Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

Application of GIS & Remote Sensing for FCA Boundary Verification

06th March 2014

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JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

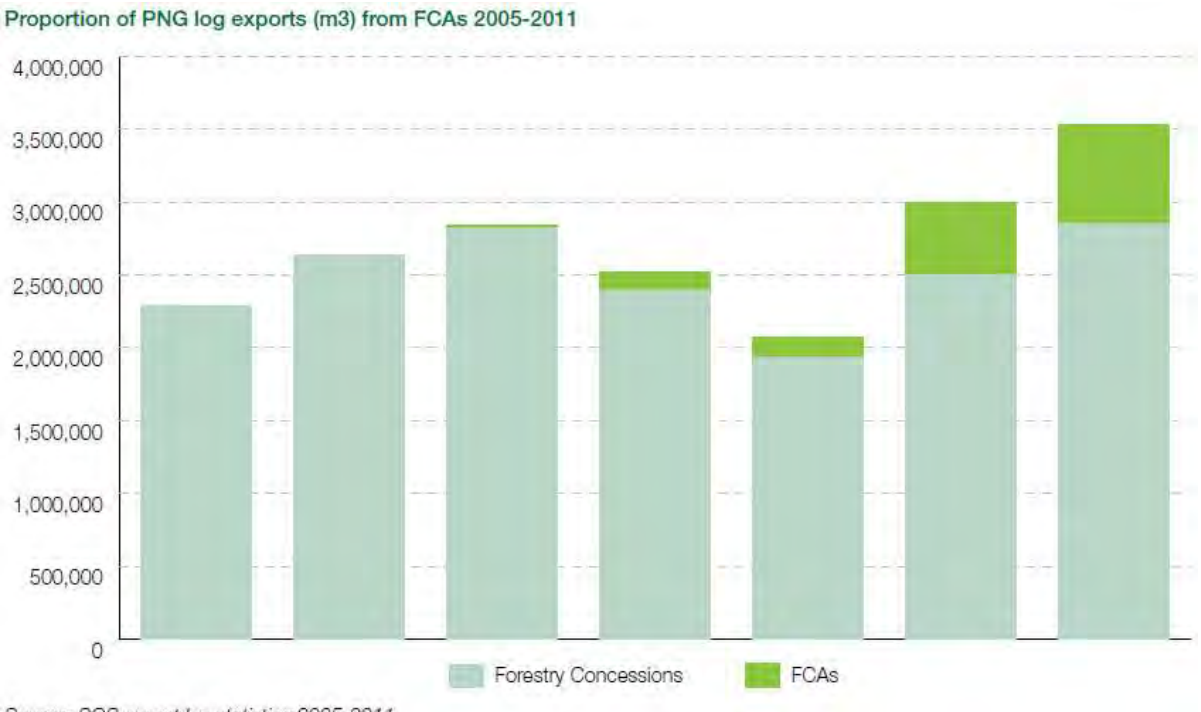
Contents

Background for FCA (Forest Clearance Authority)

- In 2007, sections of the Forestry Act were amended to enable project development companies to also harvest the forest under a Forest Clearance Authority (FCA)
- FCAs have been issued for approximately 2 million hectares of forest in existing SABLs (Special Purpose Agricultural and Business Leases).
- This promotes the exploitation of native forest resources without requiring PNG Forest Authority (PNGFA) approval and adherence to existing forestry regulations.
- SABLs are therefore an avenue to circumvent prevailing efforts to reform the forestry industry in PNG, which has long been plagued by allegations of mismanagement and corruption.

Ref: Up for Grabs (Greenpeace)

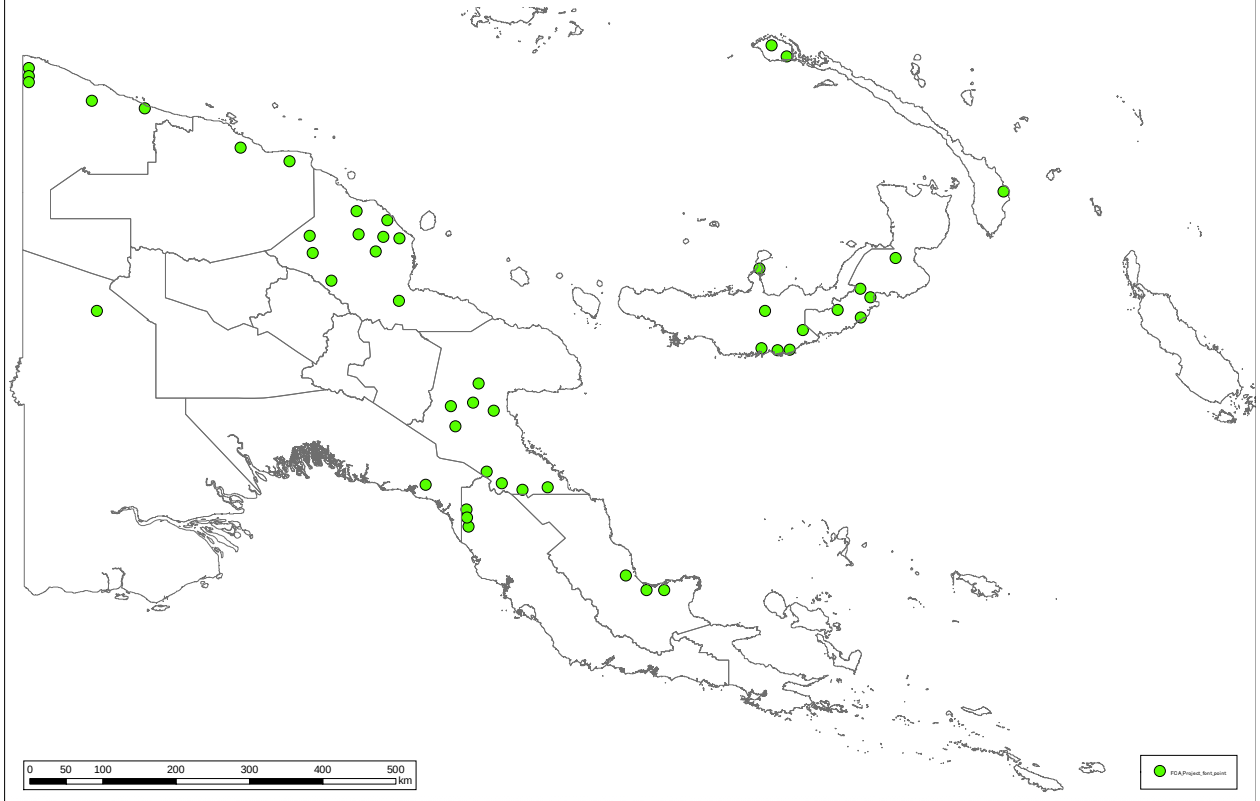
Proportion of PNG log exports (m3) from FCAs 2005-2011



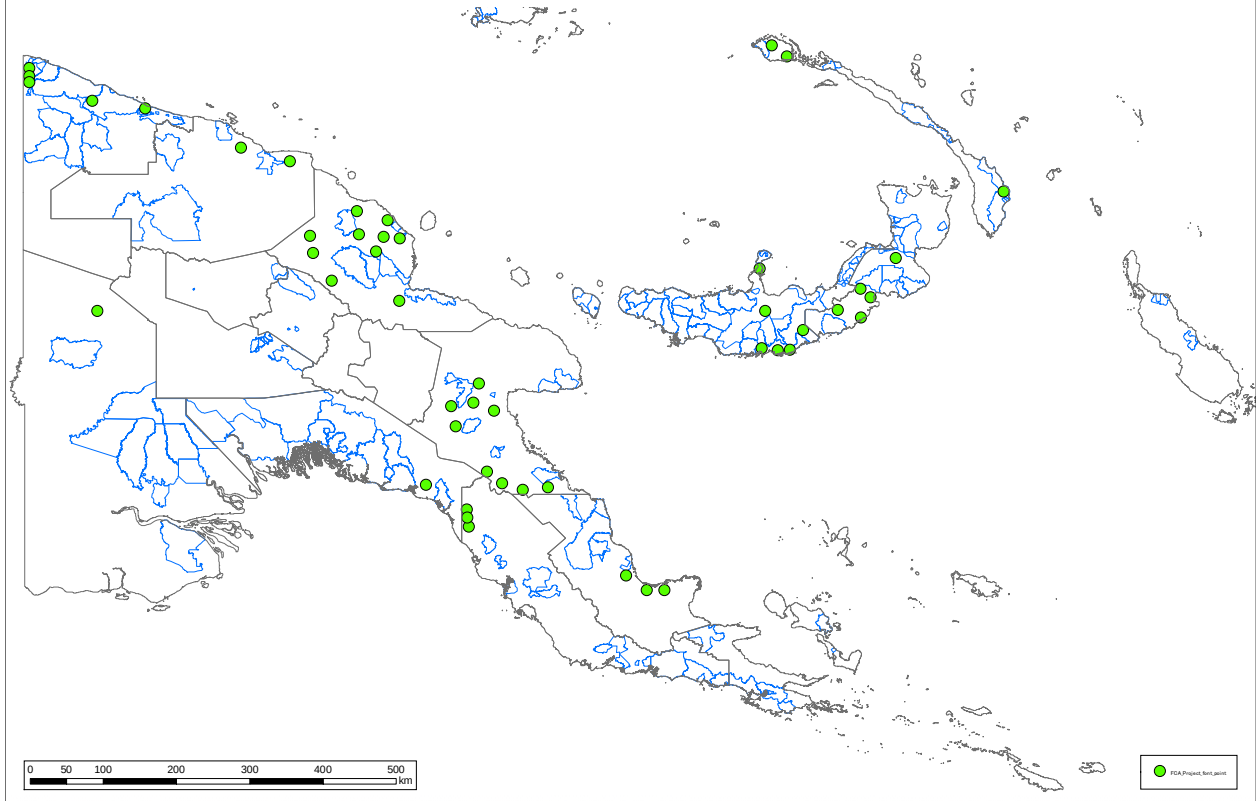
Source: SGS export los statistics 2005-2011

Ref: Up for Grabs (Greenpeace)

FCA Information by GIS in PNGFA in the past

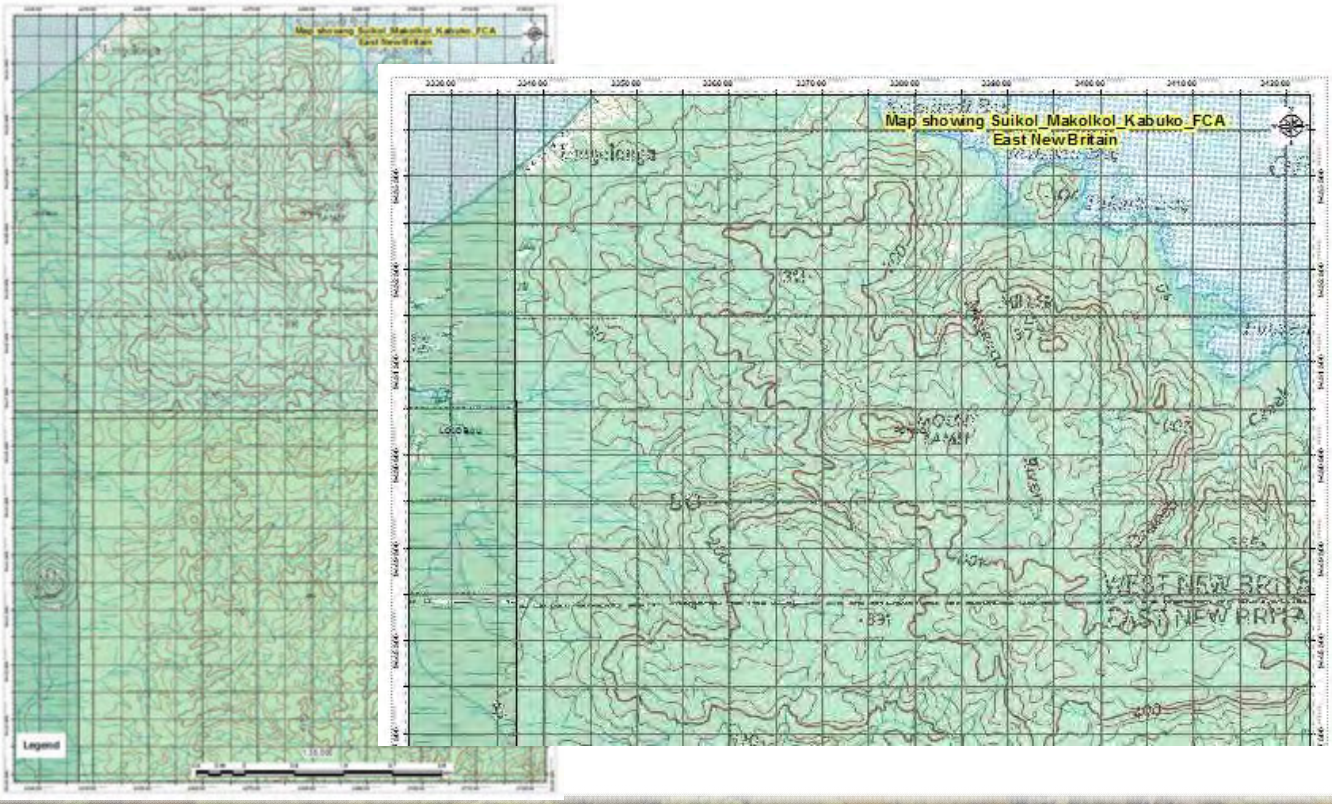


Comparing FCA and Logging Concession



Example of FCA GIS Work

Scanned Geo-Rectified TopoMap

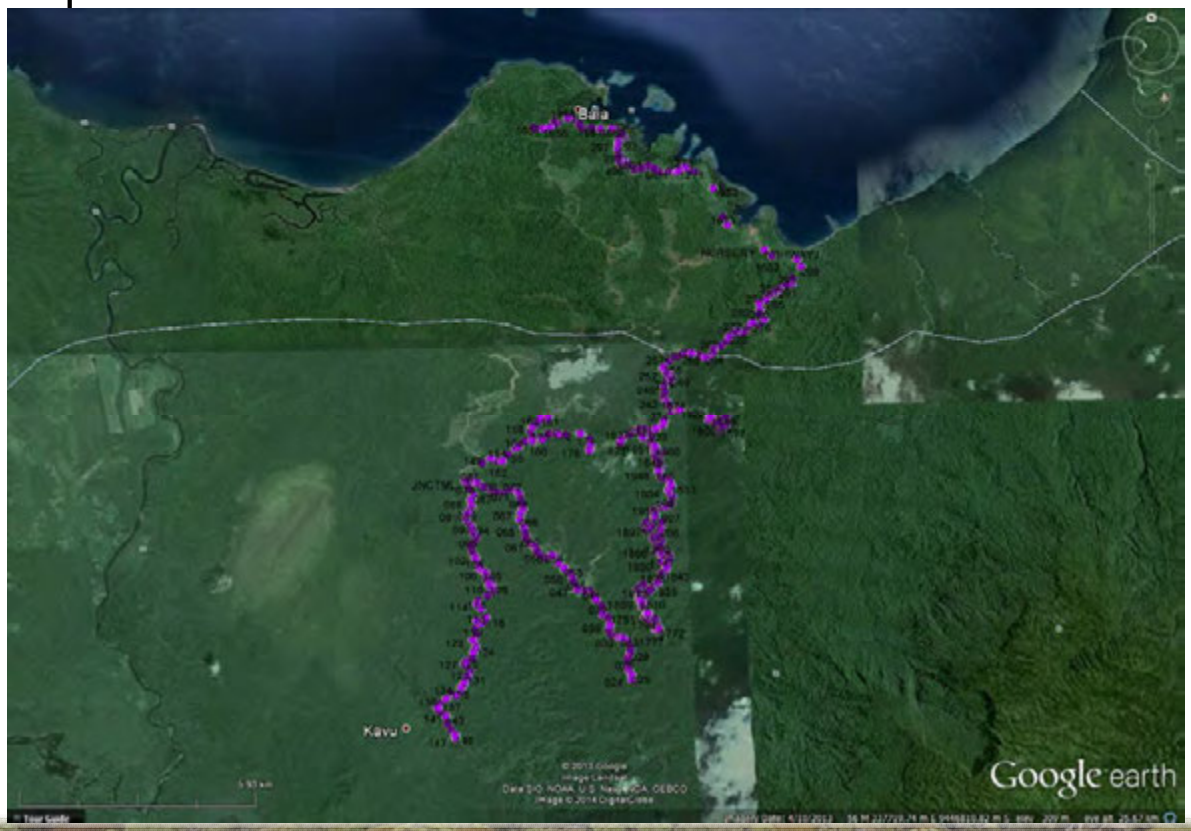


Example of FCA GIS Work

TopoMap with Existing GIS data

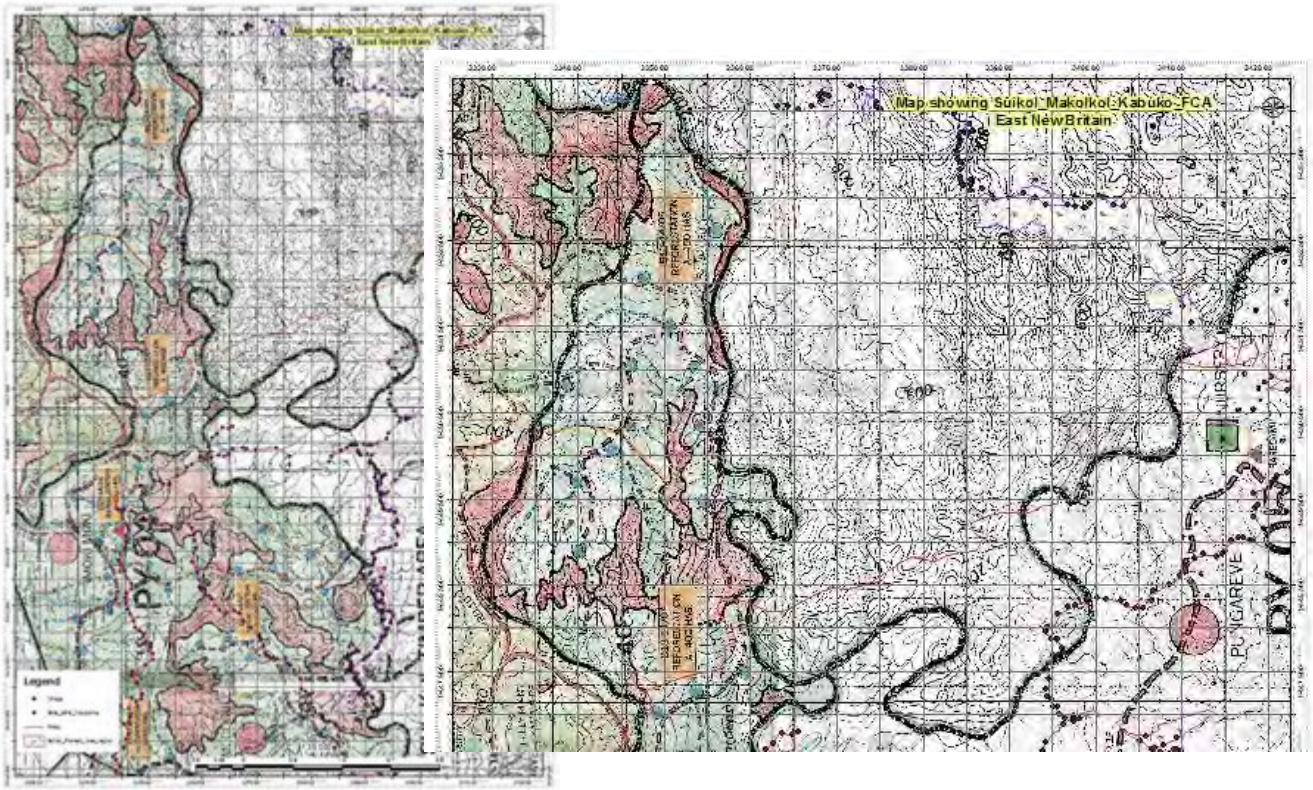
Example of FCA GIS Work

GPS Data Collection



Example of FCA GIS Work

Project Map for FCA

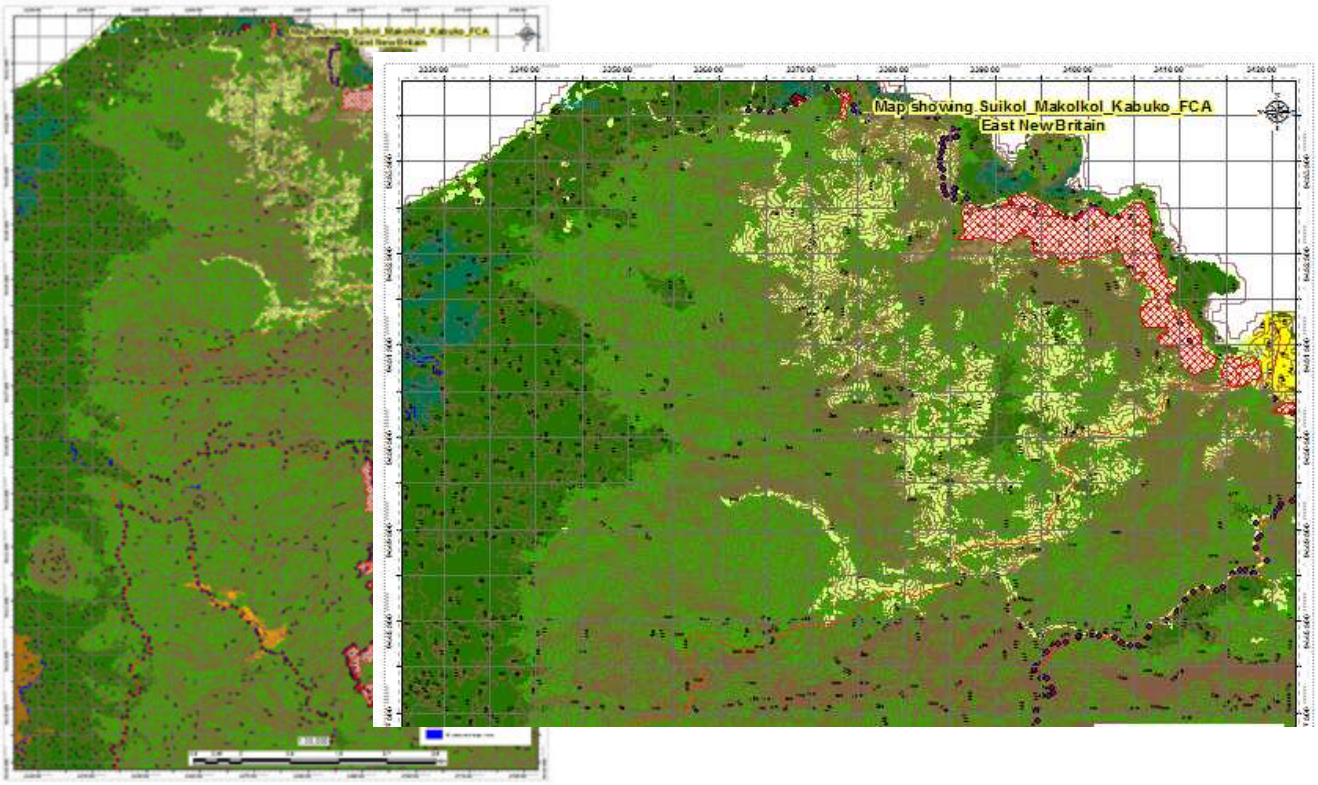


Example of FCA GIS Work

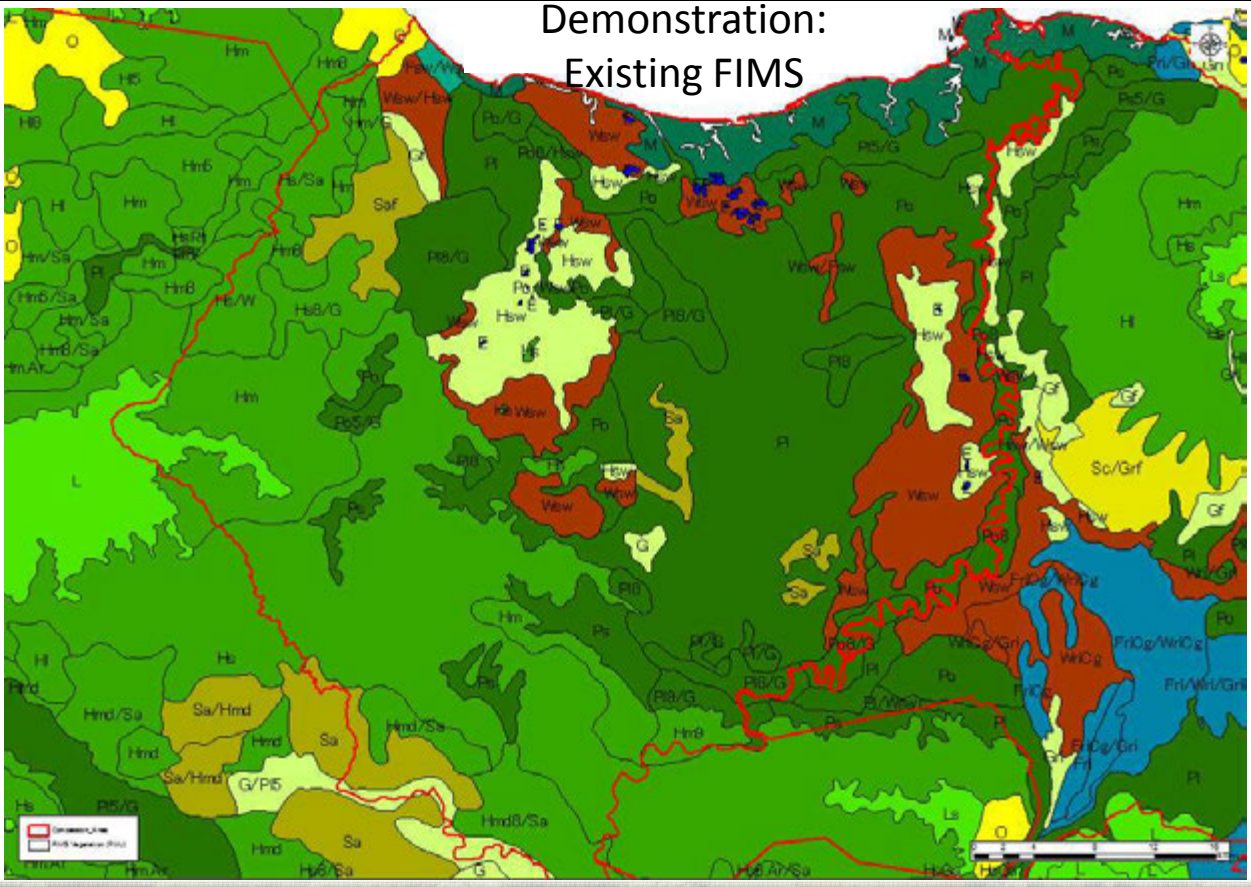
Satellite Image with possible FCA

Example of FCA GIS Work

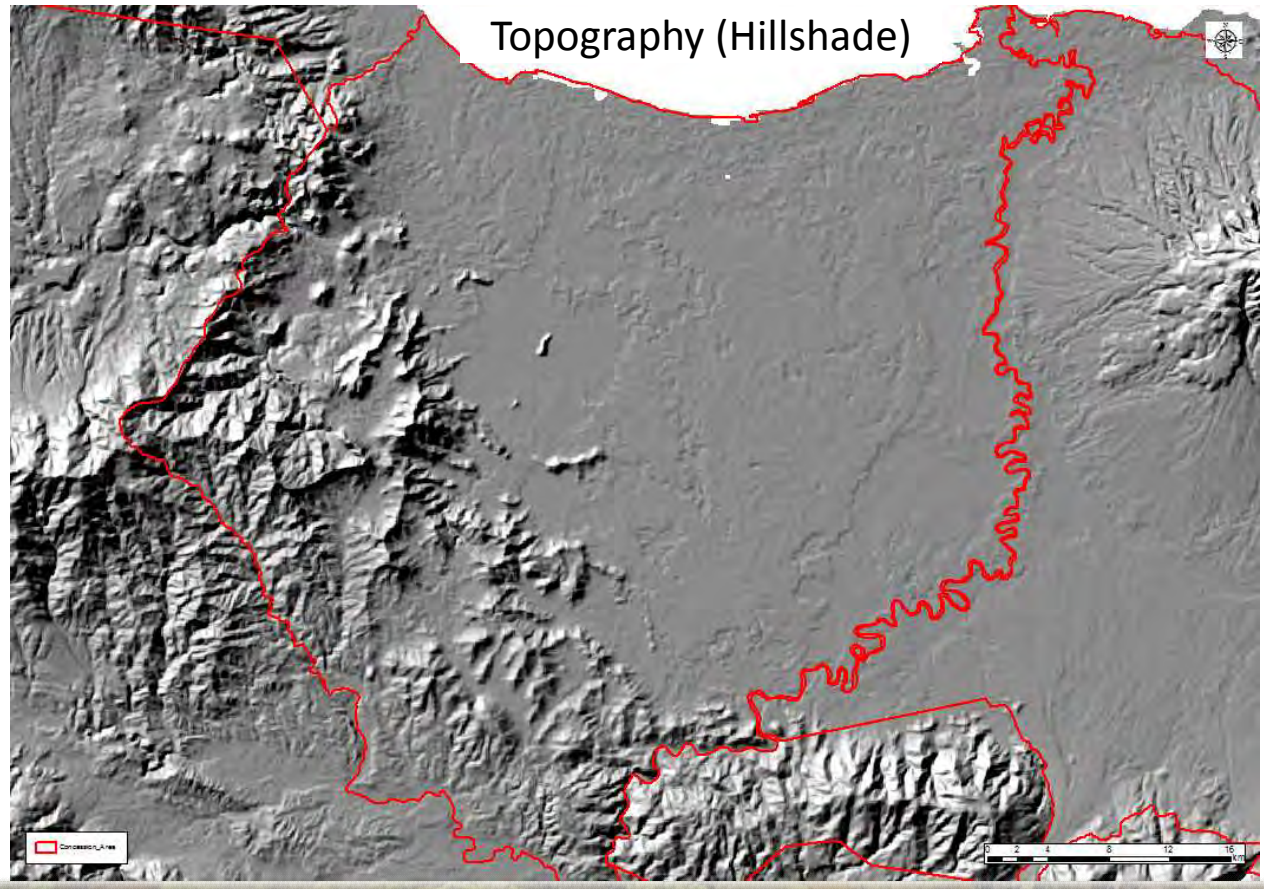
Forest BaseMap with 10m Contour & FCA



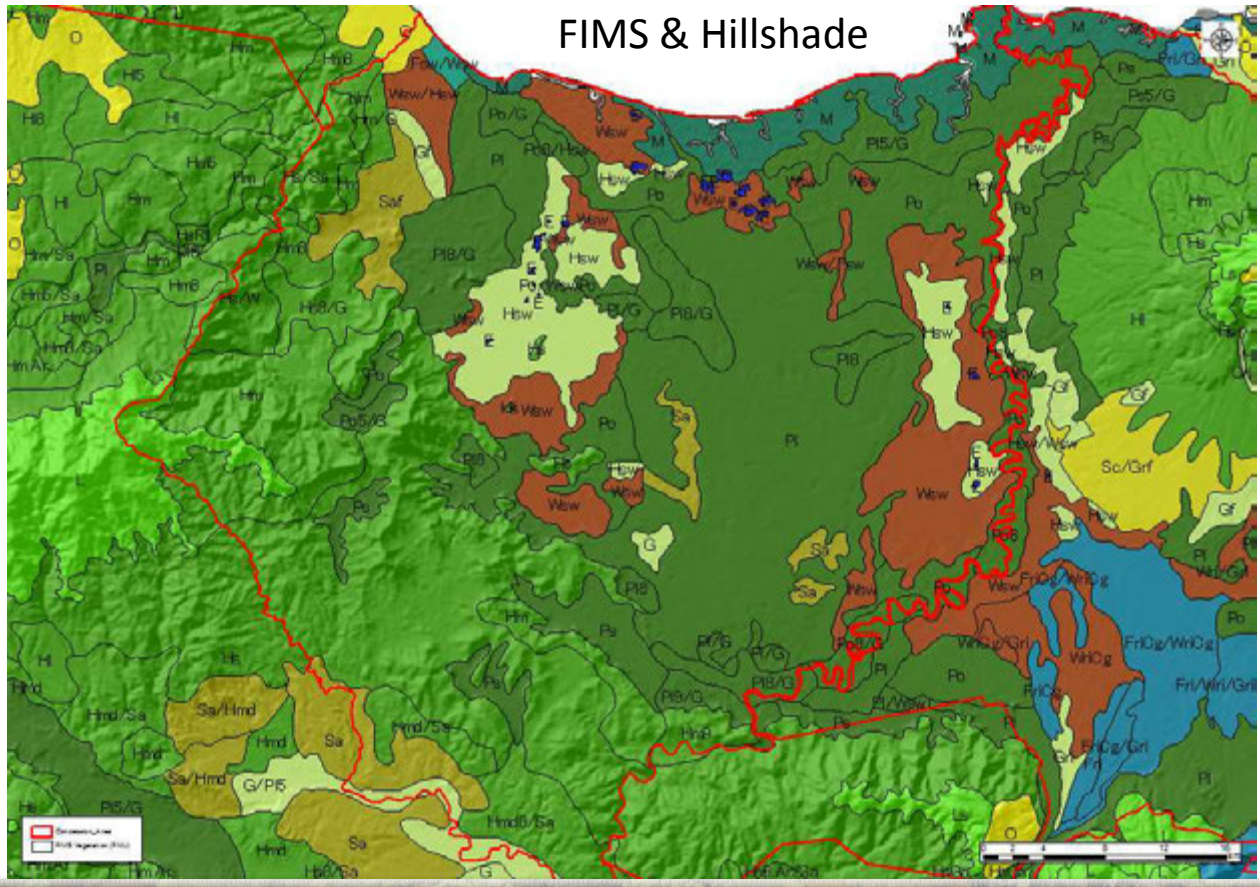
Demonstration: Existing FIMS



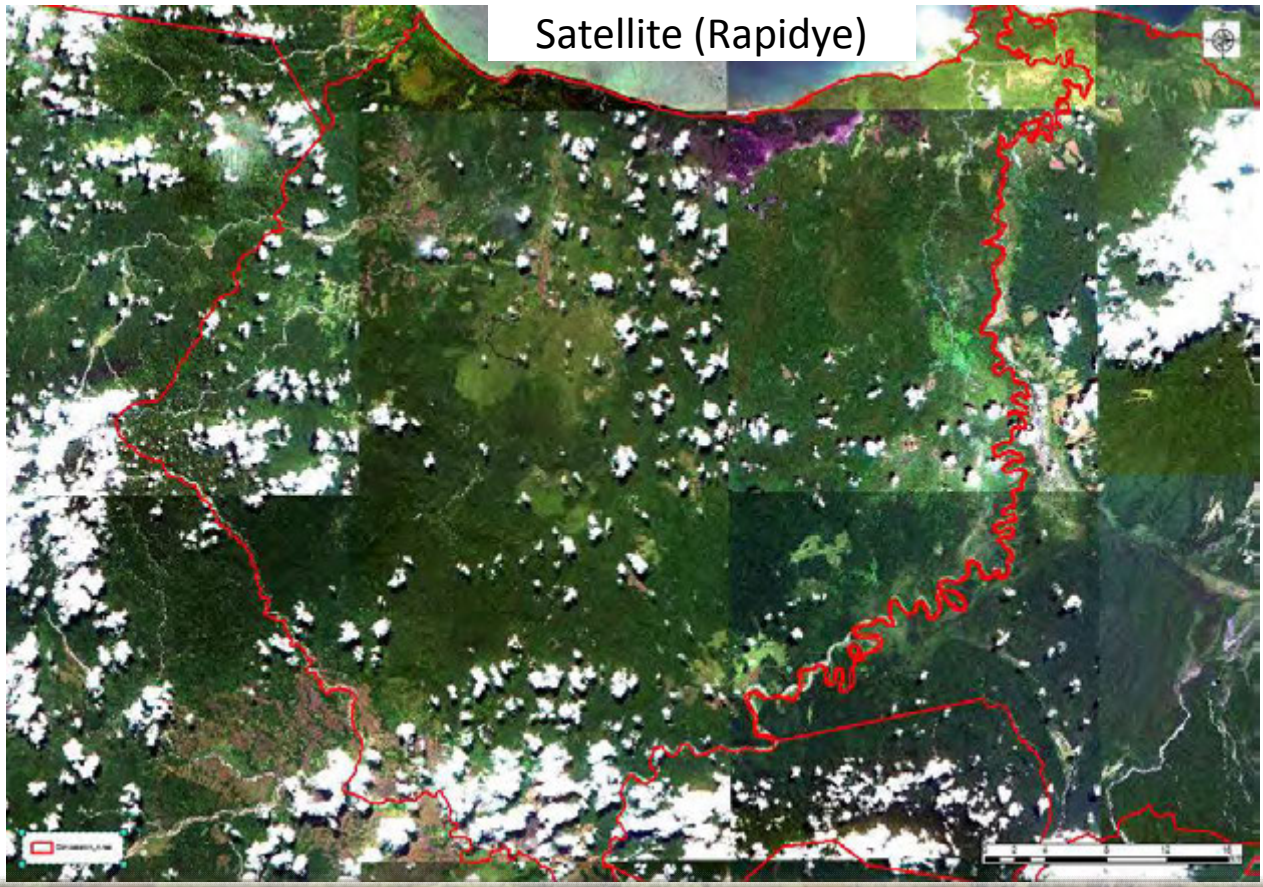
Topography (Hillshade)



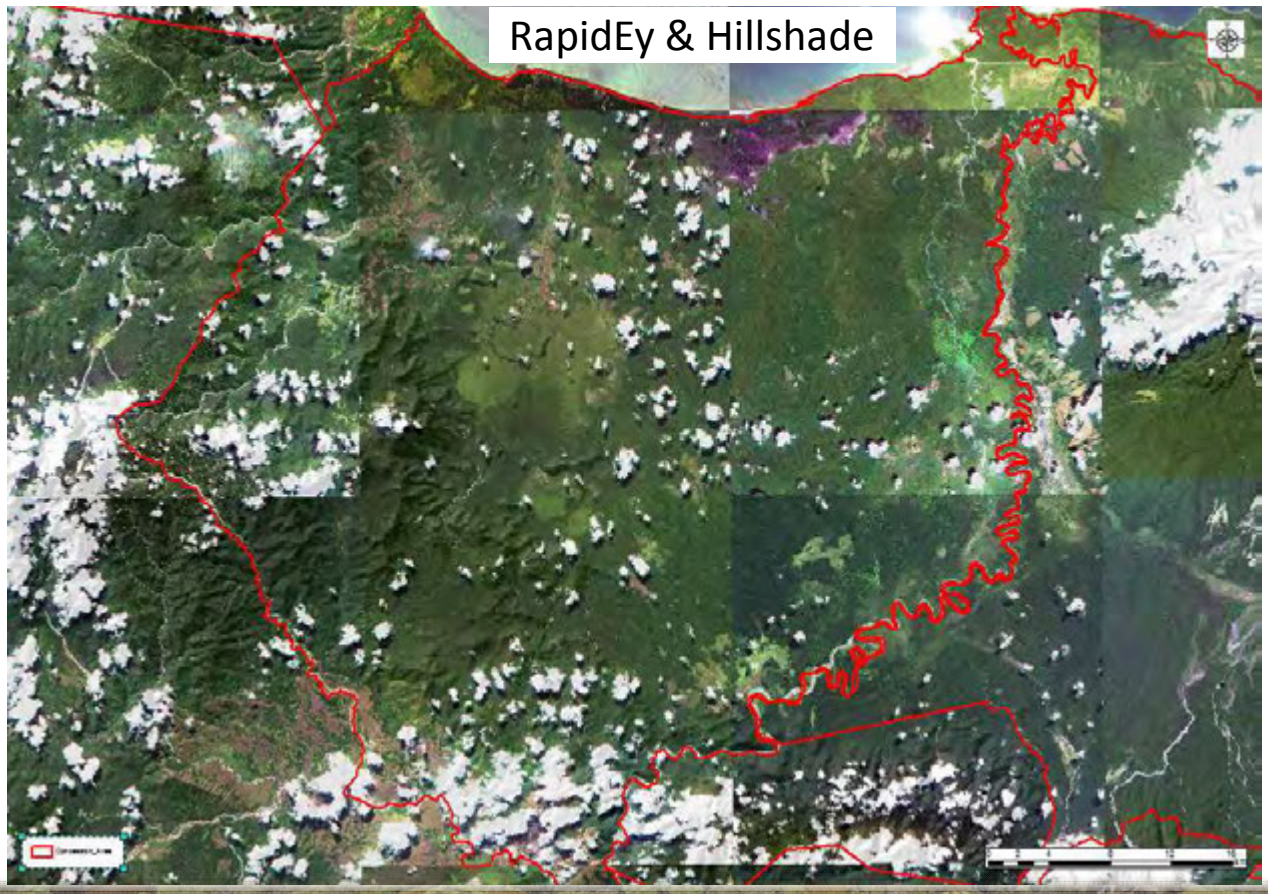
FIMS & Hillshade



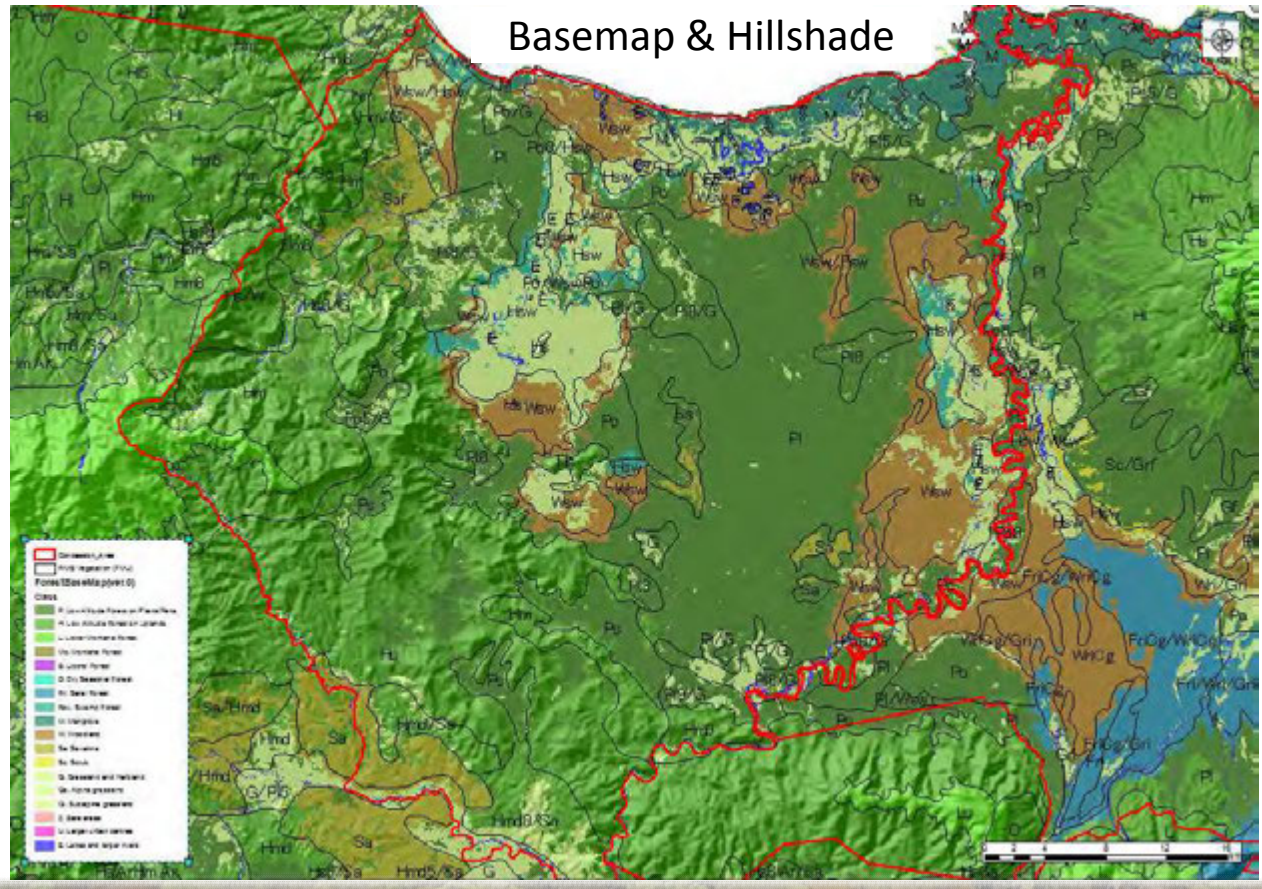
Satellite (Rapidye)



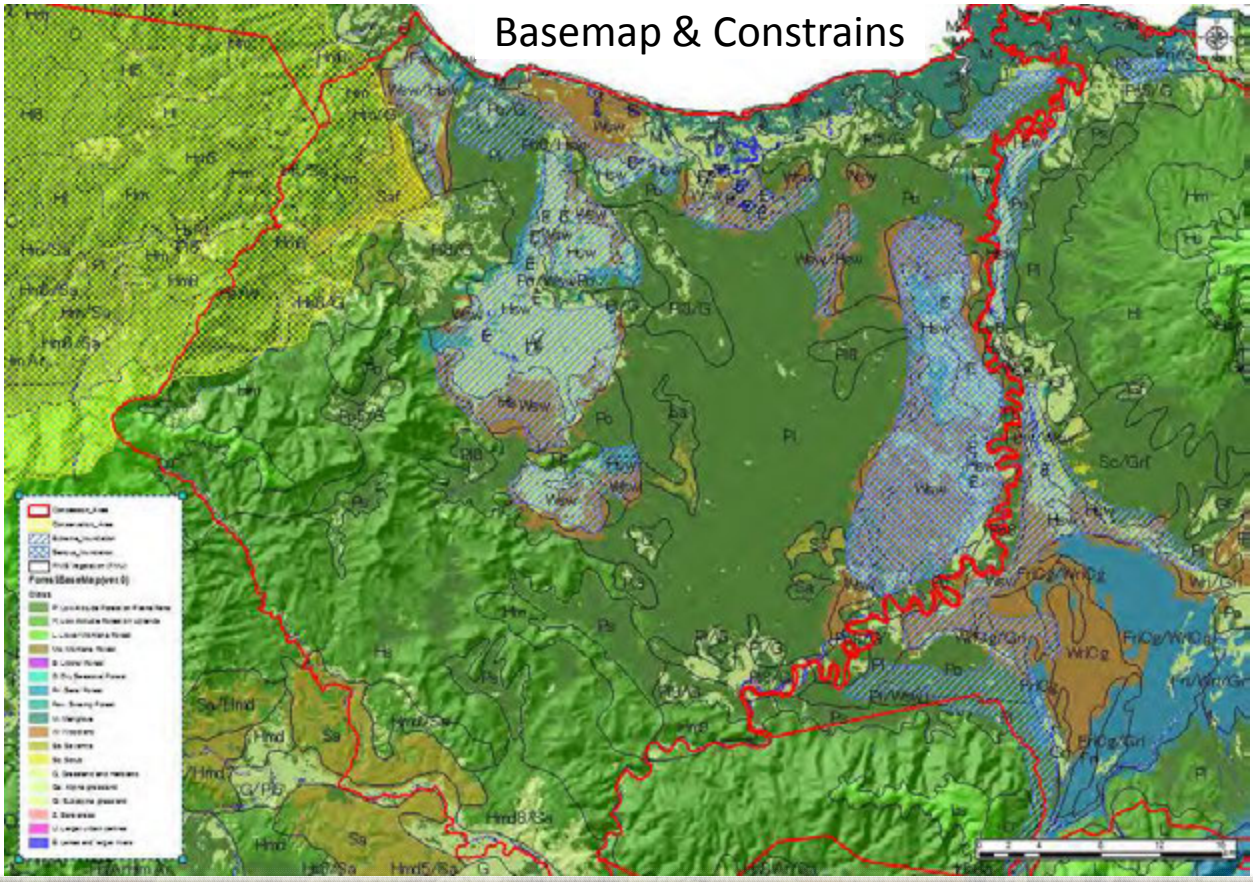
RapidEy & Hillshade



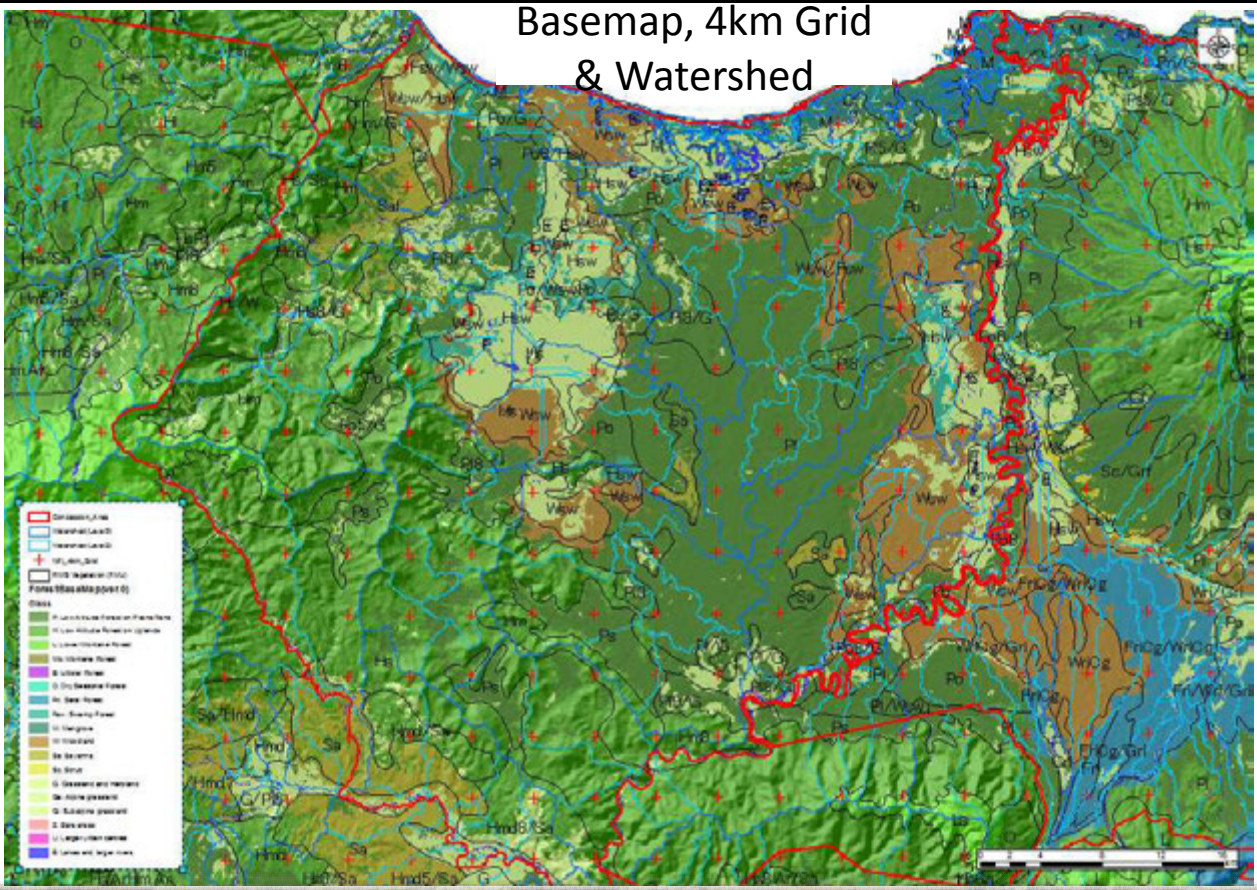
Basemap & Hillshade



Basemap & Constrains



Basemap, 4km Grid & Watershed



Current Progress of FCA GIS Work (1/2)

Project	FCA_Id	Type	Term	Area (ha)	FCA
Mekeo Hinterland Integrated Agriculture	1	03(b)		116,427	03-01
Kerema Meporo Agro-forest	2	03(b)		89,000	
Gre-Drimgas Road	3	02(b)		2,000	
Yumi Agro-forest	4	03(b)		115,000	
Abeda Integrated Agriculture	5	03(b)		11,700	03-02
Tufi Wanigela Tree Farming	6	03(b)	4 yrs	5,552	05-01
Musa Pongani Integreated Agro-forest	7	03(b)		350,000	
Wanigela Integrated Agriculture	8	03(b)	10 yrs	38,350	05-02
Aitape East Integrated Agriculture	9	03(b)		29,205	10-01
Aitape West Integrated Agriculture	10	03(b)	10 yrs	47,626	10-02
Bewani Oil Palm Development	11	03(b)		139,909	10-03
Scotchiao Cocoa Estate Development	12	03(b)		6,114	10-04
Walsa Integrated Agro-forestry	13	03(b)		34,400	
Wewak Turubu Integrated Agriculture	14	03(b)		121,000	11-01
Angoram (Marianberg) Integrated Agriculture	15	03(b)		25,600	11-02
Wasab Amal Forest TA	16			632,171	
Wasab State Plantation	17				
Guam TA	18				
Usino TA	19				
Garinam TA	20				
Bugaty TA	21				
Mavak TA	22				
Akamkus TA	23				
Mungem TA	24				

Completed

Current Progress of FCA GIS Work (2/2)

Project	FCA_Id	Type	Term	Area (ha)	FCA
Baisarik TA	25				
Waria Roadline TA	26				
Tainameo TA	27				
Asalum TA	28				
Denford TA	29				
Oomsis Block 5	30				
Semin TA	31				
Headshump TA	32				
Keroko Susuam TA	33				
Suluwa TA	34				
Lolobau Integrated Agriculture & Infrastructure	35	03(b)		146,524	
Fullbourne Extension TA	36				
Balolo Mini Estate	37				
IIIi-Wawas Roadline	38	02(b)	20 yrs		15-01
IIIi-Wawas Integrated Agriculture	39	03(b)	20 yrs	38,500	15-02
IIIi Standalone Agriculture	40	03(b)	4 yrs	10,400	15-03
Inland Lassul Baining Integrated Agriculture	41	03(b)	10 yrs	30,830	15-04
Suikol-Makolkol Integrated Agriculture	42	03(b)	8 yrs	52,000	15-05
Toriu Integrated TA	43				
Rangulit TA	44				
Mukus Melkoi Integrated Agriculture	45	03(9b		68,300	
Danfu Integrated Agriculture	46	03(a)	5 yrs	24,851	16-01
Central New Hanover	47	03(b)	10 yrs	56,592	
Tabut Mamirum Integrated Agriculture	48	03(b)	5 yrs	11,864	

10/48 of FCAs captured as GIS Boundary

Summary

- PNGFA is mandated to manage FMA, TRP, and LFA. FCA is outside of its jurisdiction. But due to common critics from outside stakeholders, PNGFA using its capacity developed by JICA/Grant Aid Projects worked beyond the scope of the Projects.
  - FCA boundaries and basic information are being developed as GIS information in PNGFA
  - Creating FCA GIS data, C/P utilize GIS capacity and equipment supported by JICA/Grant Aid
- PNGFA will continue to address the FCA boundaries issues. (This capacity is now available in PNGFA.)
- FCA GIS and monitoring capacity with Forest Basemap enables proper forest monitoring

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Achievements of the Current Project - Output One -

Constin Otto Bigol

JICA PNGFA Project Manager
Manager, Mapping and Inventory
Forest Policy and Planning Directorate
PNGFA

Contents

1. Expected Output 1 and activities
2. Achievement of Output 1 measured by Indicators
3. Issues to be addressed

1. Expected Output 1 and activities

- Expected Output 1: Nation-wide forest base map is developed by using remote sensing technology.
- Activities under Output 1:
  a. Analysis on current use of remote sensing data in forestry sector
  b. Basic design of remote sensing analysis
     ✓ Definition of forest (1)
  c. Analysis of remote sensing data (Preliminary, secondary)
  d. On-site checking of the analysis : 6 Trips
     ✓ Ground Truth (3)
  e. Development of nation-wide forest base map (2)
     ✓ Agriculture land use (4)
  f. Training for above (a) to (e)
- Activities more than expected(!)
  ✓ Field verification of FCA site using base map information (5)

2. Achievement of Output 1 measured by Indicators

✓ Achievement of Output 1
- Nation-wide forest base map is improved by using remote sensing technology.

✓ Indicators
1. Nation-wide forest base map is developed by using remote sensing data
   Achieved (but further improvement is needed)
2. Manuals and workflow design documents for preparing, utilizing and managing the forest base map are prepared
   Achieved
3. More than 10 officers become capable of preparing and managing nation-wide forest base map
   Achieved
4. Workshops for the developed nation-wide forest map are held and 70% of the participants consider the workshops useful
   To be achieved (surely, by your support!)

Modified from 'Summary of Terminal Evaluation' by PNG-Japan Joint Evaluation Team

3. Issues to be addressed

Schedule of the Plan of Operation of the Project might not be realistic. More inputs were needed for improving forest base-map.

Source: 'Summary of Terminal Evaluation' by PNG-Japan Joint Evaluation Team

→ Elements for project activities under new Project Output One.

✓**The PNG Forest Resource Information Management System (PNG-FRIMS) is expanded and enhanced**

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Output One, Basemap ver. 1 developed. Congratulations to the JICA PNGFA Project team! ☺

Thank you
Tenkyu tru
Arigatou gozaimashita

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From the People of Japan

Improvement of FIPS (Forest Inventory Processing System)

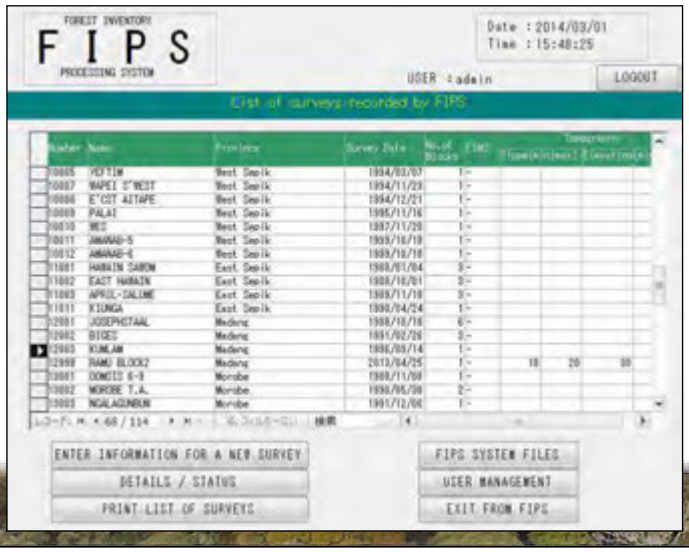
Prepared by JICA/PNGFA

Yasuyuki Okada (JICA)
Ledino Saega (PNGFA)

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

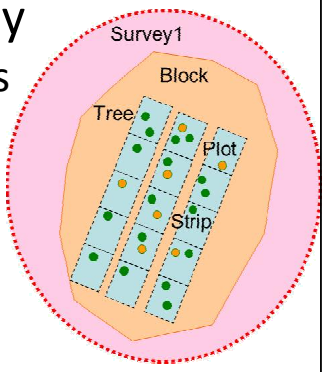
Overview of FIPS (Forest Inventory Processing System)

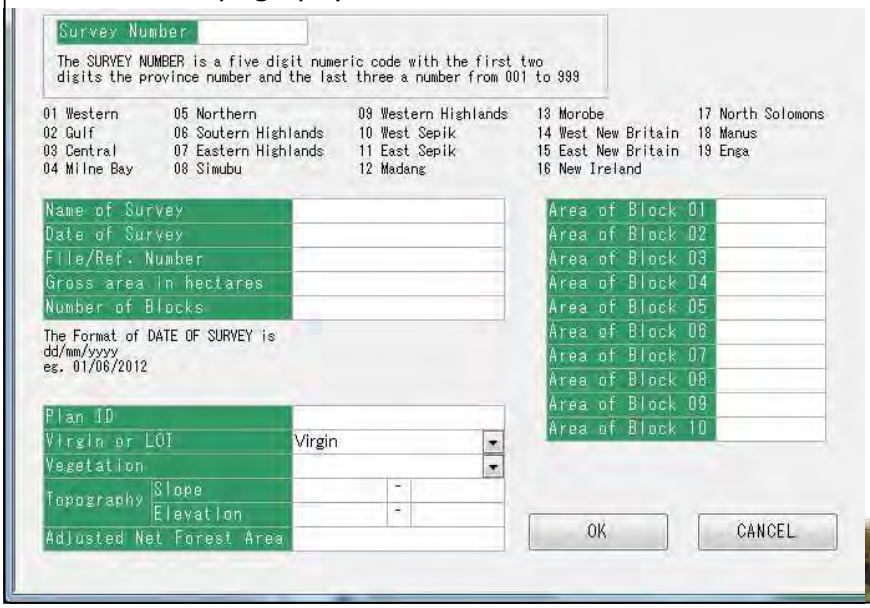
- FIPS is a simple computer system to process PNG inventory assessments of natural forest.
- FIPS was developed and first used in 1986 to processed inventory assessment data.
- JICA undertook the review and update of FIPS since the project started in March 2011 to present.
- FIPS is now Improved Functional and running.



Basic Function : Edit the details of field survey

- FIPS has the following data on field survey, such as
  - Name of survey
  - Date of the survey
  - Gross area of resource area in hectares
  - Number of block, Area of each block in hectares
  - Topography etc.



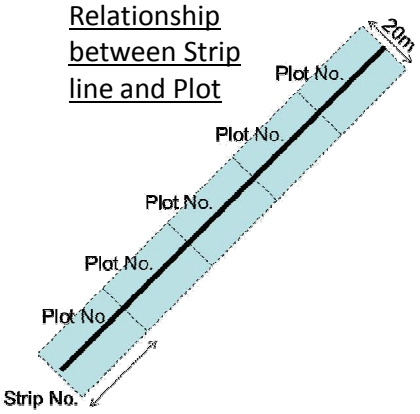


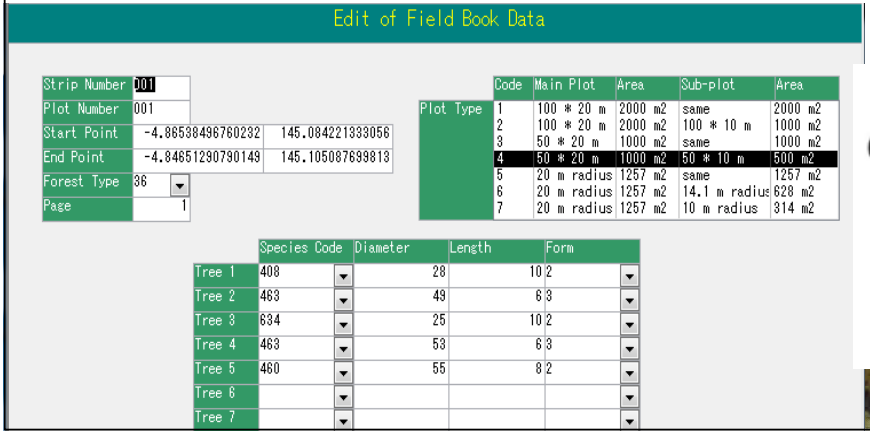
There are two areas of survey.
a) Virgin : For new area
b) LOI : (Logged Over Inventory)
- In logged over area

Basic Function : Edit the field book data

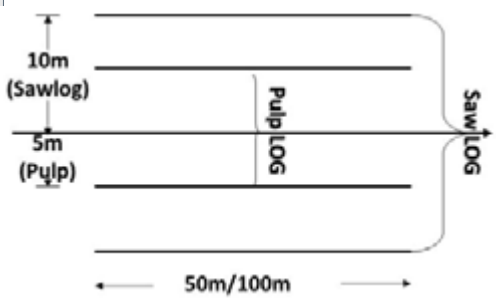
- FIPS has the following data on each tree surveyed, such as
  - Strip number, Plot number
  - Forest Type : Combination of topography and dominant species
  - Plot Type : plot sizes used for collection of field information
  - Species Code, Diameter, Length : for each tree
  - Form : The tree stem form classes are denoted by ranking between Form A – F based on the straightness of the bole

Relationship between Strip line and Plot



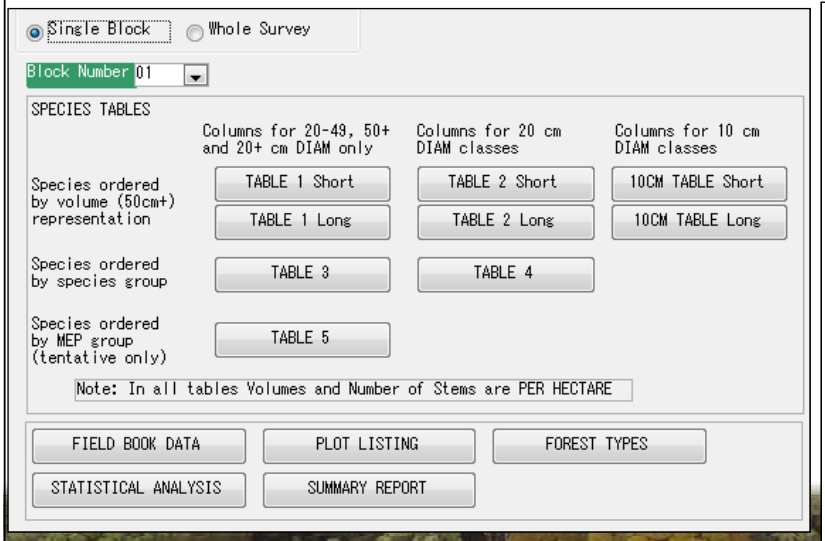


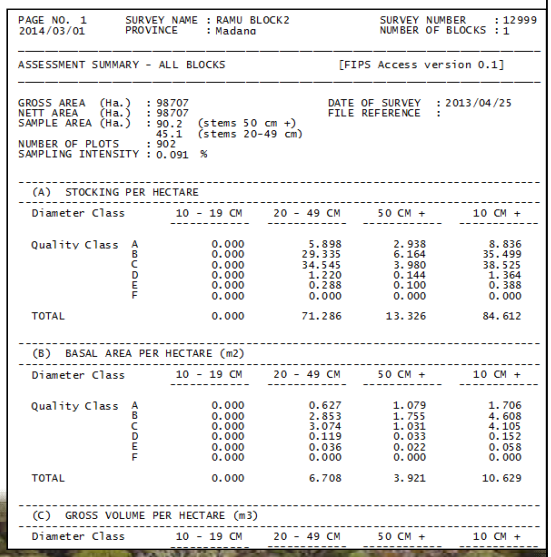
Plot size



Basic Function : Process field book data and make reports

- FIPS can make several reports by using the field book data
- The type of reports are
  - Assessment Summary which shows “Stocking per ha”, “Basal area per ha ” and “Gross Volume per ha”
  - Species Listing in order of volume representation in the assessment.





Point of improvement of FIPS

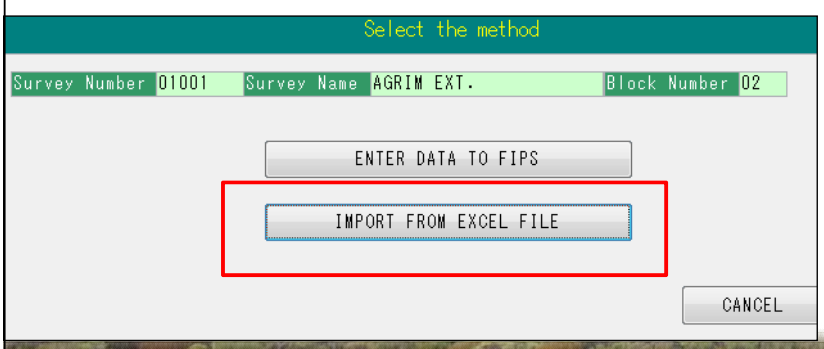
1. Import spreadsheet of field survey result

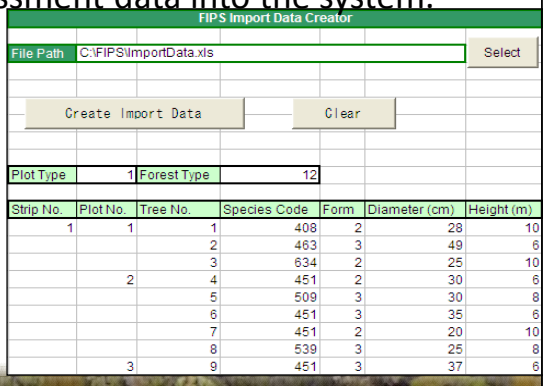
Before the project

- Old FIPS had only one way of data entry into the system; that is by direct entry.
- Some results of survey were managed in excel spread sheet.

Achievement

- New FIPS makes it possible to import field book data from excel spread sheet, which makes it easier to update the FIPS database.
- New FIPS still maintains direct entry of assessment data into the system.





Point of improvement of FIPS

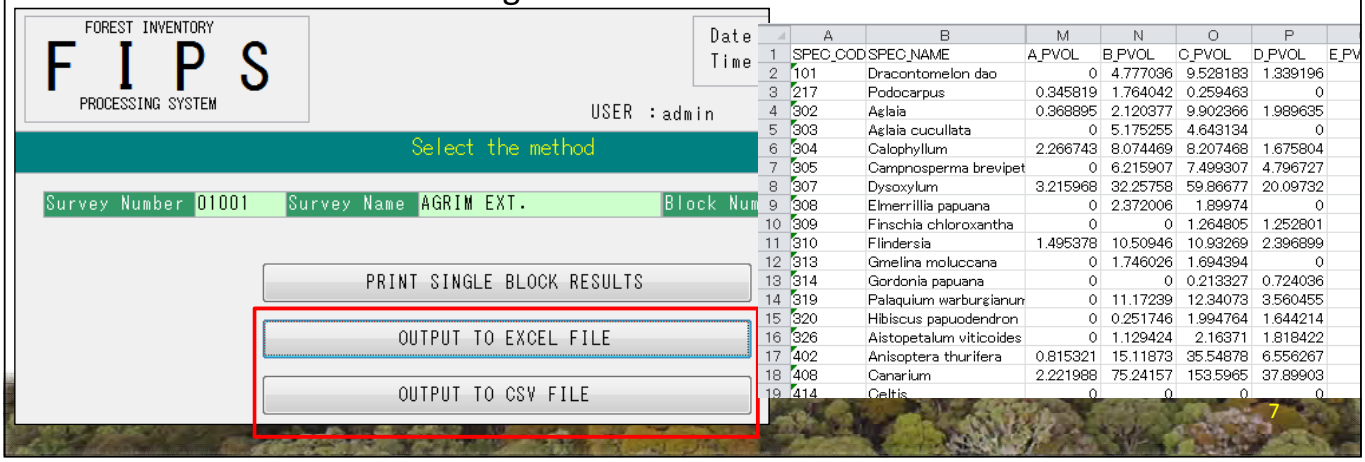
2. Output reports to excel and csv format

Before the project

- Old FIPS only made hard copy of reports processed by old FIPS. It was not enough to make good use of FIPS data.

Achievement

- New FIPS makes it possible to export processed FIPS data to excel and csv format, which makes it easier for staff who is interested in FIPS data to do further analysis and summarize forest marketable volume in each species, diameter of tree and log form.



	A	B	M	N	O	P
1	SPEC_COD	SPEC_NAME	A_PVOL	B_PVOL	C_PVOL	D_PVOL
2	101	Dracontomelon dao	0	4.777036	9.528183	1.339196
3	217	Podocarpus	0.345819	1.764042	0.259463	0
4	302	Aglaia	0.368895	2.120377	9.902366	1.989635
5	303	Aglaia cucullata	0	5.175255	4.643134	0
6	304	Calophyllum	2.266743	8.074469	8.207468	1.675804
7	305	Campnosperma brevipet	0	6.215907	7.499307	4.796727
8	307	Dysoxylum	3.215968	32.25758	59.86677	20.09732
9	308	Elmerrillia papuana	0	2.372006	1.89974	0
10	309	Finschia chloroxantha	0	0	1.264805	1.252801
11	310	Flindersia	1.495378	10.50946	10.93269	2.396899
12	313	Gmelina moluccana	0	1.746026	1.694394	0
13	314	Gordonia papuana	0	0	0.213327	0.724036
14	319	Palaquium warburgianum	0	11.17239	12.34073	3.560455
15	320	Hibiscus papuodendron	0	0.251746	1.994764	1.644214
16	326	Aistopetalum viticoides	0	1.129424	2.16371	1.818422
17	402	Anisoptera thurifera	0.815321	15.11873	35.54878	6.556267
18	408	Canarium	2.221988	75.24157	153.5965	37.89903
19	414	Celtis	0	0	0	0

Point of improvement of FIPS

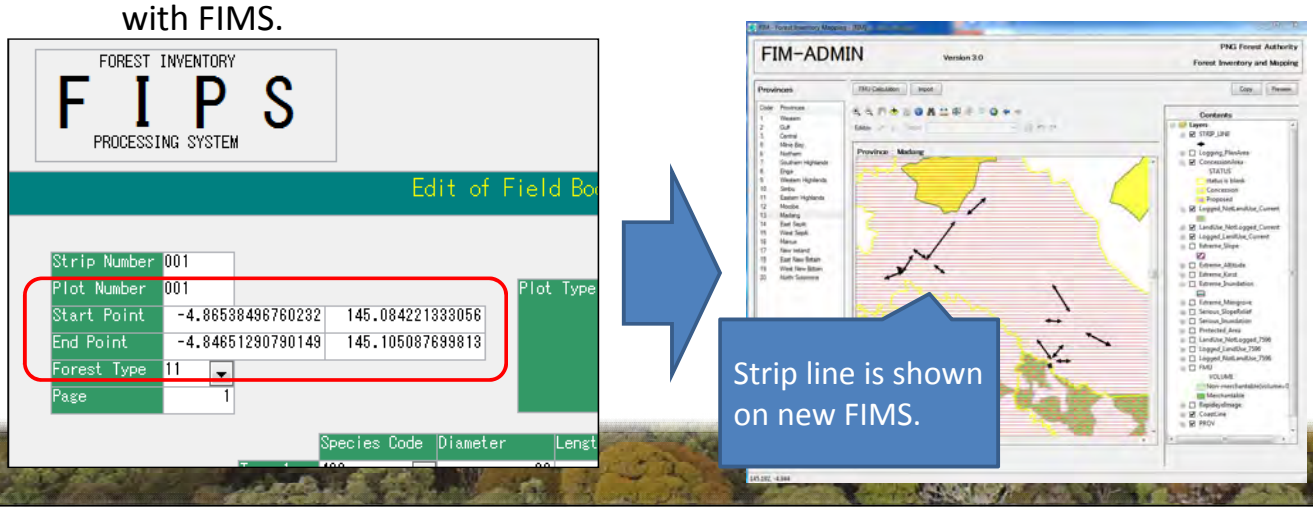
3. Enter GPS coordinates of strip line

Before the project

- Old FIPS did not have spatial information about field survey. It was not enough to analyze data spatially with FIMS data.

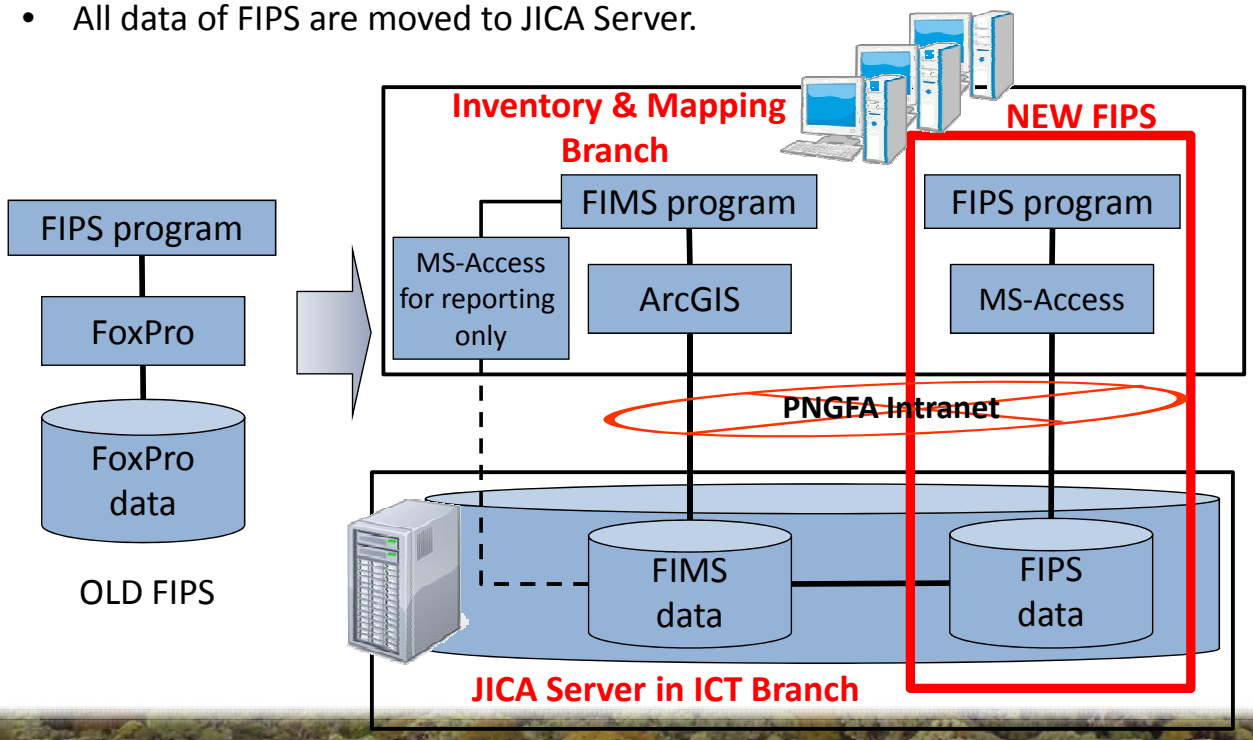
Achievement

- New FIPS makes it possible to enter GPS coordinates of strip line, which makes it possible to see the strip line stored in FIPS database on FIMS Map.
- It also makes it possible to compare estimated forest volume from FIPS with FIMS.



System architecture of New FIPS

- PNGFA & JICA have converted FIPS from the outdated FOXPRO software into a Microsoft Access database.
- All data of FIPS are moved to JICA Server.



Future Tasks

- Update species code, name and Mep (minimum export price classes - log export) Group
  - The database of species names, codes and Mep Group in FIPS need to be updated regularly to reflect any amendments or changes, but new FIPS have not been updated in the past
  - Addition of new species to the current list as they become better known

Summary

- PNGFA & JICA have converted FIPS from the outdated FOXPRO software into a Microsoft Access database.
- PNGFA and JICA added new FIPS functions.
  - Import spreadsheet of field survey result
  - Output reports to excel and csv format
  - Enter GPS coordinates of strip line
- It enables us to make good use of FIPS database.

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Thank you

Tenkyu tru

Arigatou gozaimasu

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Improvement of FIMS (Forest Inventory Mapping System)

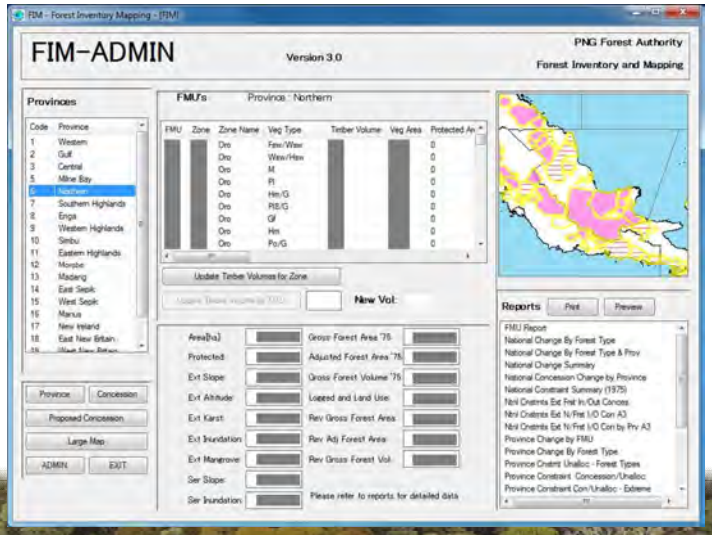
Perry Malan

GIS team for JICA Project

Inventory & Mapping/PNGFA

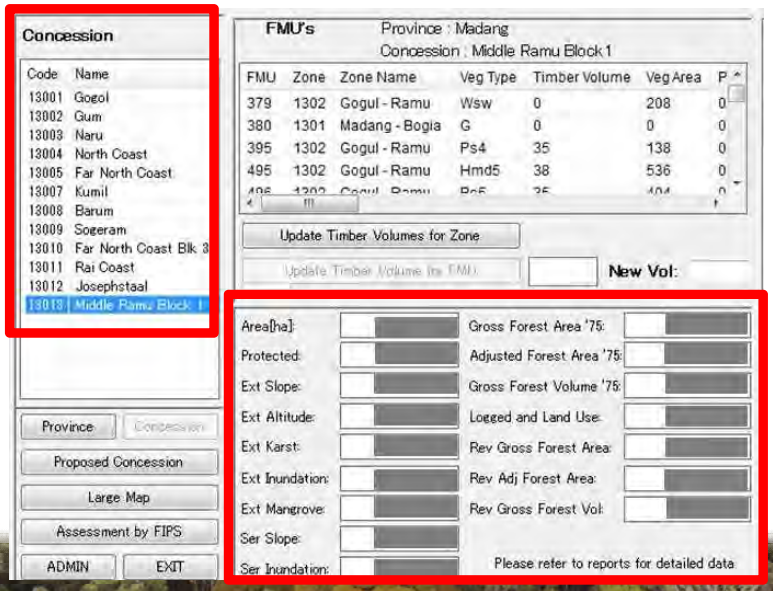
Overview of FIMS(Forest Inventory Mapping System)

- The Forest Inventory Mapping (FIM) system has been developed to provide a consistent and country wide set of information on the type and extent of the forest resource and of its current use by the forest industry in PNG.
- FIMS provides maps such as Concession area, Logged over area, forest areas with physical limitations (slope, altitude, inundation, karst, mangrove) , and FMU (Forest mapping unit is an area of forest or other vegetation) , etc.
- FIMS also provides merchantable forest volume in each province and in each concession area.



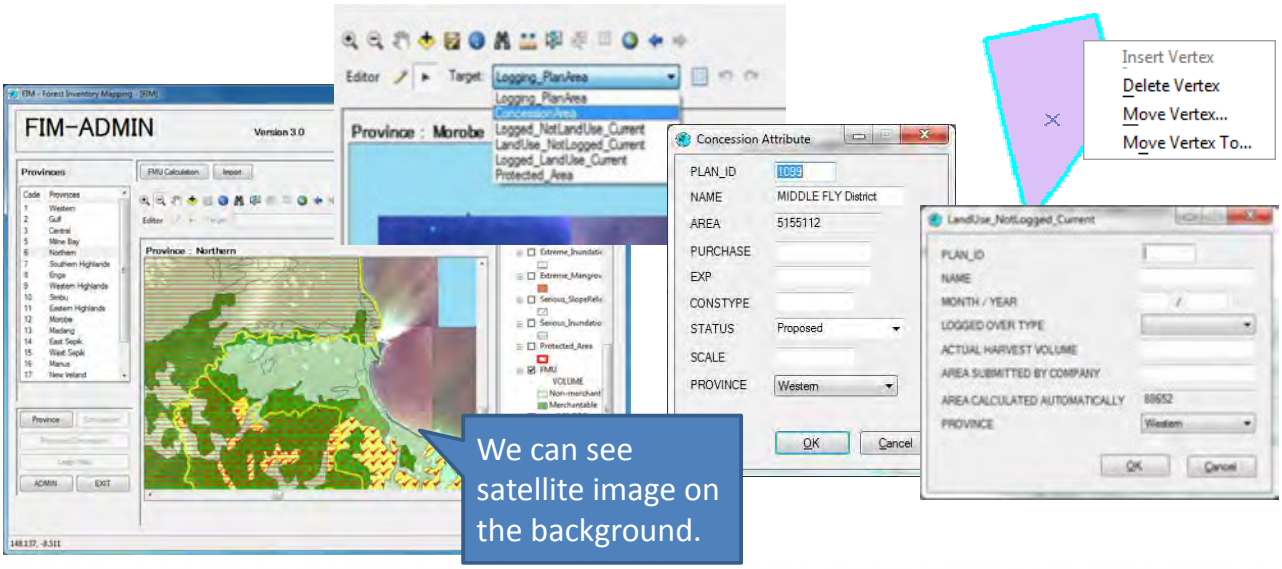
Basic Function : Estimate the Forest volume

- FMU is the most important data in FIMS. Each polygon of FMU has a timber volume (cu m / ha) and an area, which enable FIMS to estimate forest volume.
- FIMS can also estimate forest volume in each concession area by overlaying FMU map and Concession Area map.



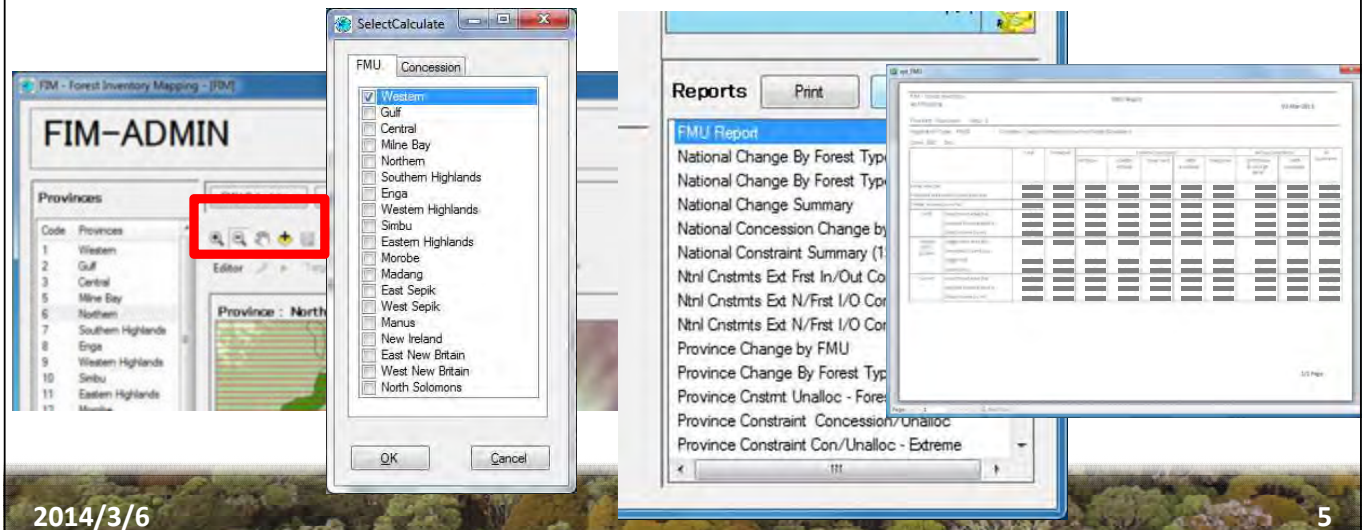
Basic Function : Digitize and compile map

- FIMS can update the following map data, such as
  - Concession area
  - Logged over area (changed from forest to settlement, plantation, etc.)
  - Protected area etc.



Basic Function : Process and make reports

- FIMS can make several reports by using map data
  - After updating map data, FIMS need to calculate to update forest volume.
- The type of reports are following list, such as
  - National Reports: National change By Forest Type, etc.
  - Province Reports: Province change by FMU, Province Resource, etc.
  - Concession Reports: Concession change by FMU, constraint summary, etc.



Point of improvement of FIMS

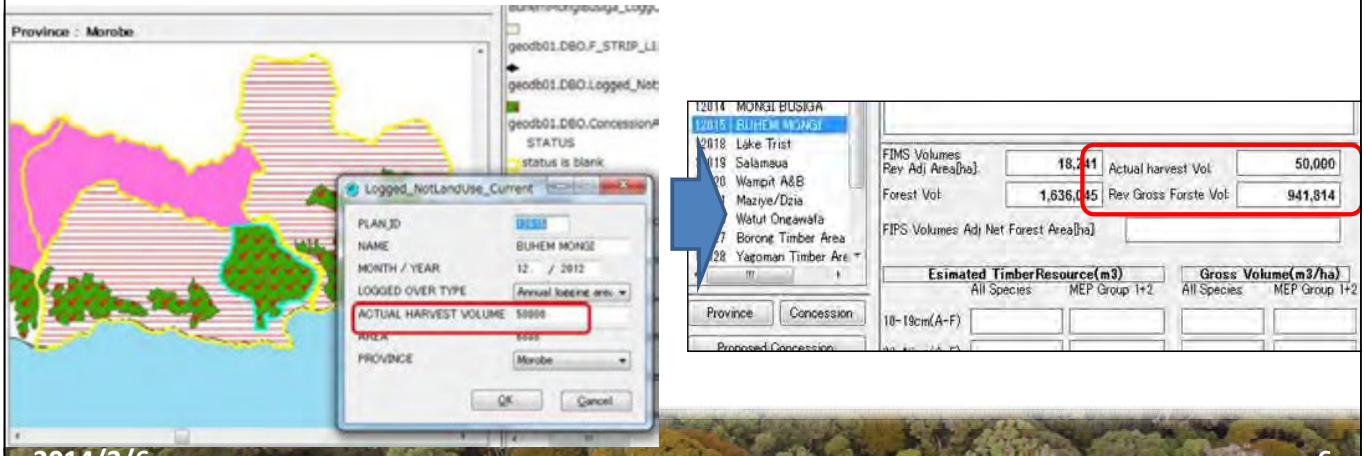
1. Enter the actual harvest volume

Before the project

- Old FIMS could not record the actual harvest volume reported in an annual logging plan. It was not enough to recognize a current situation about concession area.

Achievement

- New FIMS makes it possible to enter the actual harvest volume reported by company, which makes it more useful to compare an actual harvest volume with estimated volume.



Point of improvement of FIMS

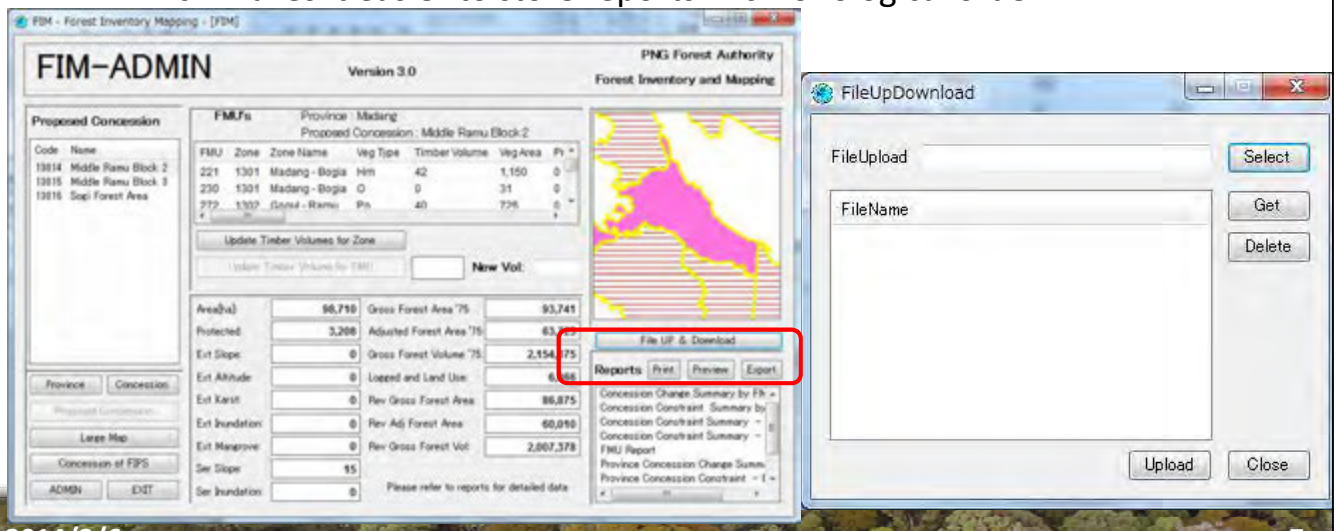
2. Upload associated files with concession area

Before the project

- Past reports printed by old FIMS had been stored as hard copy. It wasted space to store past reports and was too difficult to find them.

Achievement

- New FIMS makes it possible to upload reports from new FIMS to server, which makes it easier to store reports in chronological order.



Point of improvement of FIMS

3. Import FIPS database

Before the project

- It was difficult to compare forest volume estimated by FIMS with forest volume estimated by FIPS.

Achievement

- Since new FIPS records coordinates of strip line, new FIMS can import FIPS data, which makes it possible to integrate FIMS and FIPS database.

From FIMS

From Logging Company

From FIPS

FIMS Volumes

Rev Adj Area [ha]:	245,211	Actual harvest Vol:	1,123,456
Forest Vol:	9,245,211	Rev Gross Forest Vol:	8,123,456

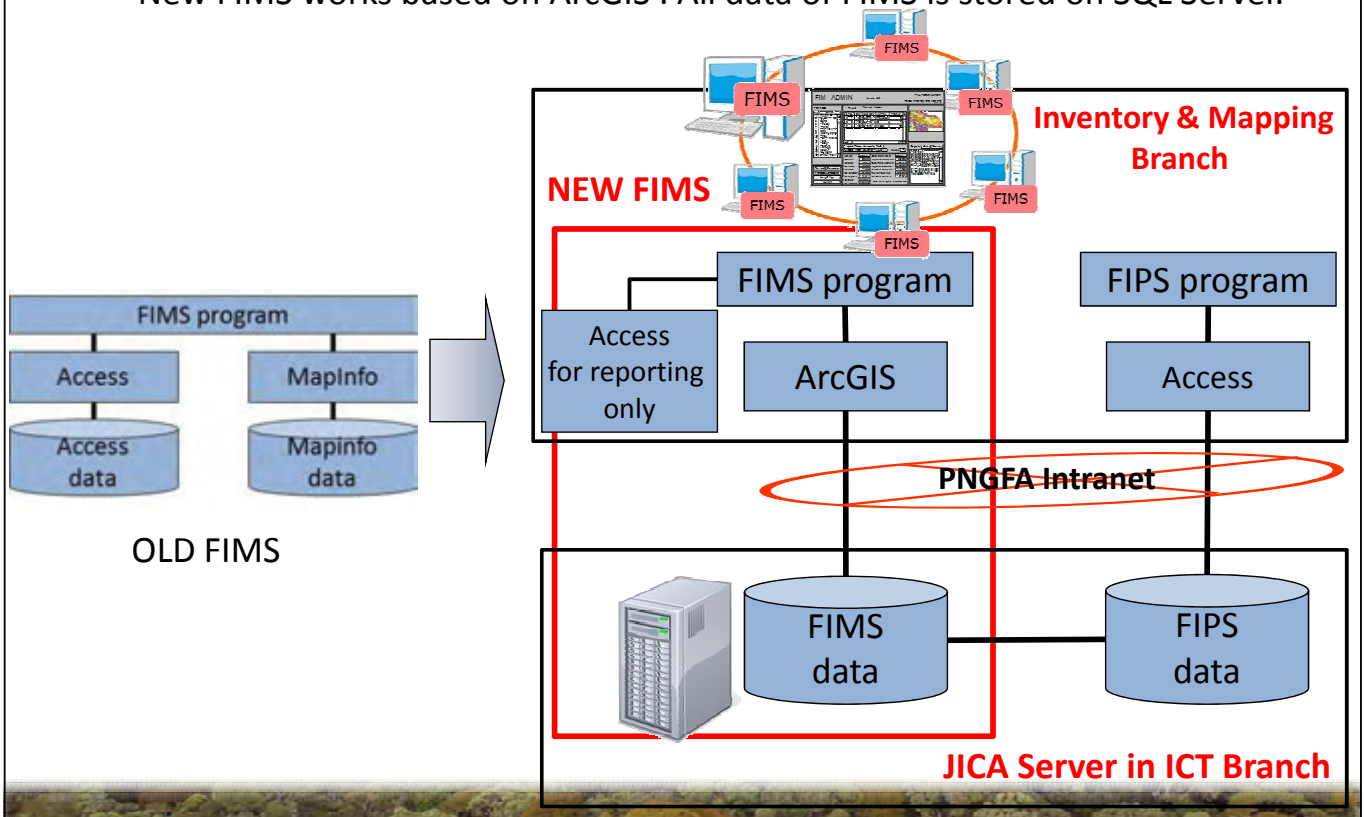
FIPS Volumes

Adj Net Forest area [ha]: 205,211

Esimated TimberResource(million m3)			Gross Volume (m3/ha)	
	All species	MEP group 1+2	All spe	MEP grp 1+2
10-19cm (A-F)	9,845,211	9,845,211	45	45
20-49cm (A-F)	9,845,211	9,845,211	30	30
50cm + (A-F)	205,298	205,298	30	30
Total	9,238,410	9,238,410	60	60
50cm + (A-C)	12,596	12,596	20	20

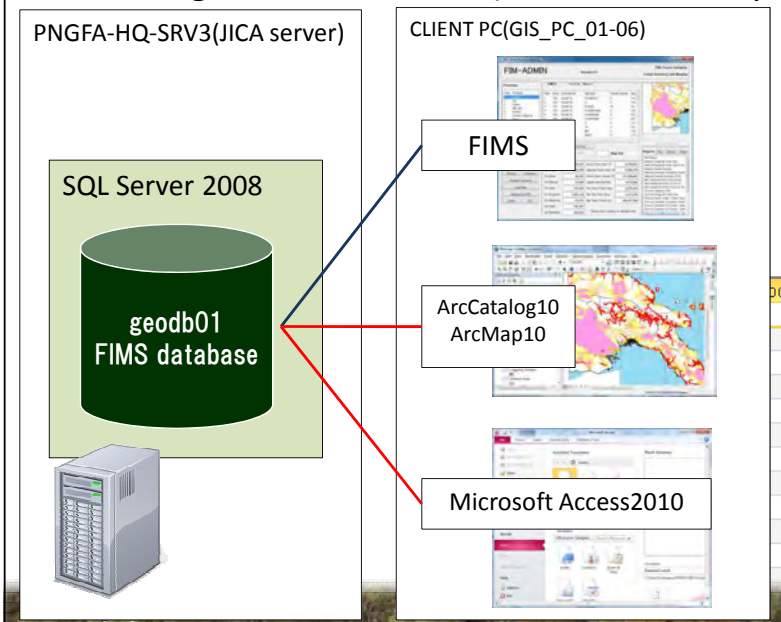
System architecture of New FIMS

- New FIMS works based on ArcGIS . All data of FIMS is stored on SQL Server.



Advanced use of FIMS database

- The data of the new FIMS are stored in JICA Server as the database of SQL Server. We can use the FIMS data by ArcMap10 and Microsoft Access2010 without new FIMS.
- It makes it possible to retrieve specific data and make original reports by using MS Access in SQL (Structured Query Language).



CONCESSIONAREA

PROVINCE	PLAN_ID	NAME	STATUS
1			
	1001	Waimare (Oriomo)	Concession
	1002	Wawoi Guavi Block 1	Concession
	1003	Wawoi Guavi Block 2	Concession
	1004	Wawoi Guavi Block 3	Concession
	1005	Makapa	Concession
	1006	SEMABO	Concession
	1007	EAST AWIN	Concession
	1008	Wipim Tapila FMA	Concession
	1009	Balimo Fly	Proposed

ode	ProvinceName	Vegetation	TotalArea
1	Western	Hm	3140363
1	Western	O	102240
2	Gulf	Hm	1665238
2	Gulf	O	65010
3	Central	Hm	651241
3	Central	O	375449
5	Milne Bay	Hm	283338
5	Milne Bay	O	162728
6	Northern	Hm	407655
6	Northern	O	167366
7	Southern Highlands	Hm	468096
7	Southern Highlands	O	472314

Future Tasks

- Keep updating the FIMS database to follow current situation.
  - We need to digitize logged over area with actual harvest volume from annual logging plan.
- Upload past reports into FIMS database
  - We need to scan the hard copies of past reports on file and save as pdf.
- Get used to SQL (Structured Query Language) to make original reports on our own.

Conclusion

- PNGFA & JICA have developed New FIMS based on ArcGIS .
- PNGFA and JICA added new functions .
  - Enter the actual harvest volume
  - Upload associated files with concession area
  - Import FIPS database
- It enables us to make good use of FIMS database.
- It provides desktop analysis for potential forest area
- It supports decision making process in forest resource planning and management

Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

PNG-FRIMS
-- available data and its use --

Kunihiro ISHII

PNGFA/JICA Project Expert

(in charge of database design)

Kokusai Kogyo Co.,Ltd (KKC)

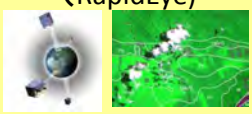
6th March 2014

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

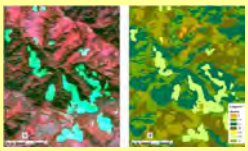
Contents

Concept of PNG-FRIMS

High Frequency Optical Satellite (RapidEye)

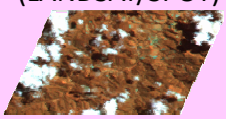


Benchmark MAP

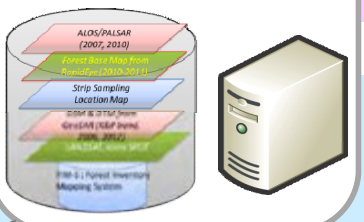


Forest BaseMap

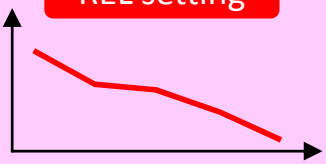
Historical Satellite (LANDSAT/SPOT)



PNG-FRIMS

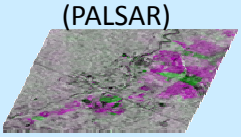


REL setting

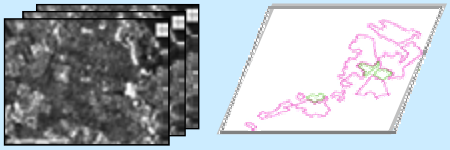


Monitoring for MRV

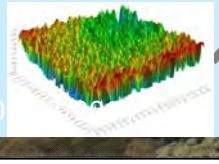
Multi-Temporal SAR (PALSAR)



Temporal Monitoring Change Detection

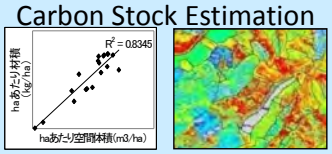


Airborne Data



Field Data

Carbon Stock Estimation



What are ready for?

National Forest Resource Information Management Database

ALOS/PALSAR (2007, 2010)

Forest Base Map from RapidEye (2010-2011)

Strip Sampling Location Map

DSM & DTM from GeoSAR (X&P band, 2006, 2012)

LANDSAT, some SPOT

FIMS: Forest Inventory Mapping System
FIPS: Forest Inventory Processing System

Production report from concessions

PSP Survey, Other projects by NGO/SCO etc.

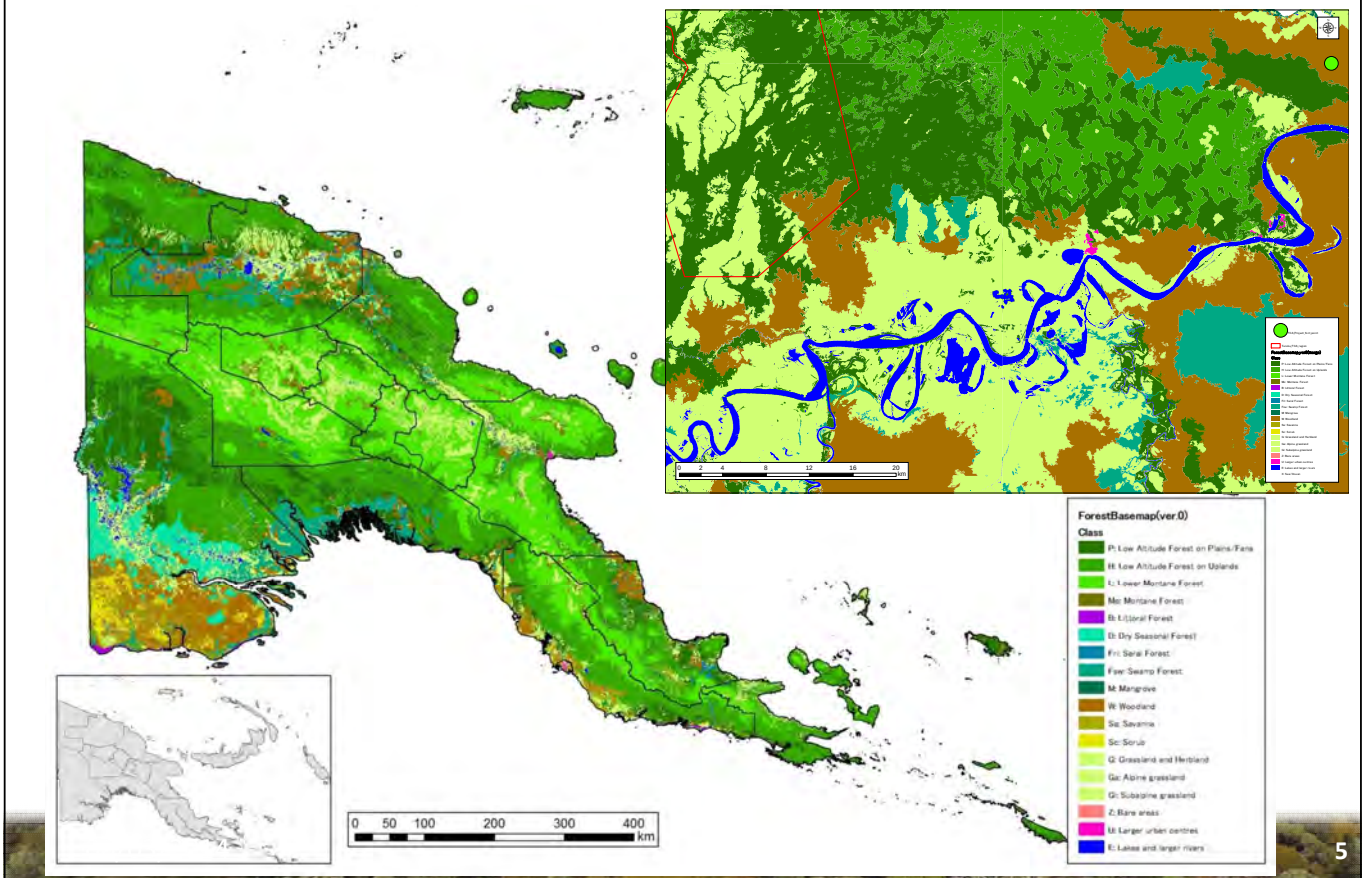
Pre and Post Logging Inventory: FIPS

Multi Purpose National Forest & Carbon Inventory 2013-2015 (EUR 8M UN-REDD/FAO&EU)

Canopy Volume (DSM-DTM)

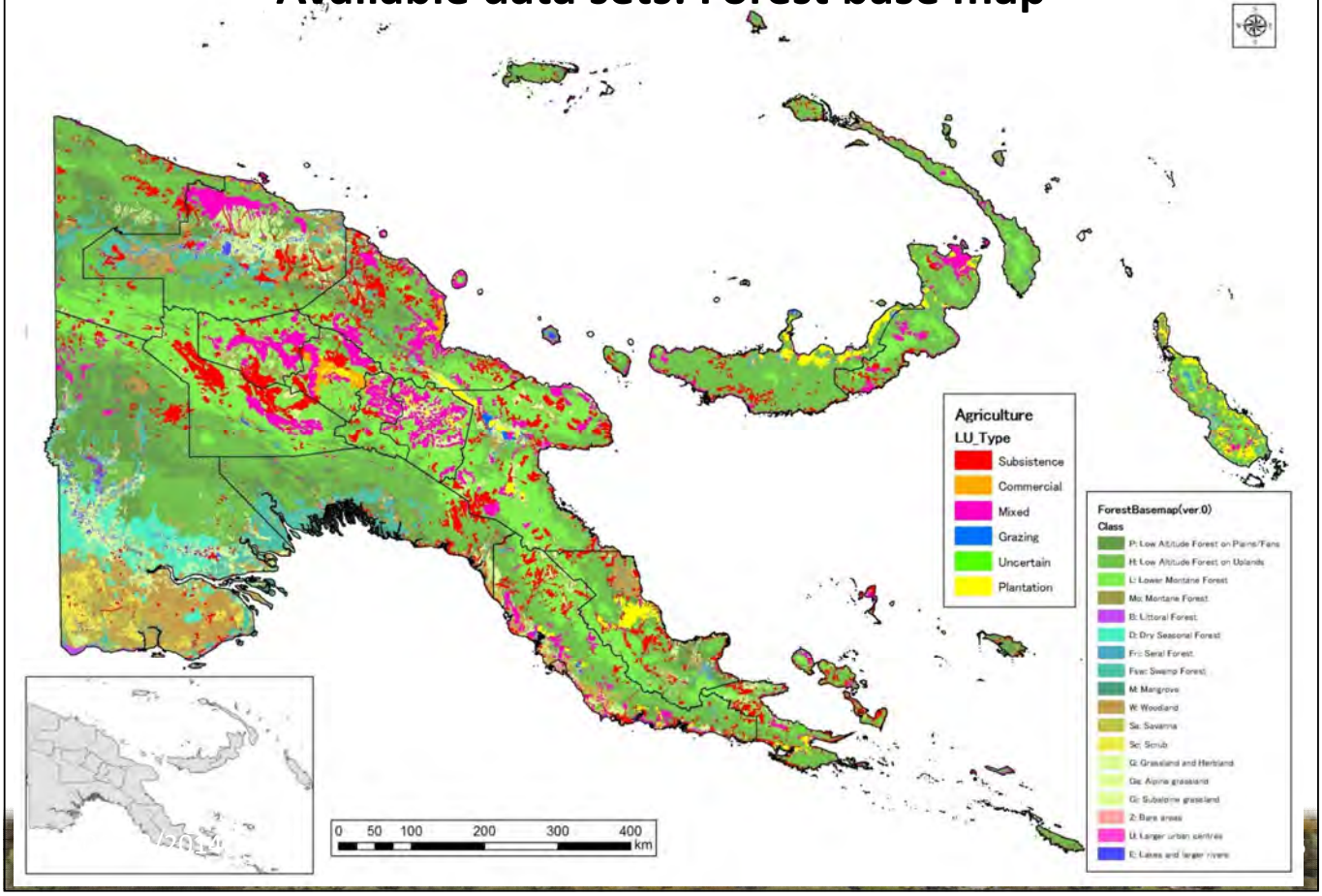
Allometric Eq. (d ⇒G,V, ΣC)?

Available data sets: Forest cover map from RapidEye (2010-2011)

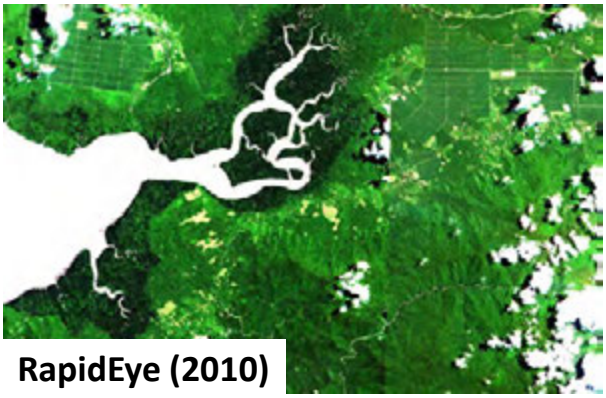


JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

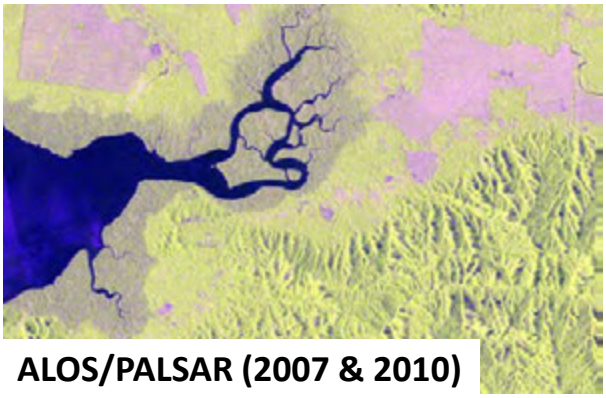
Available data sets: Forest base map



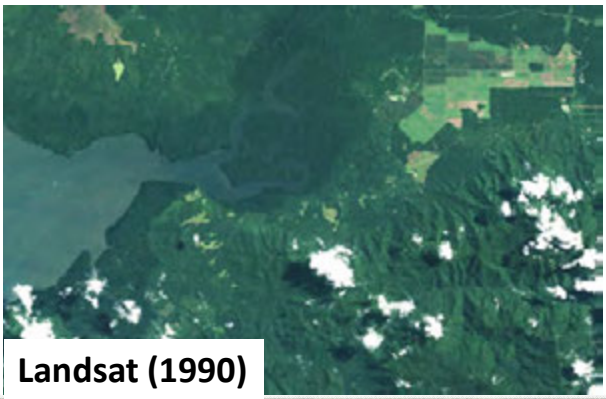
Available data sets: Satellite imagery



RapidEye (2010)



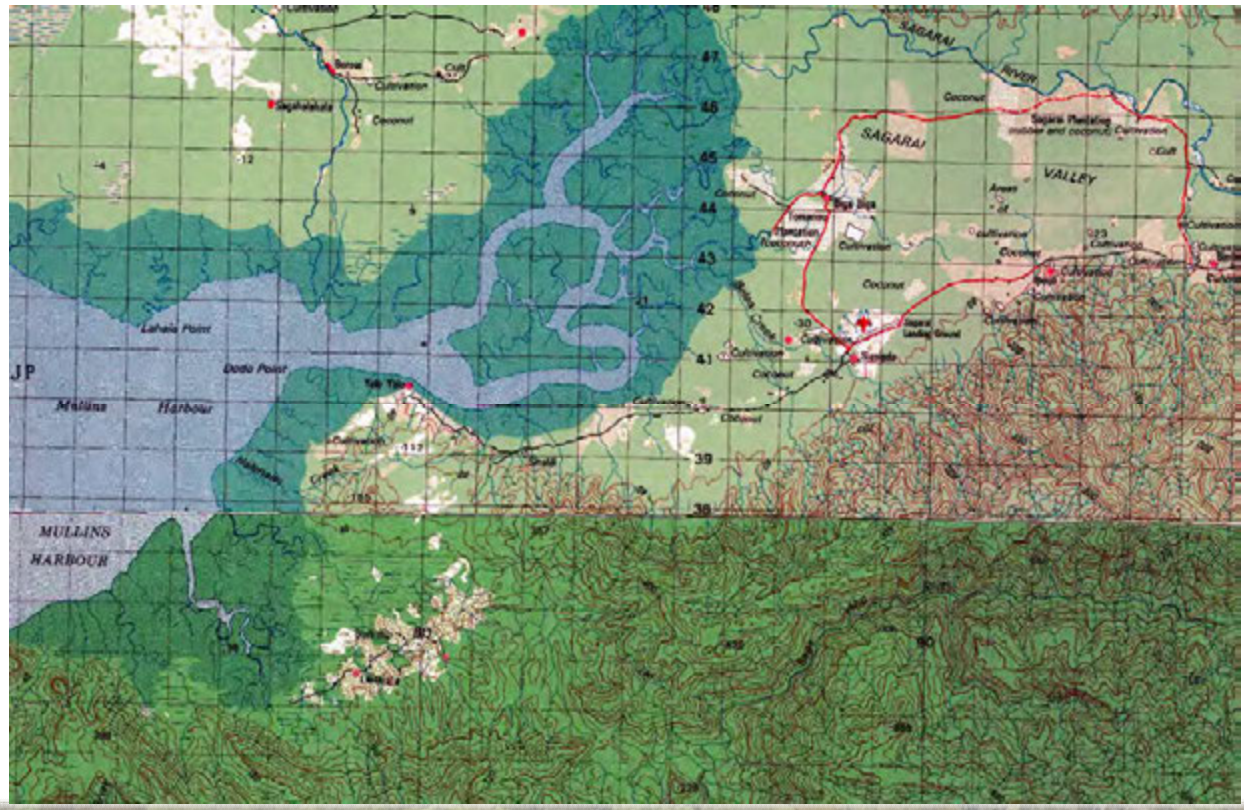
ALOS/PALSAR (2007 & 2010)



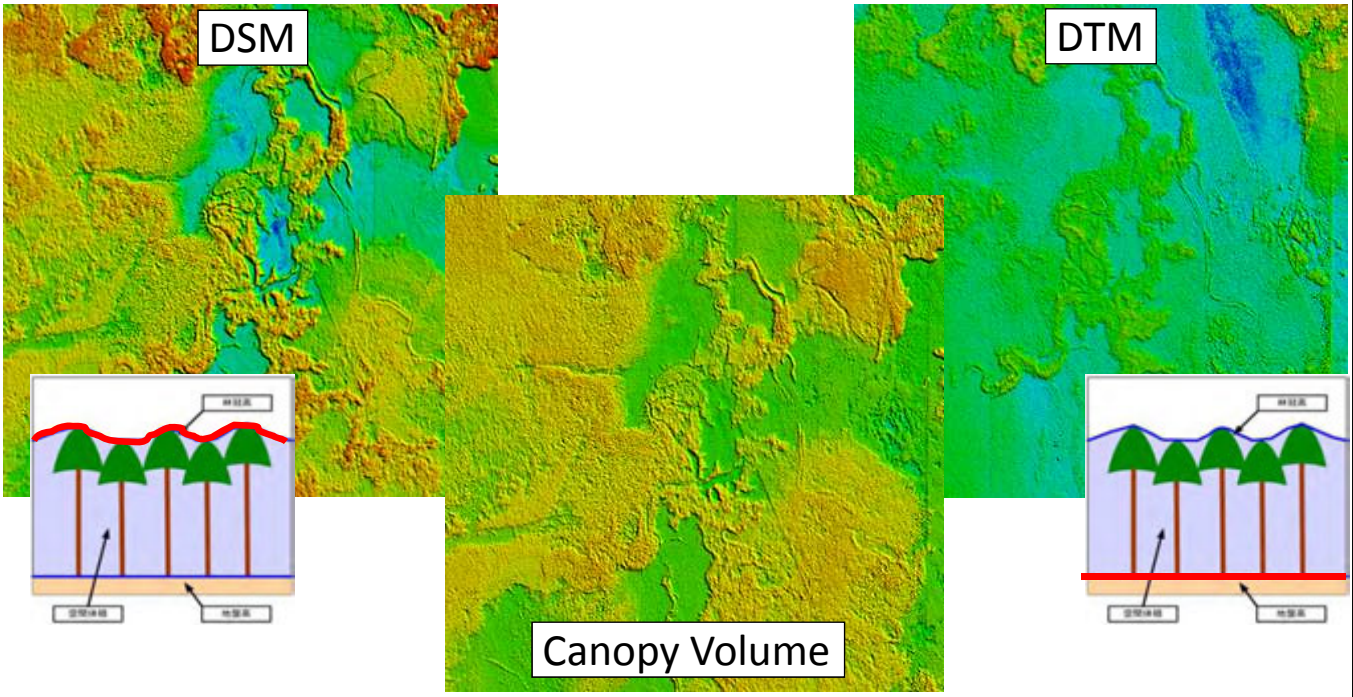
Landsat (1990)

Landsat (2000)

Available data sets: Scanned Topographic Survey map（1: 100,000）

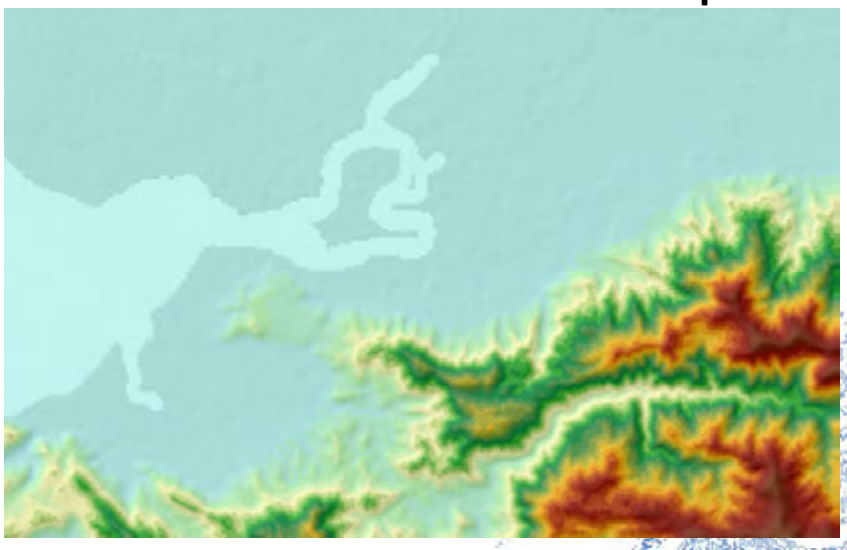


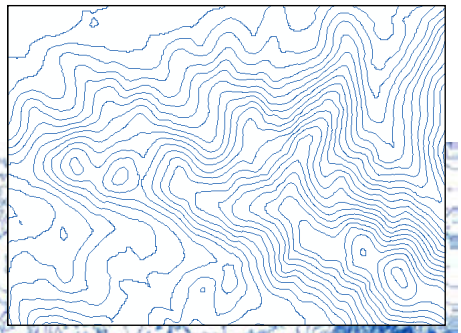
Available data sets:
DSM, DTM and Canopy Volume from GeoSAR (2006)



Available data sets: Shaded relief map and contour map from GeoSAR

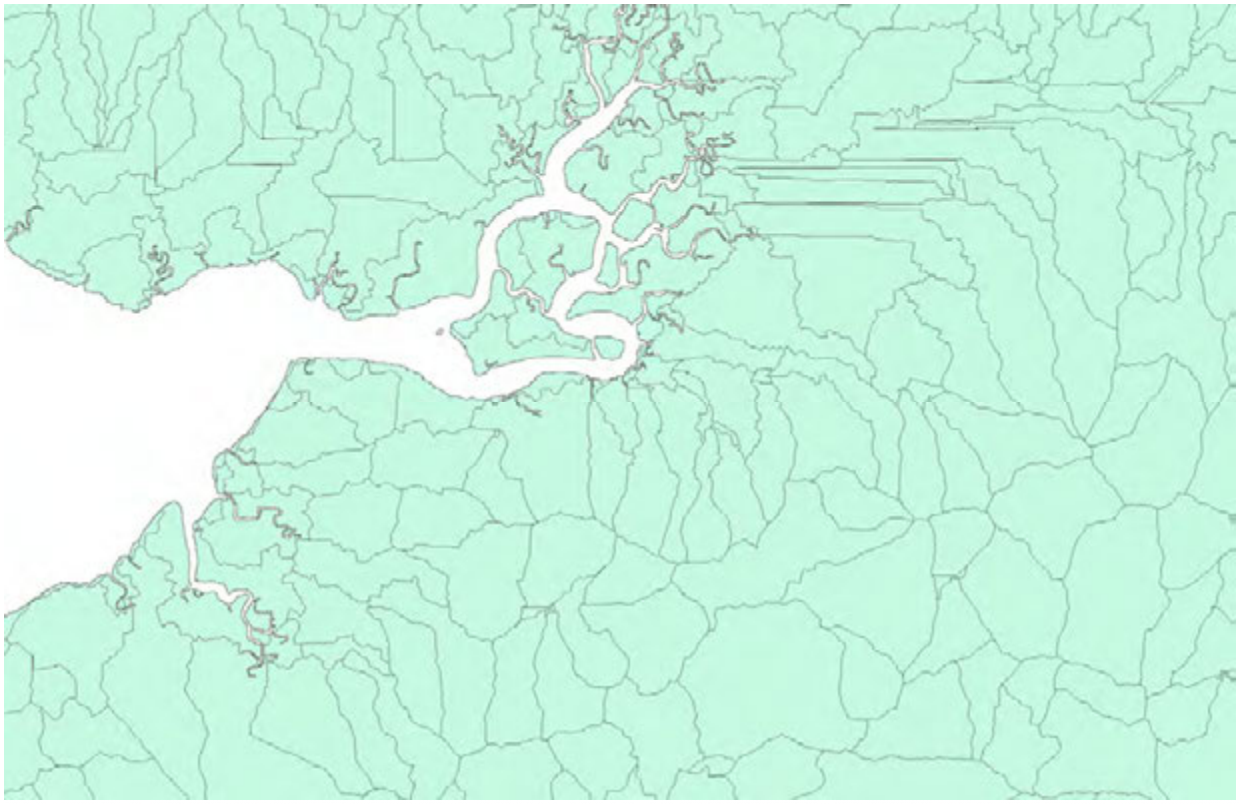
Shaded relief map



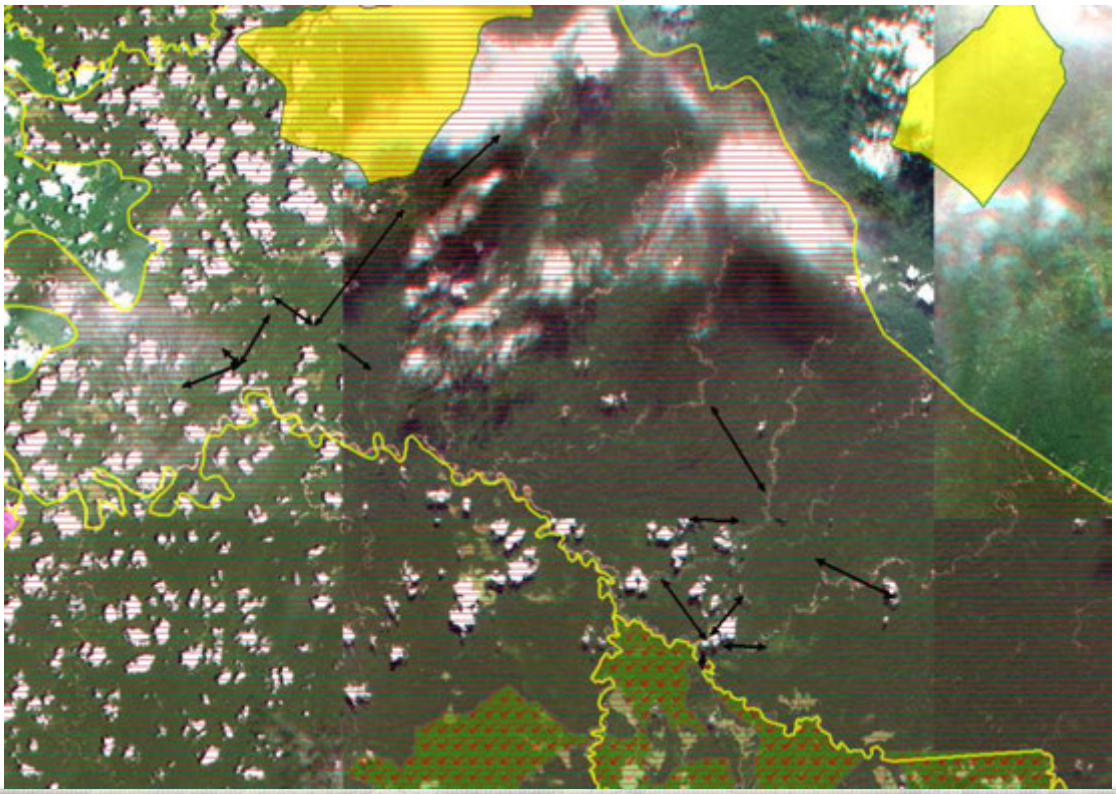


Contour Map

Available data sets: Watershed from GeoSAR



Available data sets: Strip Sampling Location Map

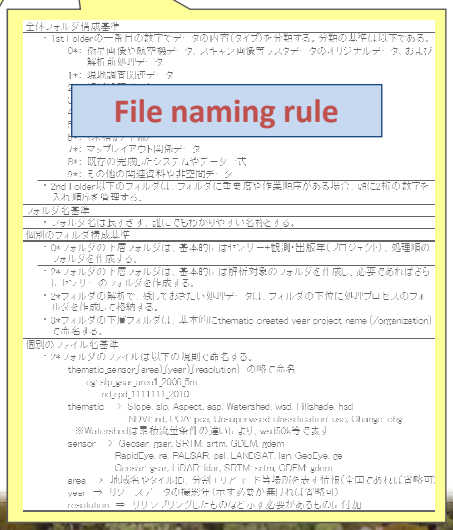


Available in both of Central level and Local level

(Training at an area office)

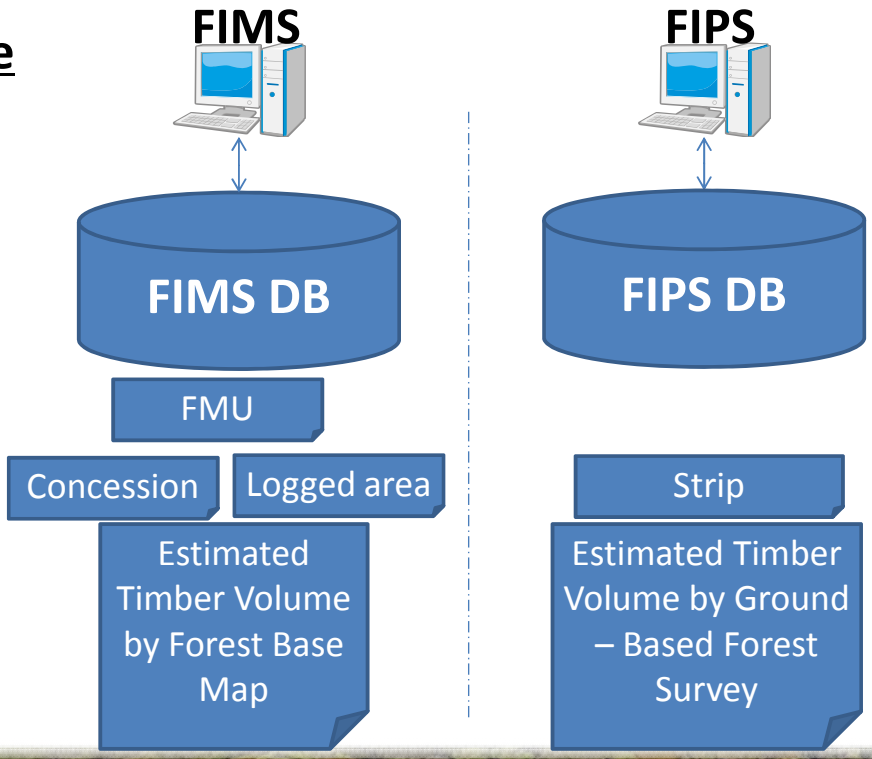
Folder construction rule

File type	Folder name	Description
Satellite & airborne imagery (original /pre-analysis data)	01_Satellite	Satellite imagery
	02_Airbone	Airborne data
	03_DEM	Satellite imagery (DEM)
	04_TopoMAP	Topographic Survey map
Field survey data	11_FieldSurvey	Field survey data
Analysis data	21_TopoAnalyst	Topological analysis data
	22_SatelliteAnalyst	Satellite imagery analysis data
Thematic data	31_ForestMap	National forest basemaps
	32_CarbonStock	Carbon stock data
Other thematic and its parts data	41_Thematic	Other thematic data
	42_Boundary	Boundary data
	43_Planning	Planning data
Other spatial data	51_Others	Other spatial data
Map layout & output data	71_MapLayout	Map layout (Map document file)
	72_Output	Report file/Exported map
Exsisting system & data sets	81_FIMS	FIMS
	82_FIPS	FIPS
	83_PNGRIS	PNGRIS
	84_Geobooks	Geobook data produced by UPNG
	85_MRA	Spatial data produced by MRA
	86_NWS	Spatial data produced by NWS
	87_FreeData	Other free data
Other documents	91_Documents	Other documents



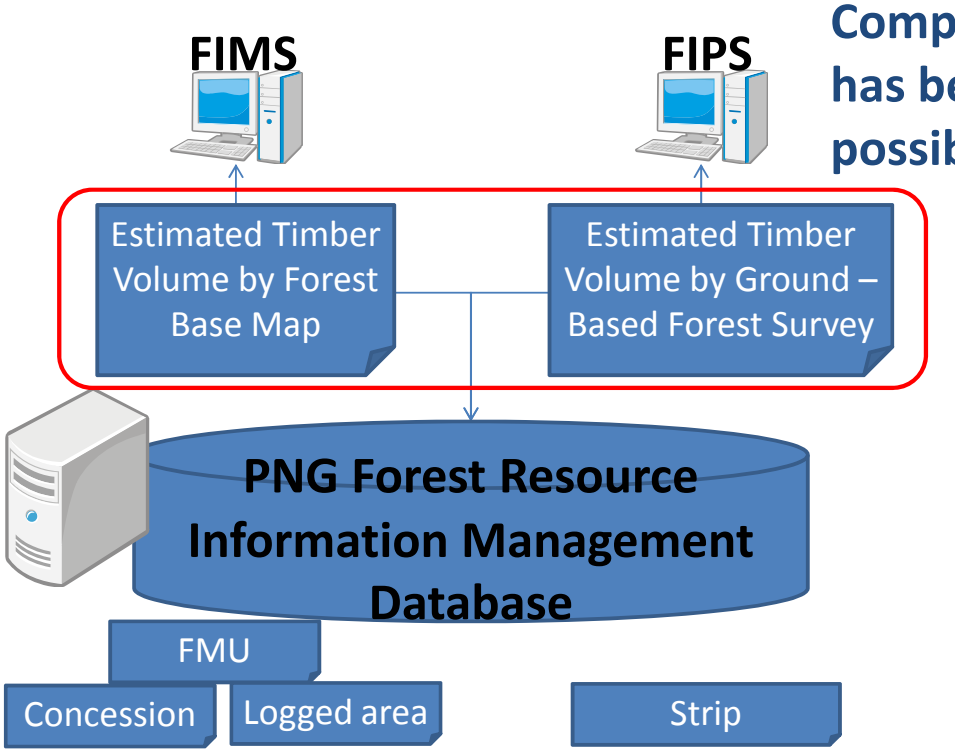
Available function -1 : Integration of FIMS and FIPS

Before

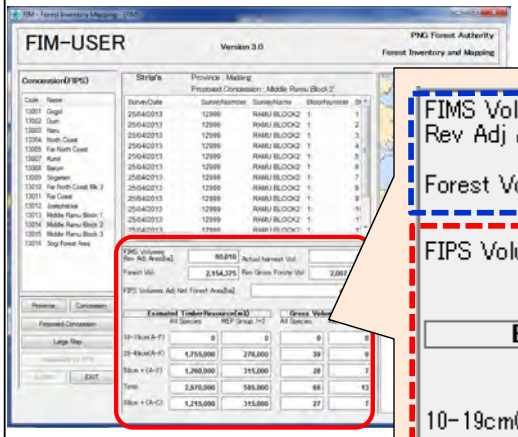


Available function -1 : Integration of FIMS and FIPS

After



Screen Image of Integrated Information



From FIMS

From Logging Company

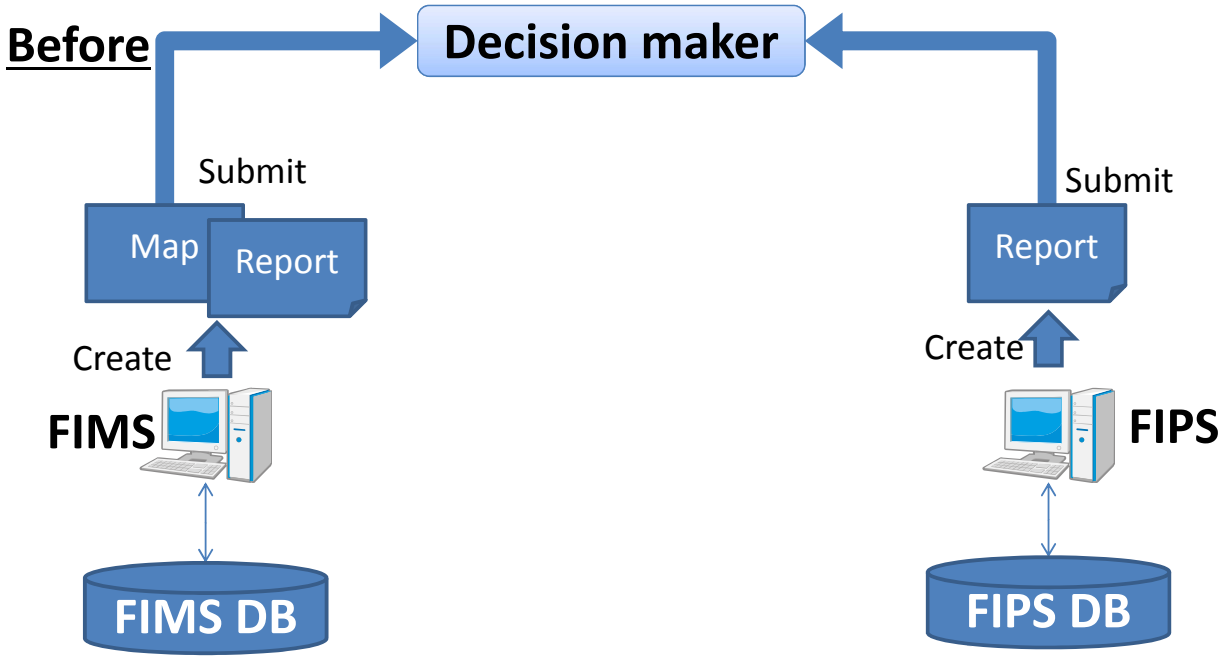
FIMS Volumes Rev Adj Area[ha]:	60,010	Actual harvest Vol:	0
Forest Vol:	2,154,375	Rev Gross Forste Vol:	2,007,378

FIPS Volumes Adj Net Forest Area[ha]: 45,000

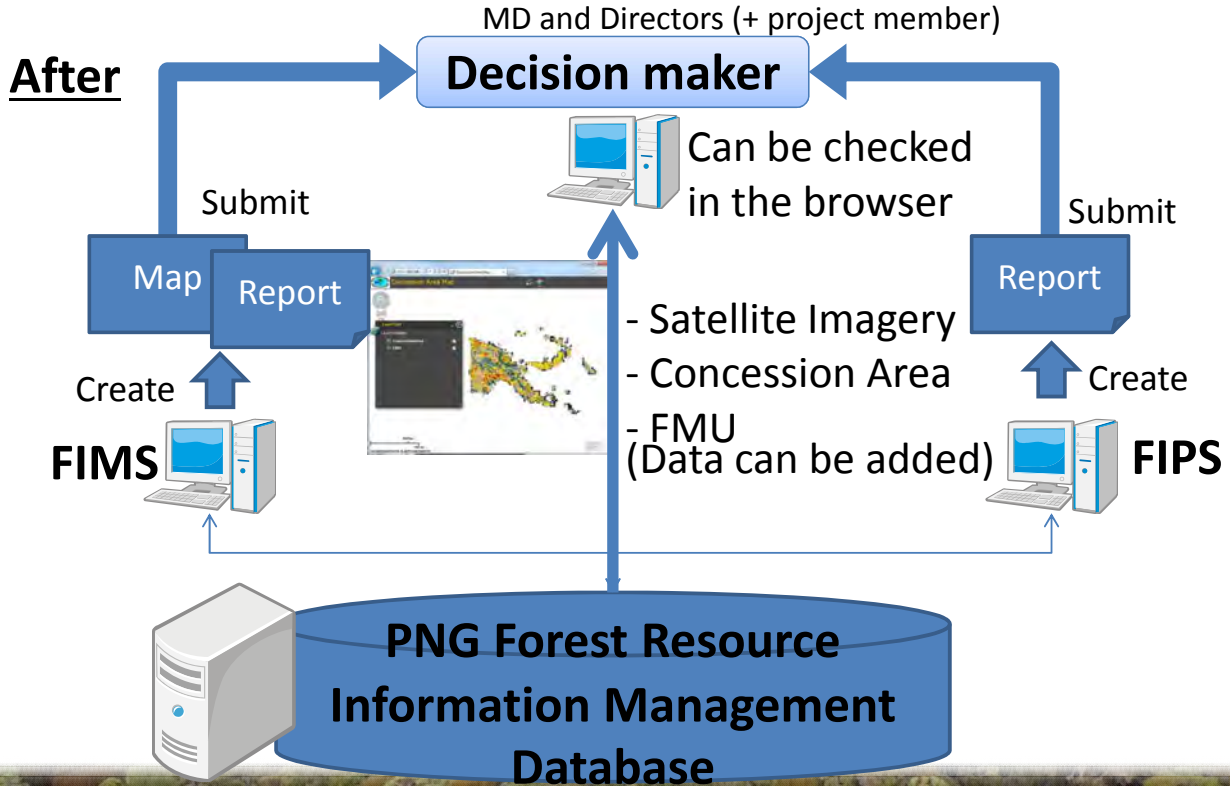
	Esimated TimberResource(m3)		Gross Volume(m3/ha)	
	All Species	MEP Group 1+2	All Species	MEP Group 1+2
10-19cm(A-F)	0	0	0	0
20-49cm(A-F)	1,755,000	270,000	39	6
50cm + (A-F)	1,260,000	315,000	28	7
Total	2,970,000	585,000	66	13
50cm + (A-C)	1,215,000	315,000	27	7

From FIPS

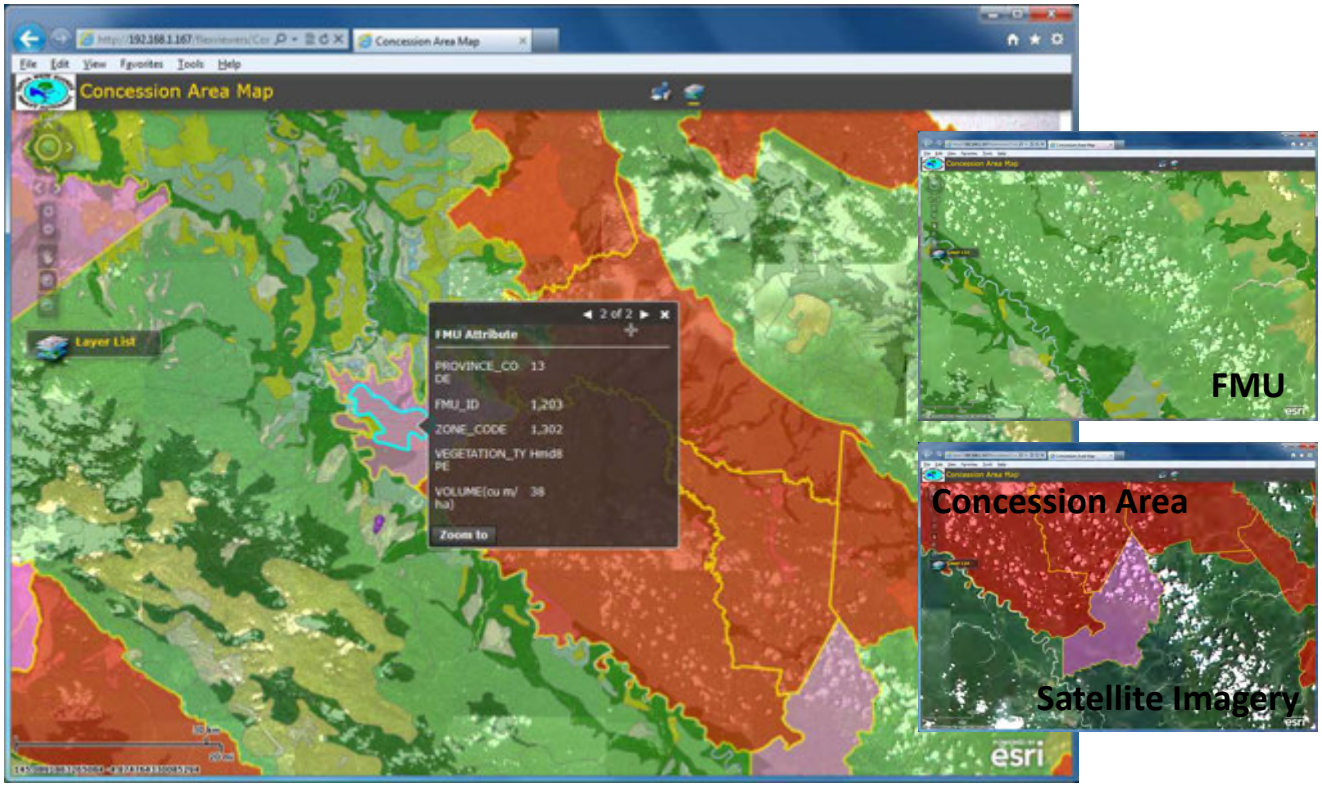
Available function - 2 :
Browse of Forest Resource Information by Decision Maker



Available function - 2 :
Browse of Forest Resource Information by Decision Maker



Screen Image of Forest Base Map on the Browser



Use of PNG-FRIMS (Future Challenges)

- Provision of detailed topographic information for field monitoring
- Validating the volume information of FIMS by ground-based forest survey
- How to update FMU
- Analysis of timber volume by region and species
- Extension of carbon stock from point information by the ground survey to the entire area using the forest base map
- Easy reference to Decision Support System (DSS)
- Integration of growth model (PINFORM) and data on planted forest

Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

Achievements of the Current Project - Output Two -

Constin Otto Bigol

JICA PNGFA Project Manager
Manager, Mapping and Inventory
Forest Policy and Planning Directorate
PNGFA

Contents

1. Expected Output 2 and activities
2. Achievement of Output 2 measured by Indicators
3. Issues to be addressed

1. Expected Output 2 and activities

➢Expected Output 2: National level forest resource database is improved.

➢Activities under Output 2:

a. Analyse available data on nation-wide forest resource
b. Basic design of national-level forest resource database
c. Develop national-level forest resource database linked with forest base-map and ground survey
   ✓ FIPS (1), FIMS (2), PNG-FRIMS (3)
d. Training for above (a) to (c)

2. Achievement of Output 2 measured by Indicators

✓ Achievement of Output 2

- National level forest resource database is improved.

✓ Indicators

1. GIS-based national level forest resource database is developed
   Achieved
2. Manuals and database design document for preparing, utilizing and managing the forest resource database are prepared
   Completed
3. More than10 officers become capable of preparing and managing nation-wide forest resource database
   Achieved
4. Workshops for the developed national level forest resource database are held and 70% of participants consider the workshops useful
   Achieved (again, by your supports!)

FULL MARK ALREADY! Congratulations!

Modified from 'Summary of Terminal Evaluation' by PNG-Japan Joint Evaluation Team

3. Issues to be addressed

- The next project can include activities necessary to enhance the current Project activities.
- How to maximize the impact of the achievement of the project is still concern.

Source: 'Summary of Terminal Evaluation' by PNG-Japan Joint Evaluation Team

Accordingly, the next JICA Project will focus on expansion (including updating) and full utilization of the data base.

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Thank you
Tenkyu tru
Arigatou gozaimashita

Closing Ceremony and Final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

Latest Outcome of UNFCCC
REDD+ in COP19
Warsaw, Poland,
17th Nov. – 26th Nov. 2013
- Findings and Implications -

6th March 2014

Photo: UNFCCC

Tatsuya Watanabe
Chief Advisor, JICA/PNGFA Project
Rabbie Lalo
Planning Analyst, DFPP, PNGFA

Contents

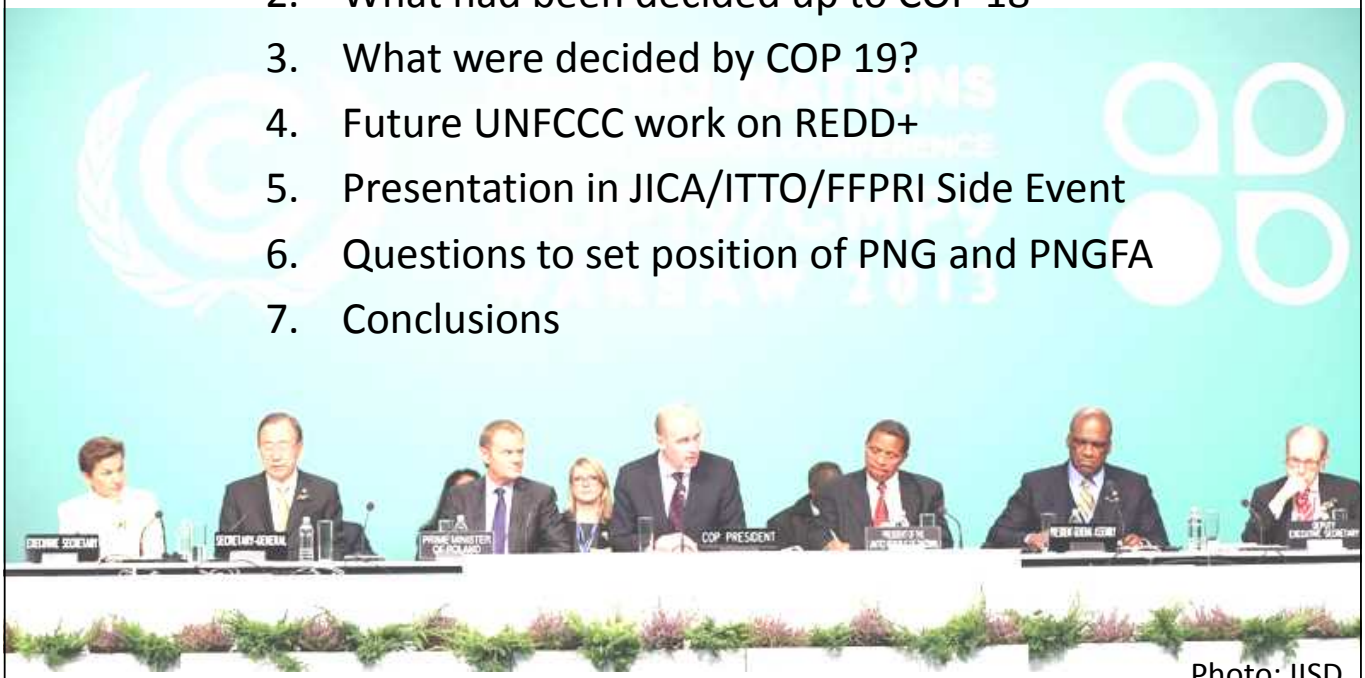


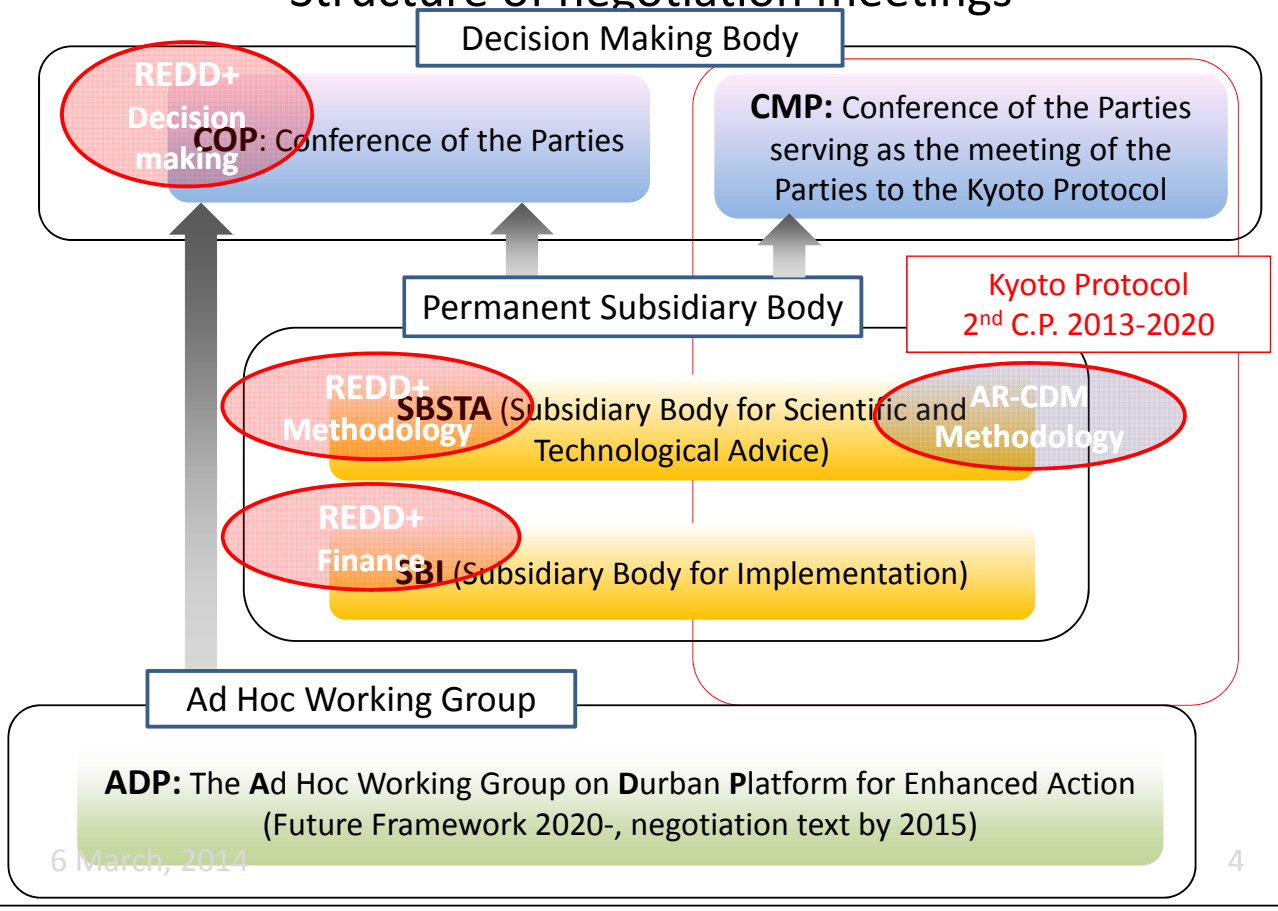
Photo: IISD

1. What are the UNFCCC & the COP? (1)

a. The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty that was produced at the Earth Summit in Rio de Janeiro, 1992.
b. The treaty is aimed at stabilizing greenhouse gas concentrations in the atmosphere.
c. Countries who sign up to the UNFCCC are known as 'Parties', there are currently 195 signed up Parties.
d. Since the UNFCCC entered into force, the parties have been meeting annually in Conferences of the Parties (COP).

1. What are the UNFCCC & the COP? (2)

- Structure of negotiation meetings -



2. What had been decided on REDD+ modalities and procedure up to COP 18?

1. Target Scale: Sub-national level is an interim measure
2. REDD'+': REDD+ five activities are implicitly selective by country (RE from deforestation, RE from forest degradation, conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon)
3. FREL/RLs:
   - Forest Reference Levels are expressed in tCO2-e/year
   - Submission of proposed FREL/RLs 'invited' though none responded
4. Phased Approach: Step-wise approach (improvement s of methodology) accepted in addition to phased-approach
5. Safeguard: 'Natural forest' has to be addressed in Safeguard reporting
6. MRV: No 'comparability' required for REDD+ Monitoring & MRV

3. What were decided on REDD+ by COP19? (1)

- What have not been decided or seen?-

1. Overall
   - Discussion was successful on REDD+. Framework is set for implementation of result-based actions and payments.
   - Market-based approach is not currently included in result-based payments.
2. Finance
   - Timetable for discussion up to 2017 was set for REDD+ funding coordination.
   - REDD+ finance flows outside UNFCCC will likely remain as they are for several years.
   - Funding source and its modality for UNFCCC REDD+ activities remains unclear.
3. Methodology
   - A round of discussion for result based actions and their payments finally concluded and resulted in five decisions.
   - The decisions since COP13 to 19 provide some fundamental requirements for methodological work.
   - No complete or easy recipe for national (and/or sub-national) implementation of REDD+ activities meeting the COP decision requirements.

3. What were decided on REDD+ byCOP19? (2)

-In some detail-

1. Overall
   a. Information on results-based payment is to be included in REDD+ Web Information Hub
   b. Key role of Green Climate Fund is reiterated for REDD+ funding
   c. COP requested Standing Committee on Finance (SCF) to consider REDD+ funding in (1) its 'work on coherence and coordination' and (2) its 'forum'

   (Dec.9/CP.19, Results-based finance)
2. Finance
   a. Parties are invited to designate a national entity (or alike) for REDD+ funding coordination and funding receipt
   b. REDD+ support coordination will be discussed up to COP 23 in 2017 annually: including existing institutional arrangements or the need for potential governance

   (Dec.10/CP.19, Financial support coordination)

3. What were decided on REDD+ byCOP19? (3)

-In some detail-

3. Methodologies
   a. National MRV systems have to assess different types of forest including natural forest, as defined by the Party (Dec.11/CP.19, NFMS)
   b. Safeguard Summary Information should be provided after the start of REDD+ activities, subsequently be consistent with submissions of 'national communications'* (Dec.12/CP.19, SG Information)
   c. Proposed "forest reference emission level and/or forest reference level" (FREL/RL) shall go under technical assessment by LULUCF experts in 32 week process in the context of result-based payments (Dec.13/CP.19, FREL/RL Tech. Assessment)

*National communications are reports that Parties must submit to the COP. The core elements of the national communications are information on emissions and removals of greenhouse gases (GHGs) and details of the activities a Party has undertaken responding to the climate change. PNG is working on the draft second national communication.

3. What were decided on REDD+ byCOP19? (4)

-In some detail-

3. Methodologies

d. Parties seeking to payments for results-based actions are requested to supply a technical annex (to UNFCCC biennial update report) including relevant FREL/RL, results of the REDD+ activity (tonnes CO2eq/year), demonstration of consistency between them, etc.

The annex has go through International Consultation and Analysis process (of Biennial Report) by a team including LULUCF experts

(Dec.14/CP.19, MRV)

d. Recognition of livelihood of forest dependant indigenous people while addressing drivers of deforestation and forest degradation

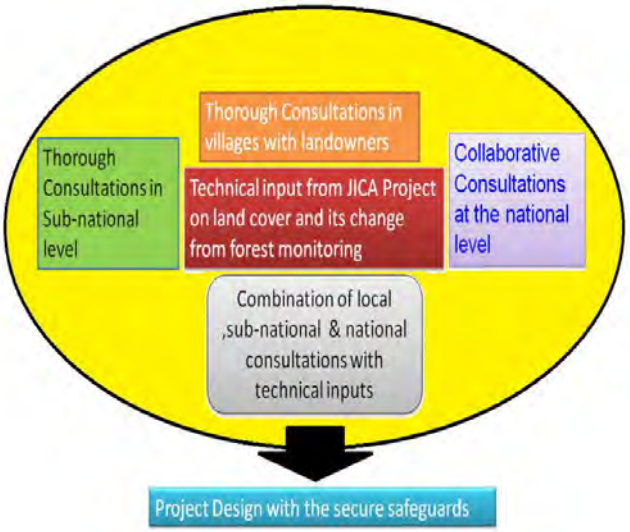
(Dec.15/CP.19, Drivers of deforestation)

4. Planned work on REDD+ in future UNFCCC meetings

Year	Month	Meetings	
2014	June	SB (Subsidiary Bodies Meeting) 40, Bonn	-Consideration on non-market based approach and non-carbon benefits
	Sep	(Climate Change Summit, UN HQ, NYC, US)	
	Dec	SB41, COP20, Peru	-First voluntary meeting on REDD+ finance coordination -Consideration of the further guidance on how the safeguards are addressed -Consider the report on the expert meeting on information hub on the results and payment for results-based REDD+ activities
2015	June	SB42, Bonn	Annual voluntary meeting on REDD+ finance coordination
	Dec	SB43, COP21, France	Negotiation text for Future Framework (2020-)
2017	Dec	SB47, COP23	Review of outcomes form the meetings on REDD+ finance coordination
2020		SB52, SB53, COP26	Future Framework

5. Presentation in JICA/ITTO/FFPRI Side-event

Title: **Efforts to convey opinions of local communities in Papua New Guinea**



Key messages:

1. Local communities' opinions on REDD+ field experiences have to be heard at all levels *(sub-national, national & international)* for sound decision and policy making.

2. Collaborative work between all stakeholders will guarantee a transparent REDD+ mechanism for Papua New Guinea.

6. Possible questions to set position of PNG and PNGFA

1. Is PNG working towards REDD+ results-based actions at (sub-national and) national level?
2. How can a way for extending five pilots to (sub-national and) national scale full implementation be defined for PNG?
3. Does PNG stick to implement all five activities?
4. How incentives for five activities should be different (deforestation and degradation from others)?
5. What can measure the gain of five activities?
6. What historical data will be available?
7. Do the historical data respond to draw necessary FREL/RL (benchmark) responding to elected activities?

7. Conclusion

- Exact knowledge on progress and development of modalities and procedures is necessary for PNG in order to develop proper national REDD+ policy step-by-step and its implementation
- Negotiation process seems to need information input on practical experiences learnt on the ground
- Continuous participation to the delegation from PNGFA is effective (SBs in June, COP in December, two weeks each)
- Activities related to JICA Projects and National Forest Inventory supported by UN-REDD/FAO/EU should be conducted steadfastly since they are source of fundamental information and practical skill for the realization of future REDD+ implementation.
- JICA expert(s) for next JICA project (mid 2014-) will be ready to assist PNG delegation

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Closing Ceremony and Final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

From the People of Japan

Tenkyu tru
Arigatou gozaimashita

Photo: Government of Poland

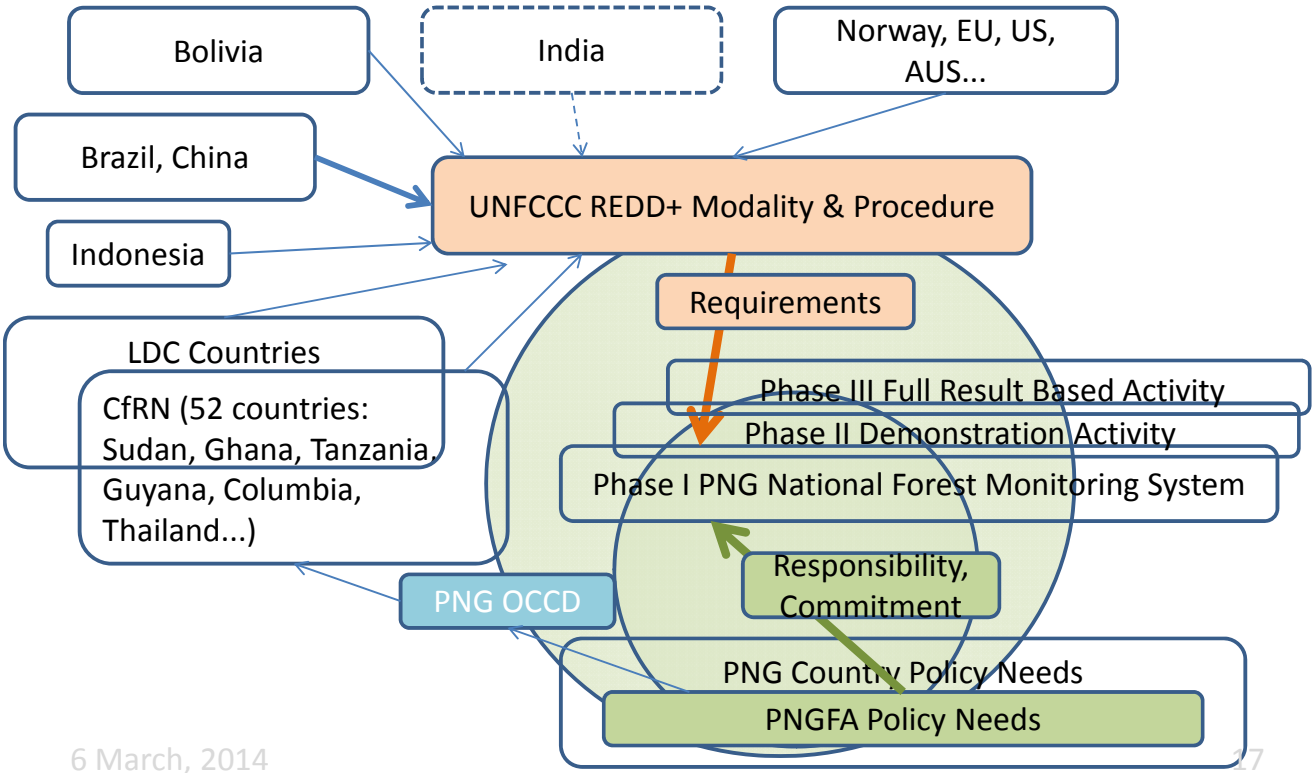
Annex 1: More details of REDD+ Decisions in COPs (1) COP 11- 15

COP11 (2005)	Montreal	- RED proposal jointly by Papua New Guinea and Costa Rica.
COP13 (2007)	Bali	- 'Bali Action Plan' (Decision 1/CP.13) addressed REDD+ for the first time in COP. - Decision 2/CP.13 provided an indicative guidance for demonstration activities and a SBSTA programme of work on methodological issues.
COP15 (2009)	Copenhagen	- Decision 4/CP.15 provided methodological guidance for REDD+; (1) use of IPCC guidelines for GHG estimation, (2) combination of ground based survey and remote sensing for forest monitoring system, and (3) establish FREL/RL taking account historical data, and adjust for national circumstances.

Annex 1: More details of REDD+ Decisions in COPs (2) COP 16- 18

COP16 (2010)	Cancun	- Decision 1/CP.16 (1) listed five REDD+ activities and safeguards (SG), and (2) requested developing countries to develop REDD+ national strategy, FREL/RL (could be sub-national as interim measure), national forest monitoring system, and SG information provision system. Many parts came from 'Copenhagen Accord'.
COP17 (2011)	Durban	- Decision 2/CP.17 (1) includes guidelines on biennial reporting and (2) provides link between REDD+ SG information provision/ MRV and financing. - Decision 12/CP.17 provides (1) principles for SG information provision and (2) modalities for FREL/RL including use of historical data, adjustment, voluntary submission and technical assessment, updating, and 'step-wise approach'.
COP18 (2012)	Doha	- COP Decision on REDD+ Finance work programme (SB38-39, COP19).
COP19 (2013)	Warsaw	- A package of seven (7) COP decisions 'the Warsaw Framework for REDD PLUS' was adopted.

Annex 2: Schematic view of REDD+ negotiation groups and PNG



Annex 3: List of the Warsaw Framework for REDD at COP19 (2013): 7 COP Decisions

- COP
  - Work Programme on results-based finance to progress the REDD+ (FCCC/CP/2013/L.5, Decision 9/CP.19)
- SBSTA/SBI 39➔COP
  - Coordination of REDD+ Support (cf. Establishment of Finance Body) (FCCC/CP/2013/L.6, Decision 10/CP.19)
- SBSTA38,39➔COP
  - Modalities for national forest monitoring systems (FCCC/SBSTA/2013/L.12/Add.1, Decision 11/CP.19)
  - The timing and channels of REDD+ safeguard information presentation (FCCC/SBSTA/2013/L.12/Add.2, Decision 12/CP.19)
  - Technical Assessment of Reference Emission Level/Reference Level (FCCC/SBSTA/2013/L.33/Add.1, Decision 13/CP.19)
  - Modalities for REDD+ MRV (Technical Analysis of result from result based activities) (FCCC/SBSTA/2013/L.33/Add.2, Decision 14/CP.19)
  - Addressing drivers of deforestation and forest degradation (FCCC/SBSTA/2013/L.12/Add.3, Decision 15/CP.19)

Annex 4: What were decided in the decisions? (1) 9/CP.19 'Work programme on result based finance'

- The COP,
  - encourages entities financing the REDD+ activities through the wide variety of sources... including Green Climate Fund in a key role, to collectively channel adequate and predictable results-based finance in a fair and balanced manner...; (para. 5)
  - decides to establish an information hub on the web platform on the UNFCCC website to publish information on the results of the REDD+ activities and corresponding results-based payments (results, fREL/RL, safeguards, national strategy, national forest monitoring system, quantity of paid results, entity paying for results) ; (para. 9)
  - requests the Standing Committee on Finance... in its work on coherence and coordination... to focus its soonest possible forum on issues related to finance for forests, including the REDD+ activities, inter alia:
    - ways and means to transfer payments for results-based actions...
    - the provision of financial resources for alternative approaches; (para. 20) ...

Note: Languages are modified for ease of reading.

Annex 4: What were decided in the decisions? (2) 10/CP.19 'Coordination of support for REDD+'

- The COP,
  - invites interested Parties to designate,...a national entity or focal point to serve as a liaison with the secretariat... on the coordination of support for the full implementation of REDD+ activities... ; (para. 1)
  - notes that the national entities or focal points... may...nominate their entities to obtain and receive results-based payments, consistent with any specific operational modalities of the financing entities...; (para. 2)
  - recognizes that in order to address issues related to the coordination of support for the implementation of REDD+ activities, needs and functions are identified:
    - ... Provide information and any recommendations, as appropriate... to improve the effectiveness of finance...to the COP;
    - Provide information any recommendations, as appropriate... on improving the effectiveness of the finance to entities including bilateral, multilateral and private sector entities... and on how these activities, including results-based actions, can be more effectively supported; ... (para. 3)

Note: Languages are modified for ease of reading.

Annex 4: What were decided in the decisions? (2) 10/CP.19 'Coordination of support for REDD+'

- The COP,
  - encourages national entities or focal points, Parties and relevant entities financing the REDD+ activities...to hold their first meeting in conjunction with the second sessional period meeting of the subsidiary bodies in 2014 and thereafter annually in conjunction with the first sessional period meetings of the subsidiary bodies; (para. 4 &5)
  - requests the SBI... at its 47th session (Nov-Dec 2017) to review the outcomes of the meetings referred to in paragraphs 4 and 5 above, to consider existing institutional arrangements or the need for potential governance alternatives for the coordination of support for the implementation of the REDD+ and make recommendations on these matters to the COP at its 23rd session (Nov-Dec 2017); (para. 9)

Note: Languages are modified for ease of reading.

Annex 4: What were decided in the decisions? (3) 11/CP.19 'Modalities for national forest monitoring system'

- The COP,
  - affirms that... the activities in this decision are undertaken in the context of the provision of adequate and predictable support, including financial resources and technical and technological support to developing country Parties; (para. 1)
  - (IPCC, Decision 4/CP.15) (para. 2)
  - further decides that national forest monitoring systems... should
    - build upon existing systems, as appropirate,
    - enable the assessment of different types of forest in the country, including natural fores as defined by the Party;
    - be flexible and allow for improvement
    - reflect, as appropriate, the phased approach... (para.4)
  - acknowledges that Parties' national forest monitoring systems may provide, as appropriate, relevant information for national systems for the provision of information on how safeguards in decision 1/CP.16, appendix I, are addressed and respected. (para.5)

Note: Languages are modified for ease of reading.

Annex 5: Safeguards in Decision 1/CP.16, appendix I

- When undertaking the activities (of REDD+) referred to in paragraph 70 of this decision, the following safeguards should be promoted and supported;

  (e) that actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions referred to in paragraph 70 of this decision are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystems, and to enhance other social and environmental benefits;

Note: Languages are modified for ease of reading.

Closing Ceremony and final Workshop for Project Completion
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Forest Biomass Survey and Training

Kiyoshi Suzuki

JICA Expert (Forest Inventory/Project Coordinator)

JICA-PNGFA Project

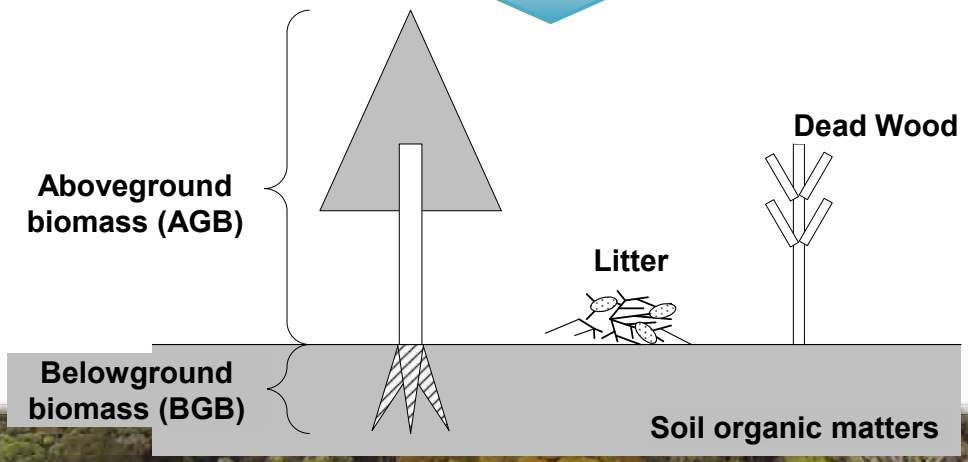
JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Contents

1. Necessity of field measurement of forest carbon

Concept of Forest Monitoring for REDD+

Activity Data		Emission Factor		
Forest Area change detection	x	**Carbon content** by 5 carbon pools	=	**Carbon Emission / Removal** from Forest



2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Main objectives of the survey

1. To get accurate Above Ground Biomass (AGB) data to examine the correlation between the forest carbon and forest canopy volume derived from airborne data.
2. To develop the capacity of relevant stakeholders for forest carbon monitoring.

Biomass Survey

Training and trial

Preliminary Survey
- 1-10 May 2012
- 16 PNGFA officers

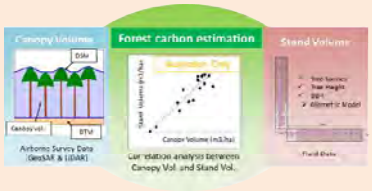
Implementation

Main Survey
- 1-30 November 2012
- 40 PNGFA officers and Unitech lecturers and students

AGB data

Carbon Estimation

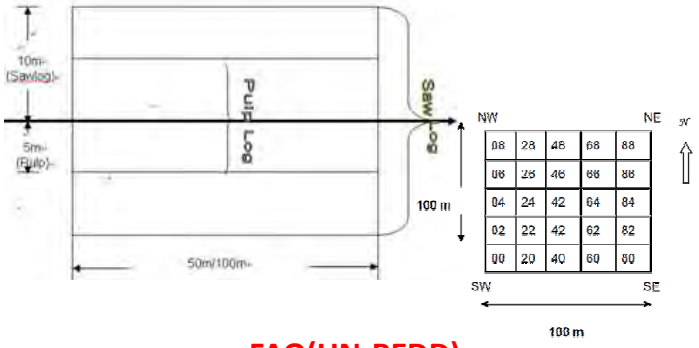
Correlation analysis between forest carbon and canopy volume



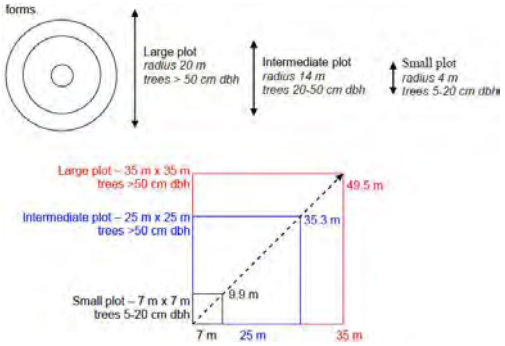
2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

The design of measurement of forest carbon (1)

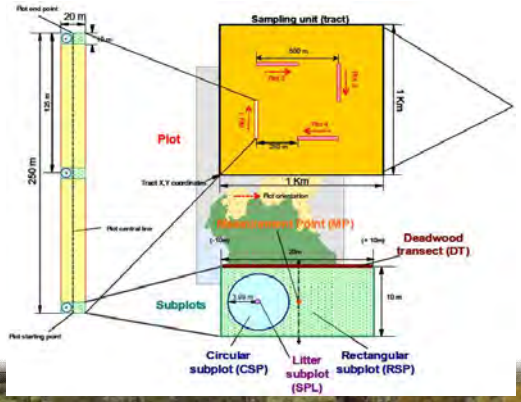
PNGFA FIPS/PSP



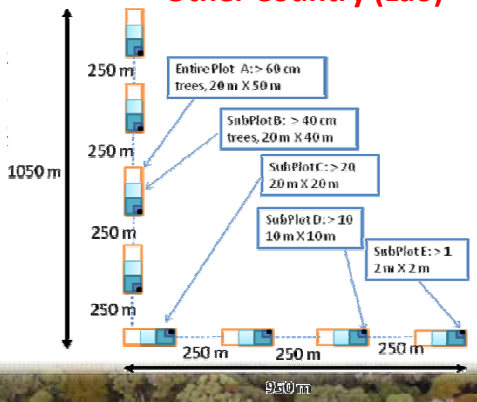
Winrock International



FAO(UN-REDD)

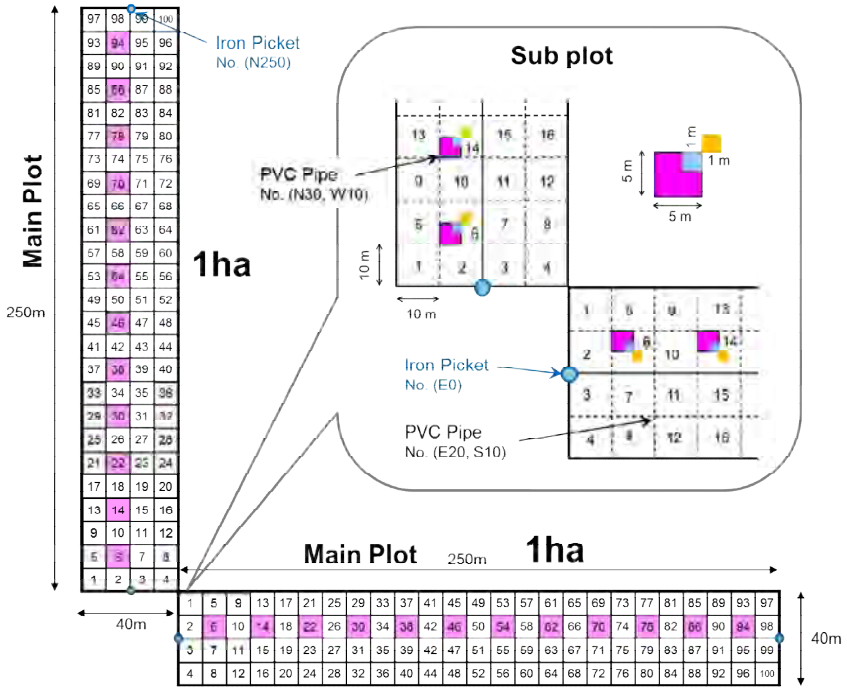


Other Country (Lao)



2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

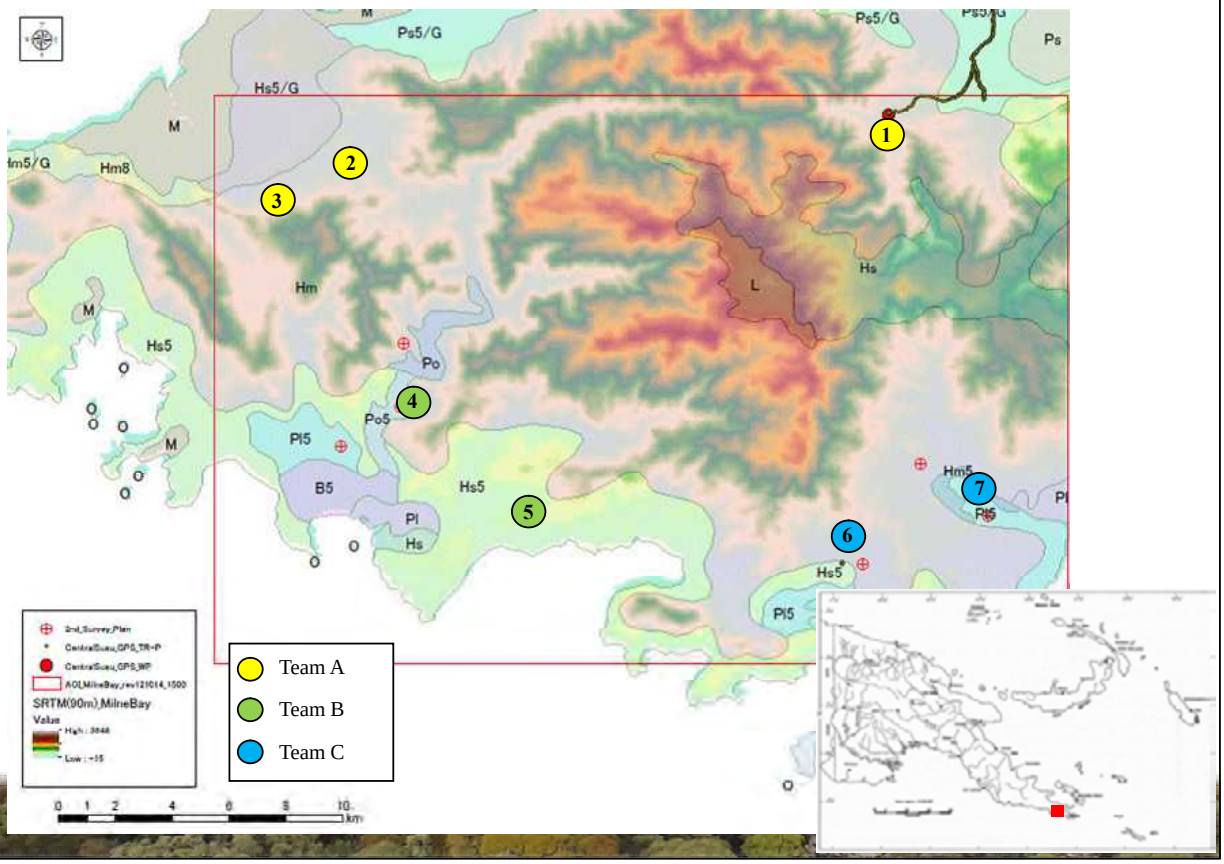
The design of measurement of forest carbon (2)



	Plot size	Measurement Object
Main plot (1ha)	40m x 250m	Live and dead standing wood, palms and vines
		Dead lying wood
Sub plot	5m x 5m	Live and dead standing wood
		Dead lying wood
	1m x 1m	Tree sapling
		Dead wood
	1m x 1m	Understory vegetation
		Litter

2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Plots' Location & Topography/Forest Type



2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Summary of Biomass Survey in Central Suau

Plot	Plot size	Measurement Object	Size of Object	Plot 1	Plot 2	Plot 3	Plot 4		Plot 5		Plot 6		Plot 7	
				East	East	East	West	North	East	North	East	North	East	North
Main	40m x 250m	Live standing trees, palms and vines	dbh ≧ 10cm	○	○	○	○	○	○	○	○	○	○	○
		Dead standing wood	dbh ≧ 10cm	○	○	○	○	○	○	○	○	○	○	○
		Dead lying wood	dia. ≧ 30cm	○	○	○	○	○	○	○	○	○	○	○
		Canopy density					○	○	○	○				
Sub	5m x 5m	Live dead standing trees	10cm > dbh ≧ 1cm										○	○
		Dead standing wood	10cm > dbh ≧ 1cm										○	○
		Dead lying wood	30cm > dia. ≧ 10cm										○	○
	1m x 1m	Tree sapling	dbh < 1cm										○	○
		Dead wood debris	dia. < 10cm										○	○
	1m x 1m	Understory vegetation	Measure all weight and get sub-sample										○	○
		Litter		○	○	○							○	○

2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Applied method to estimate Above Ground Biomass

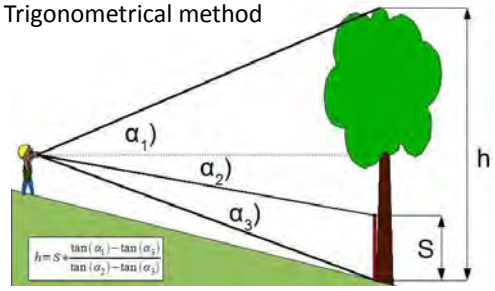
We use a generic tree allometric model developed by Chave et al. (2005) as shown below. We choose a model for wet tropical forests to estimate AGB for trees.

$$AGLB_i = 0.0776\left[\rho_i D_i^2 H_i\right]^{0.940}$$

Parameters	Measurement methods
Di : diameter (cm)	• Diameter at breast height (DBH) • Buttress trees are measured at 30cm from where the buttress ends.
Hi : total height (m)	• The trigonometrical method is applied using Suunto Clinometer and height pole.
pi : wood specific gravity (g/cm3)	• Wood density information by species is referred to Eddowes (1977) and IPCC Guidelines (2006).

Diameter measurement of buttress tree

Trigonometrical method



2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Applied method to estimate Above Ground Biomass

In terms of ABG measurement, species, tree form, DBH, POM(point of measure), total & merchantable heights, tree location and canopy size are compiled in one excel sheet with calculated AGB and carbon. This sheet is provided to examine correlation analysis between forest carbon and canopy volume.

Plot	N/E	Qud_No	Date	Tree_No	Species Name	Species Code	Tree Form	DBH	POM	Ht_Readings (degree)				direct measu	Coordinate (m)		Crown Dia. (m)		Total Height (m)	Merch_ Height (m)	Wood Density (g/cm3)	AGLB (kg)	Carbon (kg)	Merch_ Volume (m3)
										Base	10m	Merch	Total		E	S	E	S						
CS_1	E	1	2012/11/6	1	Cleistanthus myrianthus	CLE MYR		17.5	1.3	-2	25	30	38		0.8	1.1	5.0	5.2	16.28		0.88	205.89	102.95	
CS_1	E	1	2012/11/6	2	Neonauclea obversifolia	NEO OBV		14.2	1.3	0	34	18	50		0.7	3.7	6.6	3.4	17.67		0.58	101.43	50.71	
CS_1	E	1	2012/11/6	3	Cleistanthus myrianthus	CLE MYR		19.3	1.3	-2	32	20	46		0.1	8.0	2.9	3.4	16.22		0.88	246.65	123.32	
CS_1	E	1	2012/11/6	4	Cleistanthus myrianthus	CLE MYR		15.6	1.3	-4	32	22	46		3.7	9.3	8.8	2.0	15.91		0.88	162.31	81.15	
CS_1	E	1	2012/11/6	5	Cleistanthus myrianthus	CLE MYR		13.6	1.3	-4	32	24	44		4.0	9.7	2.9	3.1	14.91		0.88	117.94	58.97	
CS_1	E	1	2012/11/6	6	Garcinia latissima	GAR LAT		14.8	1.3	0	30	20	46		4.4	7.8	3.8	3.1	17.94		0.645	122.87	61.43	
CS_1	E	1	2012/11/6	7	Cryptocarya	CRY		26.7	1.3	0	30	20	48		4.4	6.7	1.2	1.5	19.24		0.465	292.54	146.27	
CS_1	E	1	2013/9/11	8	Ficus wassa	FIC WAS		10.7	1.3					10.0	3.7	4.2	3.7	2.3	10.00		0.345	21.41	10.71	
CS_1	E	1	2012/11/6	9	Myristica fatua	MYR FAT		13.1	1.3	-2	30	14	40		4.2	1.6	2.8	2.7	14.28		0.385	48.53	24.26	
CS_1	E	1	2012/11/6	10	Mangifera minor	MNG MIN		30.4	1.3	0	24	14	46		9.1	1.7	6.1	5.6	23.26		0.495	473.35	236.67	
CS_1	E	1	2012/11/6	11	Syzygium	SYZ		12.0	1.3	0	36	18	42		9.3	4.2	3.2	2.3	12.39		0.61	55.53	27.76	
CS_1	E	2	2012/11/6	1	Myristica fatua	MYR FAT		14.9	1.3	-6	24	8	36		1.0	1.0	5.9	1.8	15.11		0.385	65.21	32.61	
CS_1	E	2	2012/11/6	2	Myristica	MYR		13.7	1.3	-6	24	8	34		1.9	3.5	3.7	3.3	14.17		0.385	52.41	26.20	
CS_1	E	2	2012/11/6	3	Gmelina moluccana	GME MOL		17.3	1.3	-8	26	4	32		1.2	5.8	4.8	1.4	12.18		0.4	73.10	36.55	
CS_1	E	2	2012/11/6	4	Pouteria monticola	POU MON		19.7	1.3	-4	28	15	46		0.1	9.0	4.4	4.4	18.37		0.66	219.88	109.94	
CS_1	E	2	2012/11/6	5	Cleistanthus myrianthus	CLE MYR		16.9	1.3	-4	36	28	46		0.1	0.3	6.6	6.2	13.88		0.88	165.93	82.97	
CS_1	E	2	2012/11/6	6	Canarium lamii	CAN LAM		38.7	1.3	0	26	16	48		1.8	9.6	4.0	4.0	22.77		0.48	709.68	354.84	
CS_1	E	2	2012/11/6	7	Cleistanthus myrianthus	CLE MYR		13.4	1.3	6	32	10	42		2.3	7.1	2.5	2.5	15.30		0.88	117.56	58.78	

Correlation analysis between forest carbon and canopy volume

2. Biomass Survey in Central Suau REDD+ Pilot Project site, Milne Bay Province

Summary of the preliminary results of AGB measurement

Plot No.	Forest Type*	Disturbance	Topography	No. of trees (DBH≧10cm)	AGB (t/ha)	AGB Carbon (tC/ha)
Plot1_E	H	Intact	Steep	661	185.91	**92.95**
Plot2_E	H	Disturbed	Steep	416	61.59	**30.80**
Plot3_E	H	Intact	Steep	528	298.05	**149.03**
Plot4_W	P	Intact	Flat	629	240.22	**120.11**
Plot4_N	P, H	Intact	Flat-Steep	572	227.26	**113.63**
Plot5_E	Still processing…					
Plot5_N						
Plot6_E	P, H	Intact	Flat-Gentle slope	484	229.05	**114.53**
Plot6_N	P, H	Intact	Flat-Gentle slope	508	254.04	**127.02**
Plot7_E	P	Intact	Flat	504	251.19	**125.60**
Plot7_N	P	Intact	Flat	509	259.52	**129.76**

* H: Low Altitude Forest on Uplands P: Low Altitude Forest on Plains & Fans

3. Training and Trial on Below Ground Biomass survey in Oomsis, Morobe Province

Purpose	To develop the capacity of the officers of relevant organizations, especially FRI scientists, to conduct below ground biomass survey.
Period	4-12 September 2012
Participants	40 participants PNGFA - FRI - HQ - Area office - Plantation Other organization - OCCD - UNITECH
Contents	• Destructive Sampling of Living BGB in the field • Oven drying and measurement in Lab • Analysis of measurement results

Digging roots by hand

Digging roots by excavator

Sorting roots

Oven drying

3. Training and Trial on Below Ground Biomass survey in Oomsis, Morobe Province

Result of Measurement and Comparison with other Studies

R/S ratio was calculated by the training participants on a trial basis.

$$\text{Root : Shoot ratio} = \frac{\text{Root dry weight (g)}}{\text{Shoot dry weight (g)}} \qquad \frac{\text{BGB}}{\text{AGB}}$$

Study	R/S	Reference
Low altitude forest on uplands (Oomsis, Morobe Province, PNG)	**0.10**	Trial based result by JICA-PNGFA Project
Lower montane rain forest (2500 m ASL) in PNG	0.13	Edwards & Grubb 1977, J. Ecol. 65
Tropical rain forest (Pasoh, Malaysia)	0.23	Niiyama et al. 2010, J Trop Ecol
Lowland moist forest	0.12	Brown 1997, FAO Forestry paper 134
Tropical rain forest	0.37	IPCC Guidelines 2006

Summary

1. Training and trial of biomass survey were conducted to develop the capacity of PNGFA and relevant organization to measure forest carbon.
2. In the Central Suau biomass survey, training and implementation of field measurement of ABG, dead wood, litter and understory vegetation were conducted.
3. Massive AGB data collected through the survey were used for Correlation analysis between forest carbon and canopy volume.
4. Training and trial on Below Ground Biomass survey were also conducted. R/S ratio was calculated by the participants on a trial basis.