to obtain multiple key information at low operational costs.

CONCLUSION



1. Forest resources should be safeguarded to ensure benefits would be sustained for future generations.

2. Technological advancement in the field of remote sensing could be utilized by foresters to increase effectiveness of managing forest resources.



3. Match objectives with type of sensing system to derive optimal output.