# REDD-Alert – 2nd Annual project meeting
# Lima, Peru, 13-16 October 2010

## WP 1 Progress report


With contributions from:
Patrick Meyfroidt (UCLouvain)
Valentina Robiglio (IITA)
Derek Bruggeman (UCLouvain)
Remy Assoumou Mezui (IRAD)
Martin Tchienkoua (IRAD - ASB)
Glenn Hyman (CIAT)
Vu Tan Phuong (RCFEE)
Hoang Viet Anh (RCFEE)
Andree Ekadinata (ICRAF)
Eric Lambin (UCLouvain)
& the IRAD, IITA, CIAT, INIA, ICRAF and RCFEE teams

# Outline

- Overview

- Cameroon
- Peru
- Vietnam
- Indonesia

- Cross-country comparison

# WP 1:
# Understanding the drivers of land-use change

- Collection of time series of remote sensing, GIS and socio-economic census data

- Mapping of forest-cover change using remote sensing

- Multivariate statistical analyses based on landscape and socio-economic variables

- Identifying generic pathways of deforestation and reforestation based on statistical analyses, field surveys and published case studies.

# WP 1:
# Deliverables

- D.1.1 Forest-cover change maps for study sites (Sept. 2010)

- D.1.2 Statistical econometric models of causes of deforestation/reforestation for study sites (Month 30 – Oct. 2011)

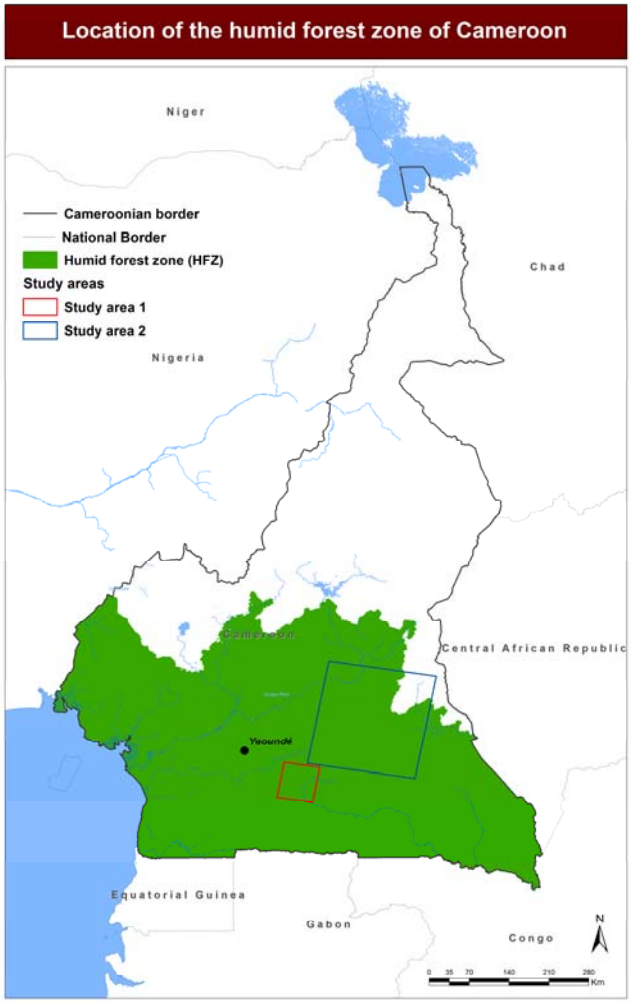
- D.1.3 Scientific papers describing generic pathways of deforestation/reforestation, based on empirical evidence (Month 36 – April 2012)

## Cameroon

- Regional change detection
- Study areas

# Cameroon – Regional change detection

D. Bruggeman, UCLouvain

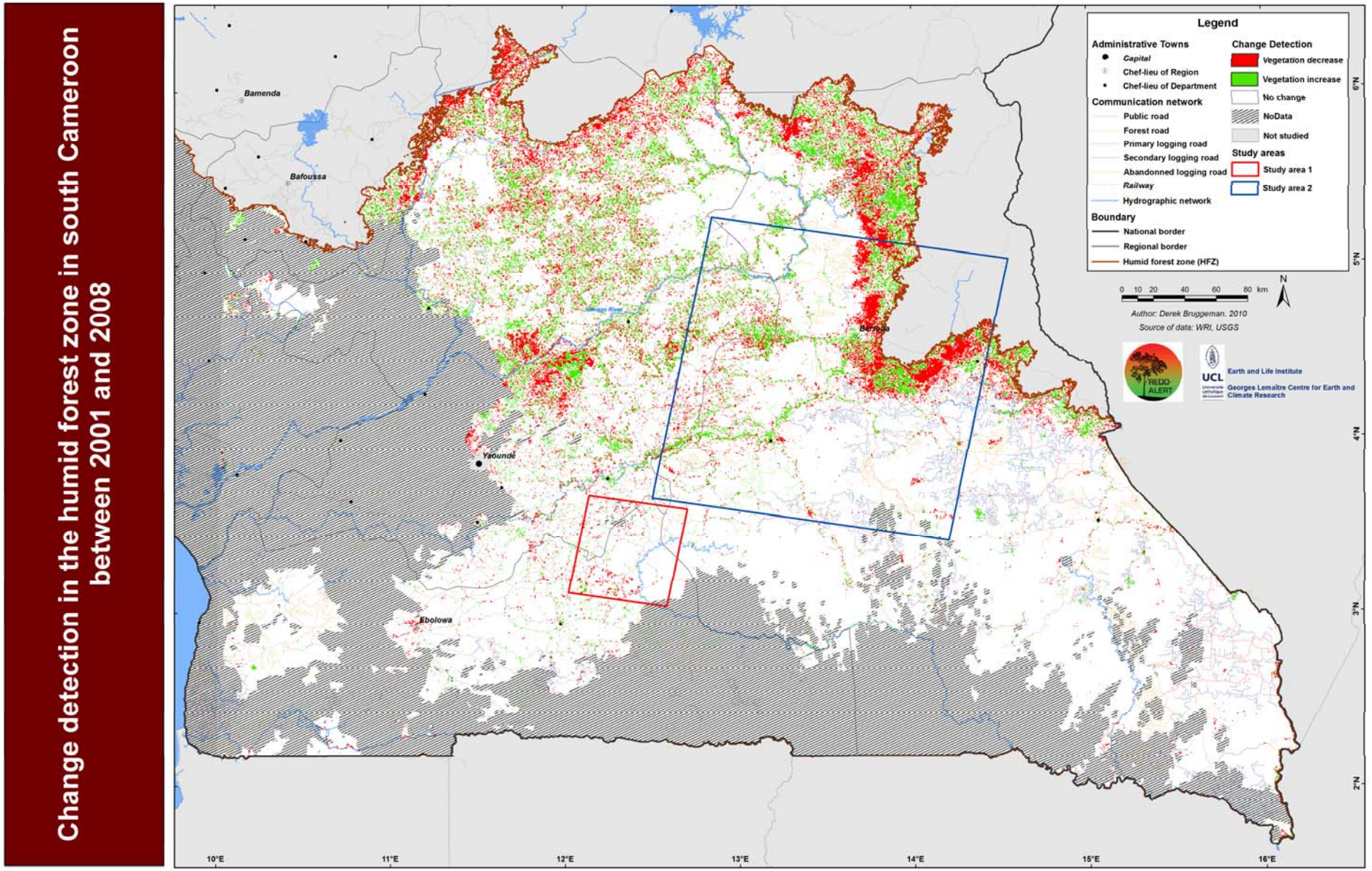



- Coarse scale - Humid Forest Zone, to define deforestation and degradation hotspots
- Time series of MODIS data 500m: 2001/2002 and 2008
- Use of the NDMI index (avoid cloud's contamination on visible channels)

NDMI = (Band 2 – band 6)/(band 2 + band 6)
Hayes et al., 2008

# Preliminary results

Change detection in the humid forest zone in south Cameroon between 2001 and 2008



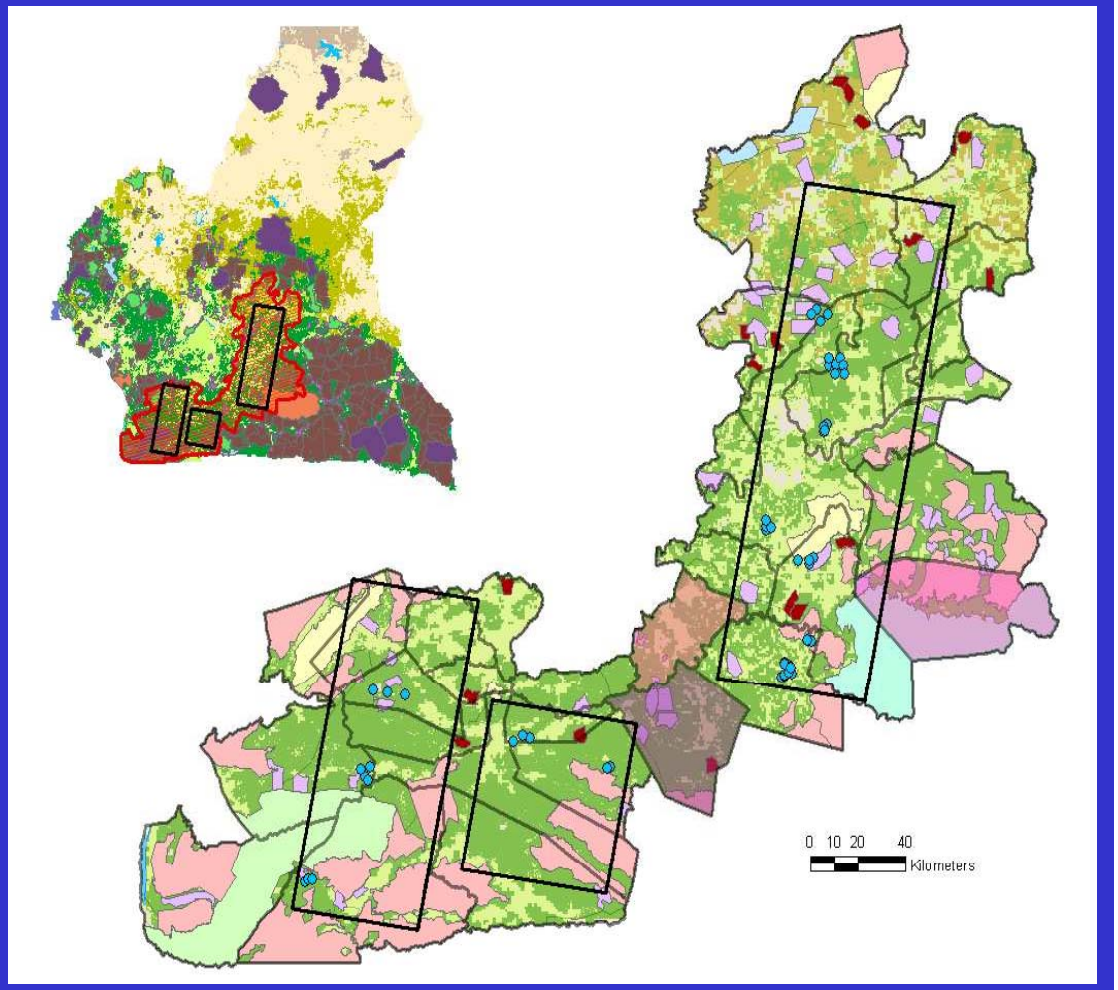
# Cameroon – Selection of study areas

V. Robiglio, M. Tchienkoua, R. Assoumou

1) Stepwise identification of study areas: 3 areas of particular interest for the study – South/Centre/East
IITA, IRAD, ASB global, MLURI, UCL;

2) Based on spatial data and selected criteria: 2 priority study areas and 12 clusters of villages for activities in WP1/WP2/WP5.
IITA, IRAD, ASB global;

3) Rapid reconnaissance survey on the ground
IRAD;




Working document in preparation:
"Report on site selection for ASB – REDD ALERT sites" by Martin Tchienkoua, Robiglio et al.

# Collection of secondary data (inc. maps, statistics, literature, laws etc)

Spatial data:
Administrative Units: regions, divisions, subdivisions, councils*
Transport infrastructures
Settlement
Forest Management/Zoning Plan

Water Courses
Soil FAO (2006)
Rainfall (various)/ Temperature (various)
DEM (30/90)

Forest cover from regional database FORAF/GLC 2000
Letouzey Forest type (1985)

Socio-economic data
2005 Census (division/sub-division)
1987 Census (division)
Agricultural statistics for production / surfaces  2008/2009 2006/2007

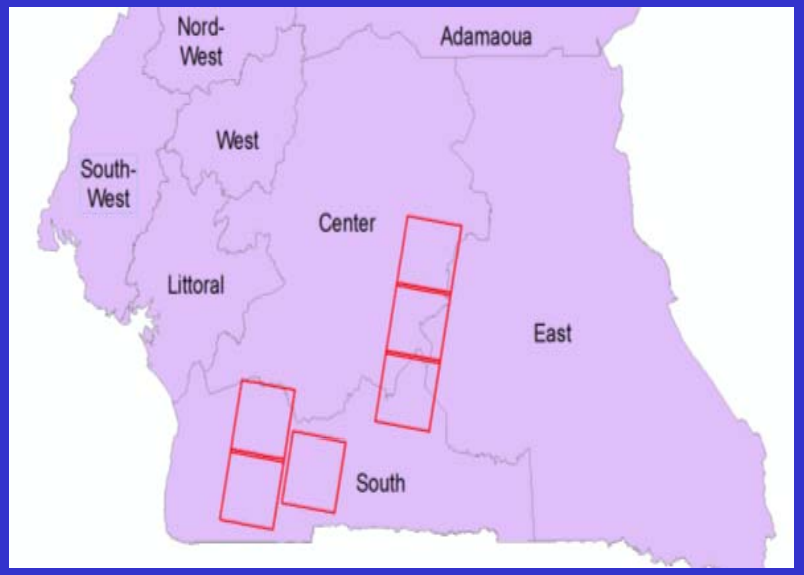
# Satellite Image purchase and initial interpretation

Satellite images acquisition*: Landsat for 2001 and Aster images for each site covering 2 dates 2004-2007 for cluster 1 and 2007 (9) for cluster 2 .

Image preprocessing: Orthorectification, Registration image-to-image, Cloud Masking, Calibration

Initial Image segmentation and classification with ECOGNITION/DEFINIENS for 1 sample area

Proposed methodology for land use change detection to be tested with the other images;




* *The images were acquired by IITA (6) and MLURI (3)*

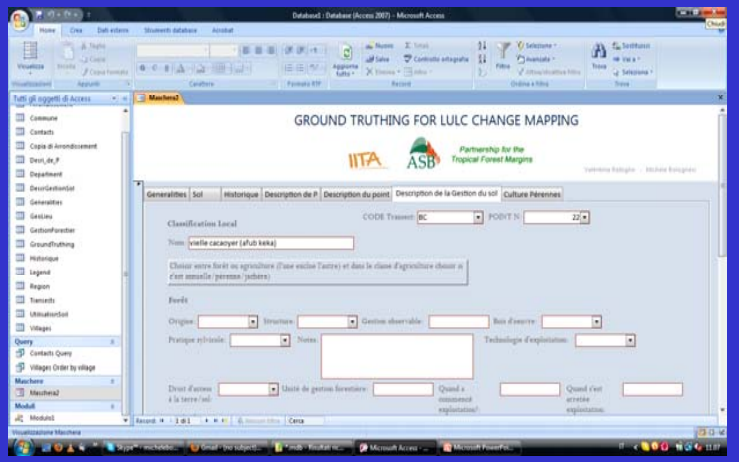
# Fieldwork for Land Use data collection in the Humid Forest Zone*

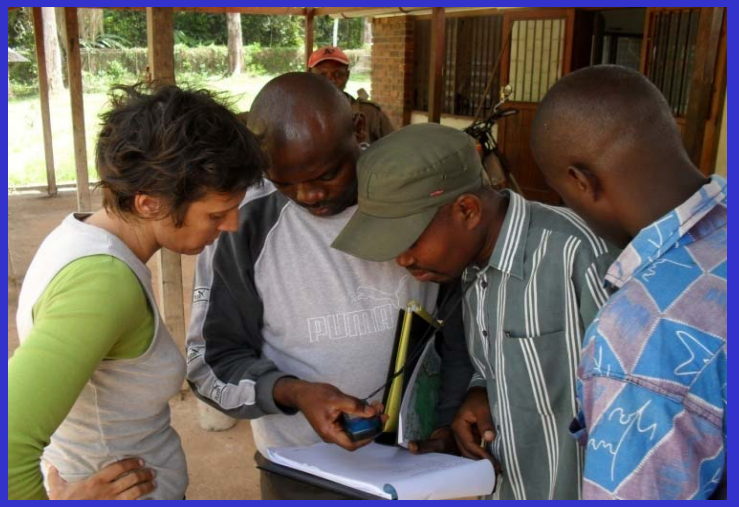
- Data Base of land uses in the 2 selected study area over a total of 950 GCPs along 65 transects 4 - 8 km;

- Protocol for data collection

- Training of 8 technicians of the Ministry of Forestry

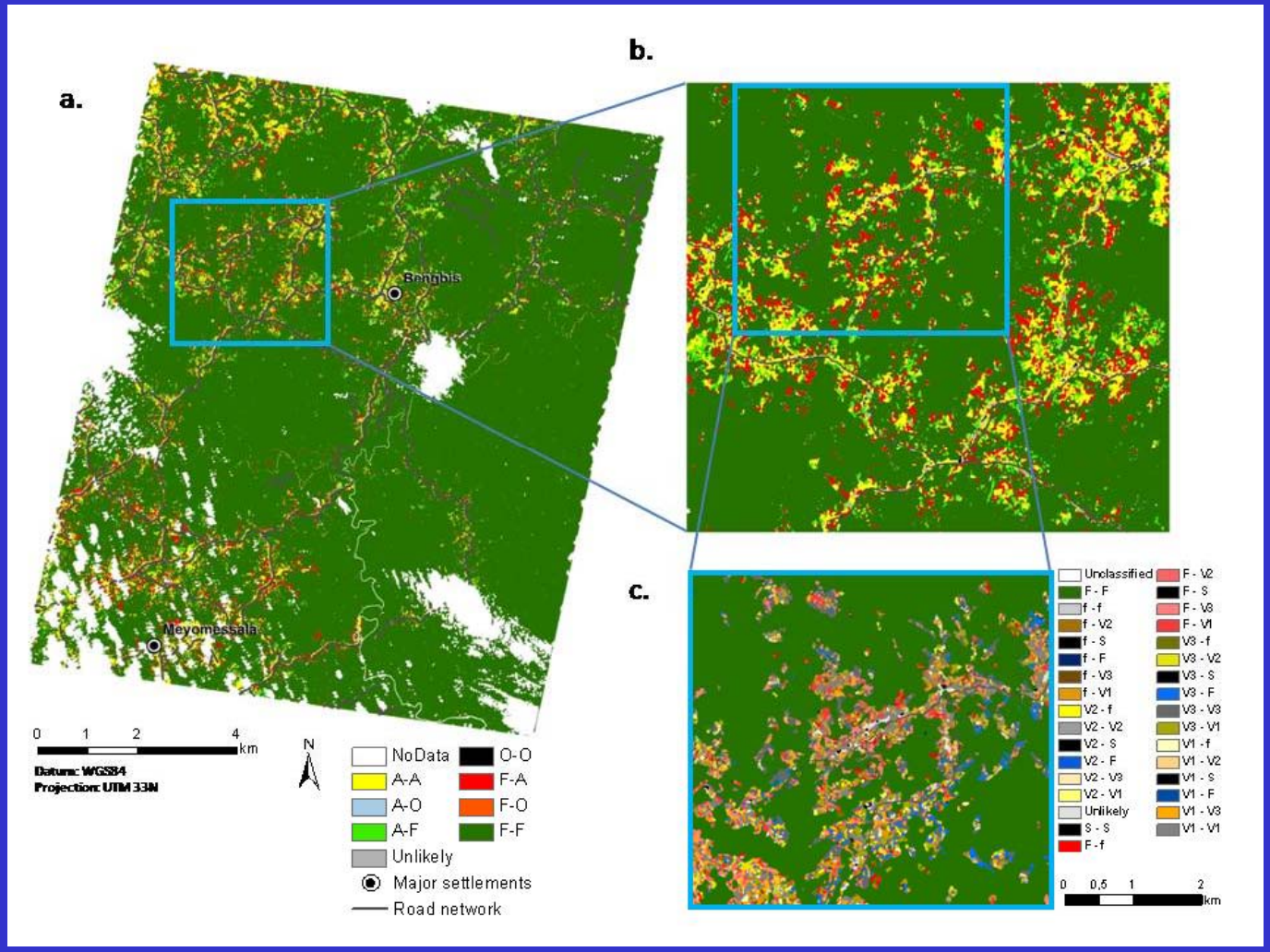
- Data used to: 1) describe agricultural land use mosaics at the forest margin 2) set training and ground control points for land cover mapping.



* ASB, IITA, REALU project funded by Norad

# Preliminary results



# Focus Group interviews in 12 selected villages

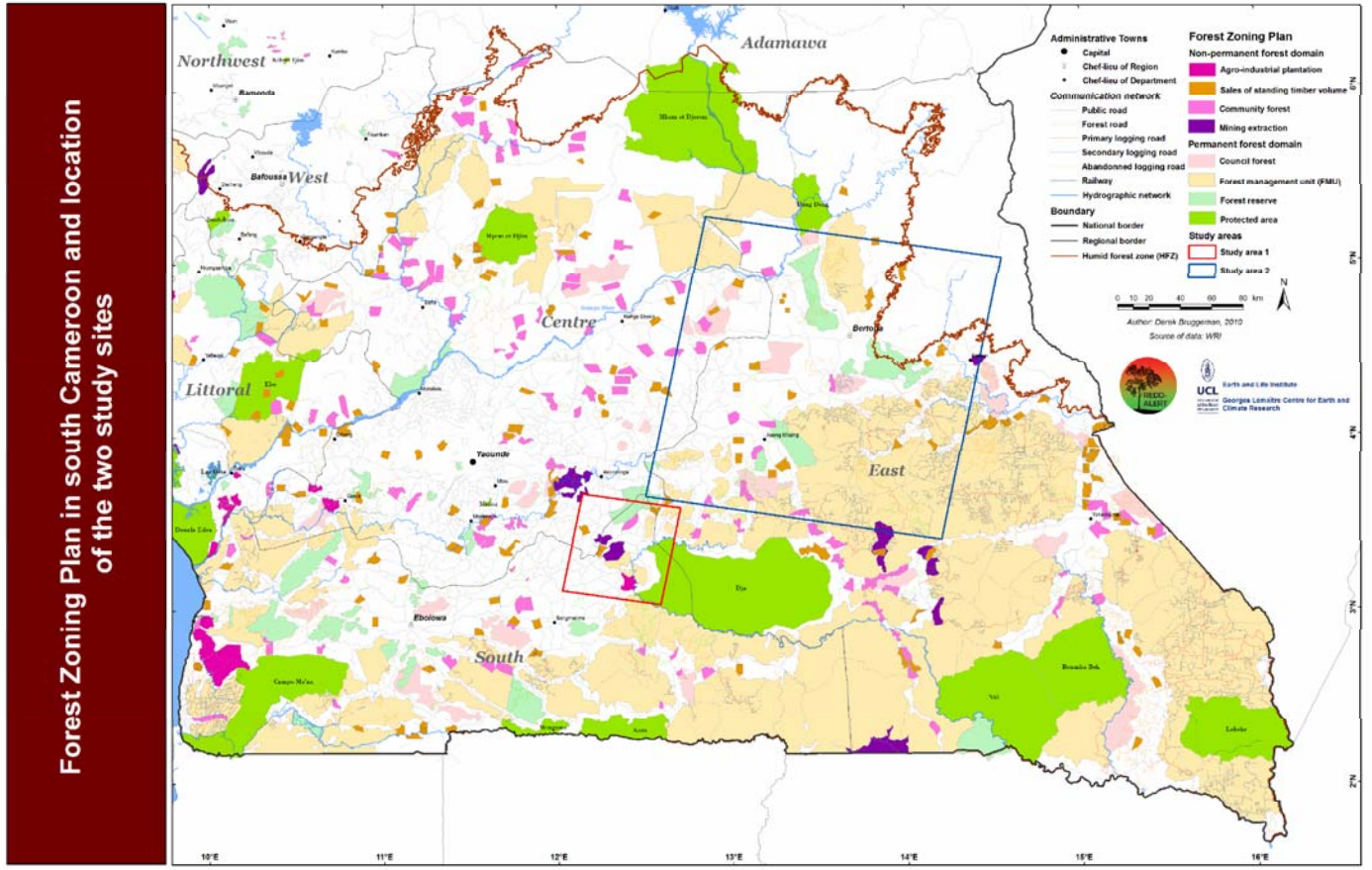
- Questionnaire for the identification of drivers, land use change, intensification, demographical dynamics and preliminary op-cost analysis – farmgate prices for commodities (WP1/WP5);

- Ongoing: 6 over 12 villages are completed;

# Cameroon – Study area 2 East Cameroon

D. Bruggeman, UCLouvain

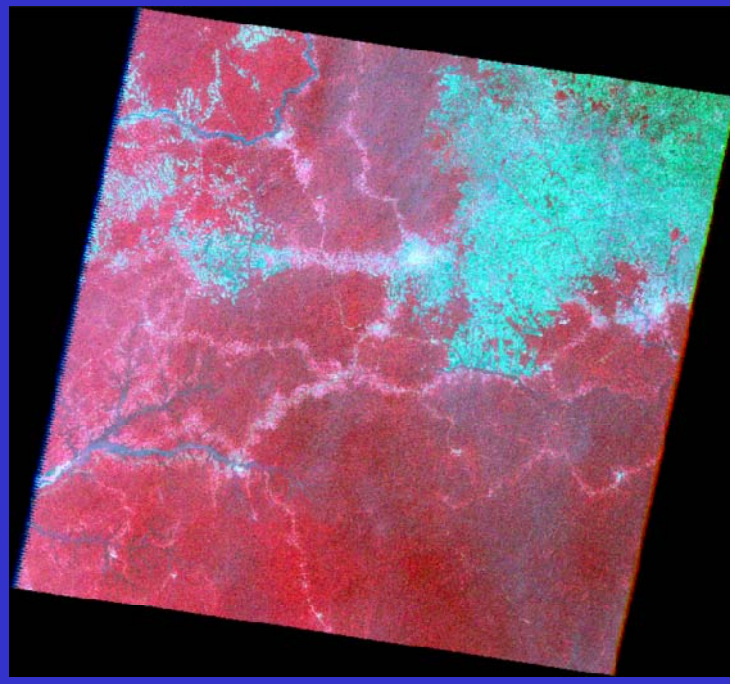
Forest Zoning Plan in south Cameroon and location of the two study sites



# Cameroon – Study area 2 East Cameroon

Focuses on interactions and feedbacks between land use changes and the policy process of land zoning

1) Remote sensing data:
1984: Landsat MSS
17 décembre 1996: 1 SPOT3
12 novembre 2002 : 2 SPOT3 + Landsat ETM+
27 décembre 2009: Landsat ETM+ (SLC-off)
30 décembre 4 images ASTER 30 decembre (+ DMC)

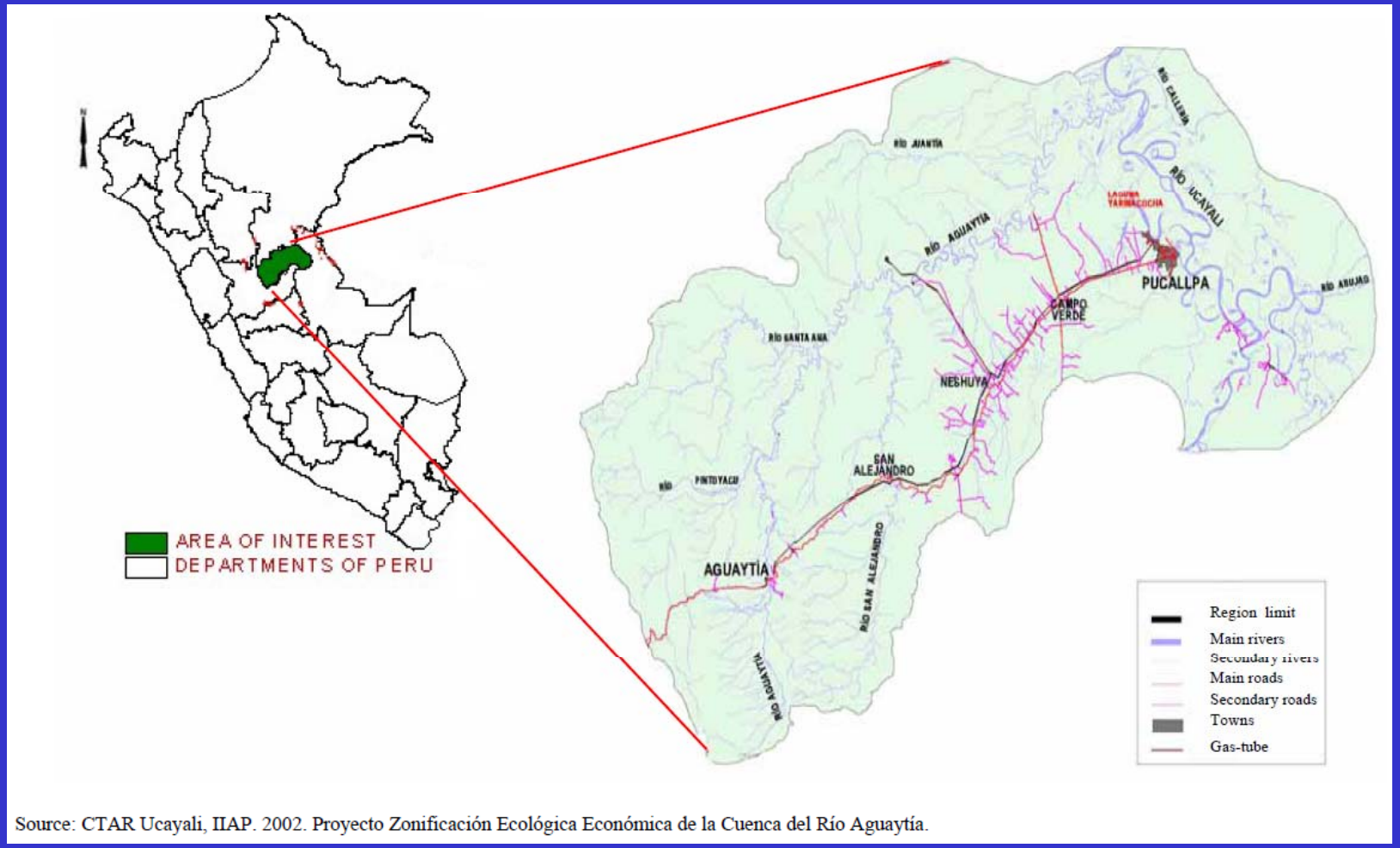


2) Groundtruthing fieldwork

3) Socio-economic survey

# Peru – Study area

G. Hyman, E. Cuellar



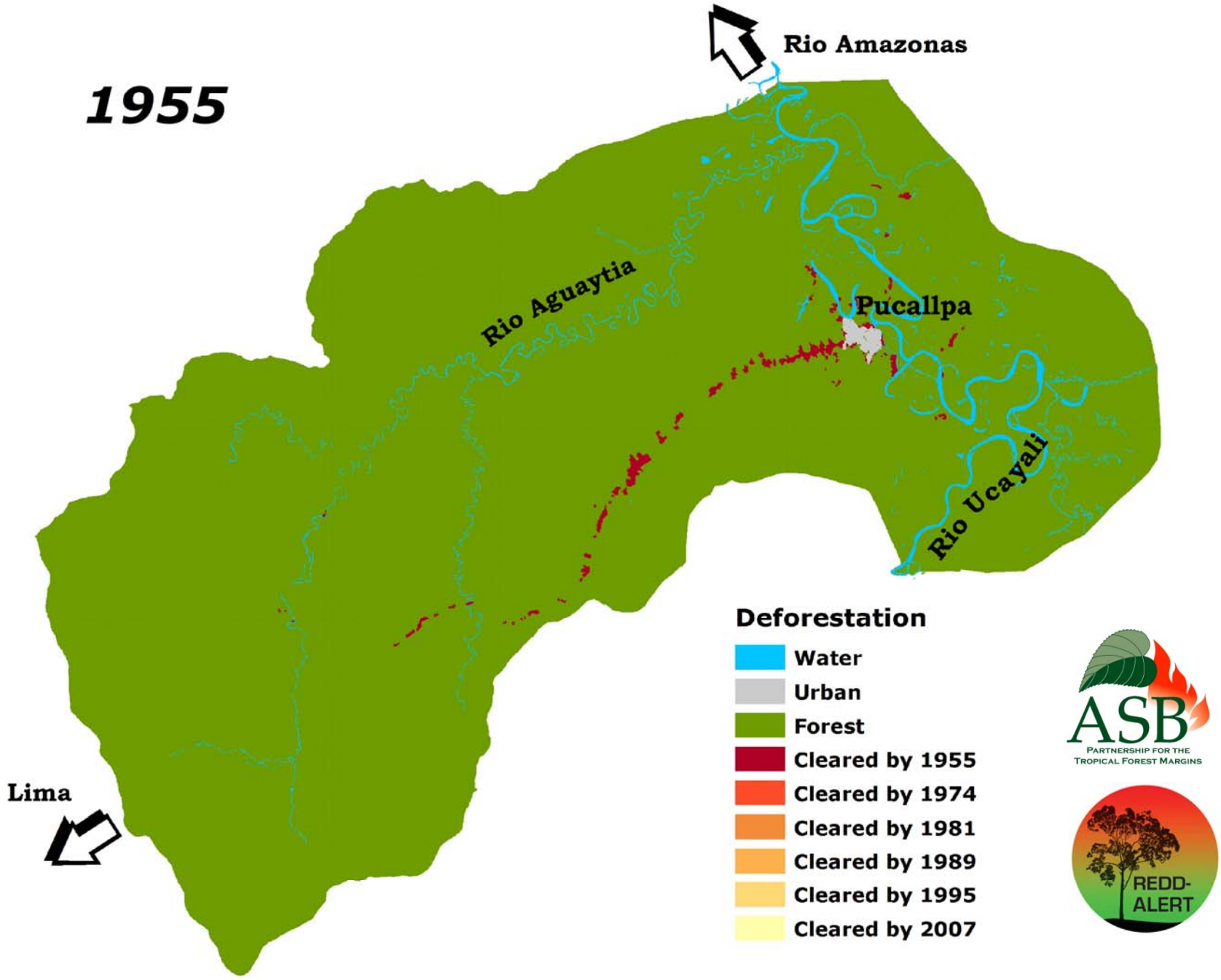

Source: CTAR Ucayali, IIAP. 2002. Proyecto Zonificación Ecológica Económica de la Cuenca del Río Aguaytía.

# Peru – Study area

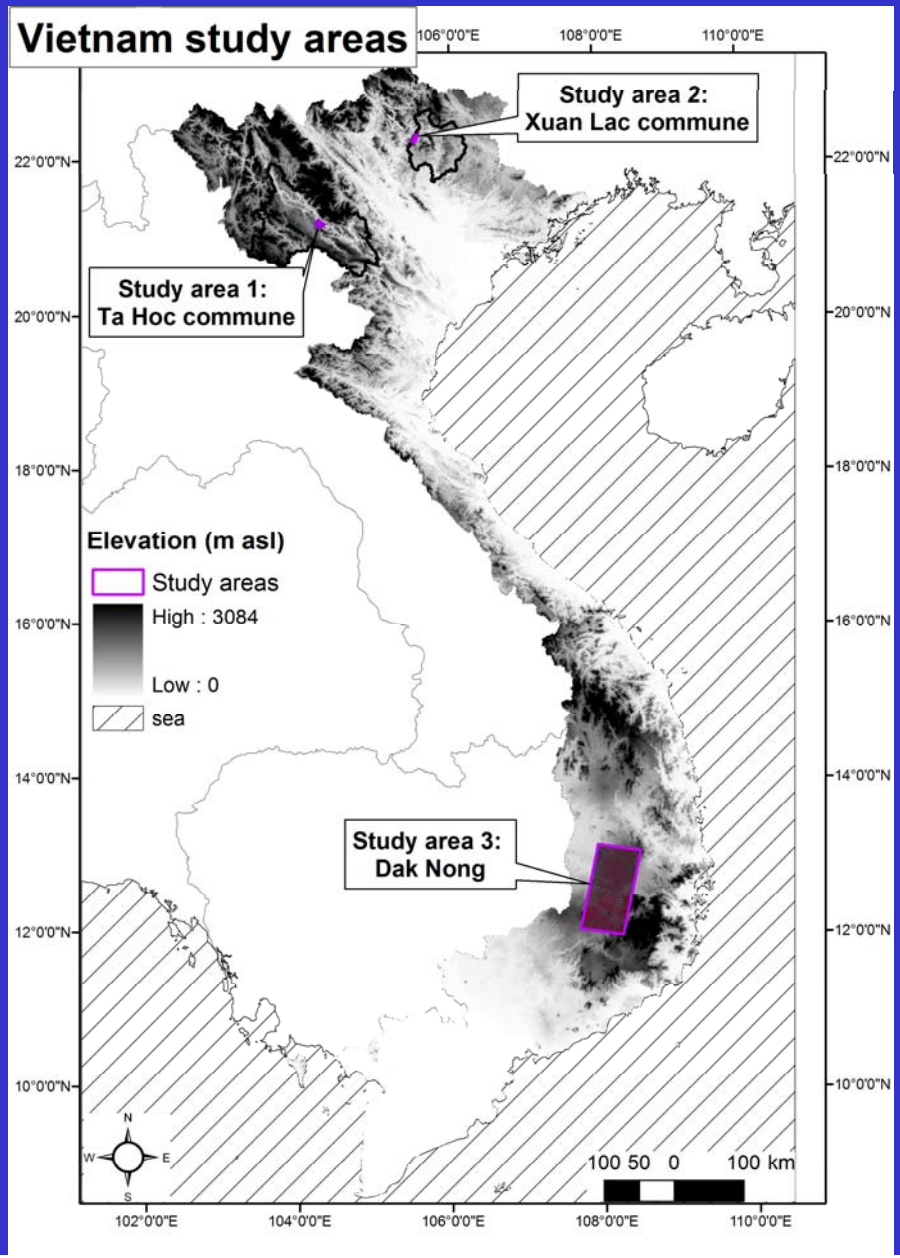
G. Hyman, CIAT & INIA

- 1994 & 2007 housing and population census at village level.
- Improving the land-use data set based on visual interpretation : validation exercise.
- Time to market data set at 90 m resolution.
- 90 m SRTM elevation data set
- Atlas Aguaytia

| Date | platform | resolution | source |
|---|---|---|---|
| 1955 | Air photos | 1:20,000 | APODESA |
| 1974 | Air photos | 1:20,000 | APODESA |
| 1981 | LandSat | 79 m | CIAT |
| 1989 | Landsat | 30 m | IIAP/CIAT |
| 1995 | LandSat | 30 m | IIAT/CIAT |
| 2007 | Landsat/Aster | 30 m | CIAT |

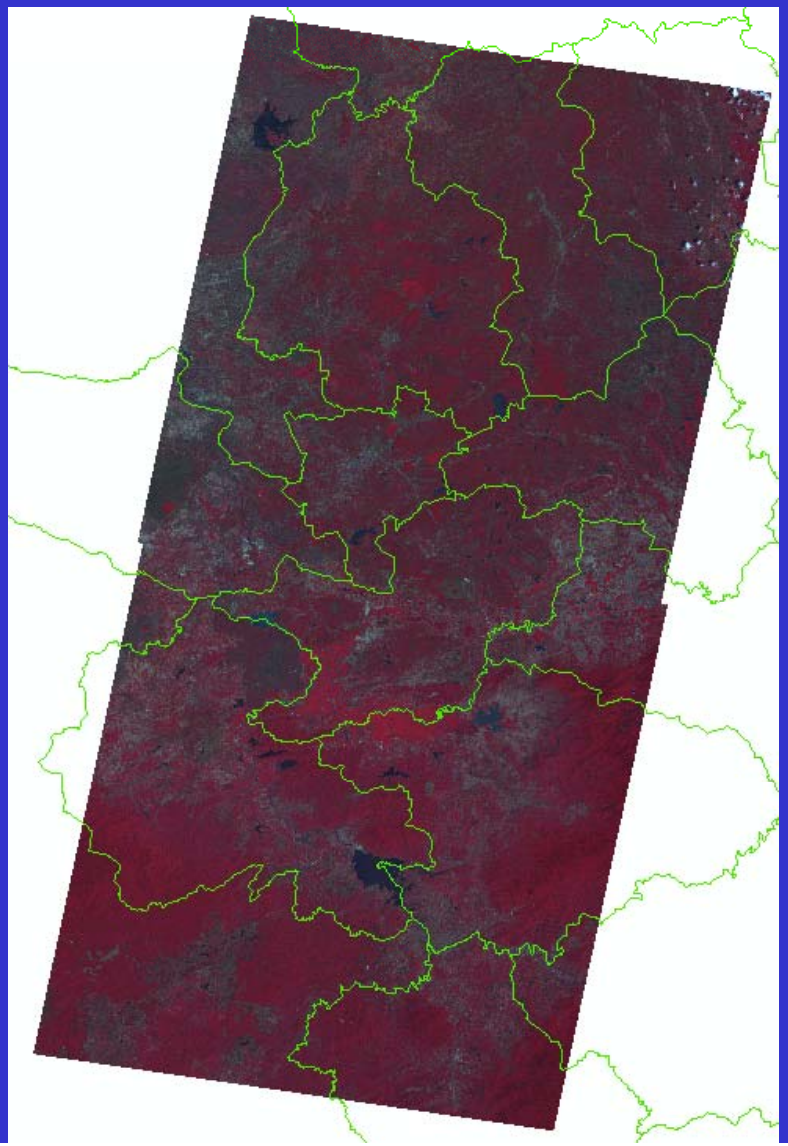

1955
Rio Amazonas
Rio Aguaytia
Pucallpa
Rio Ucayali
Lima
Deforestation
Water
Urban
Forest
Cleared by 1955
Cleared by 1974
Cleared by 1981
Cleared by 1989
Cleared by 1995
Cleared by 2007
ASB
Partnership for the Tropical Forest Margins
REDD-ALERT

# Vietnam study areas



# Vietnam – Study area

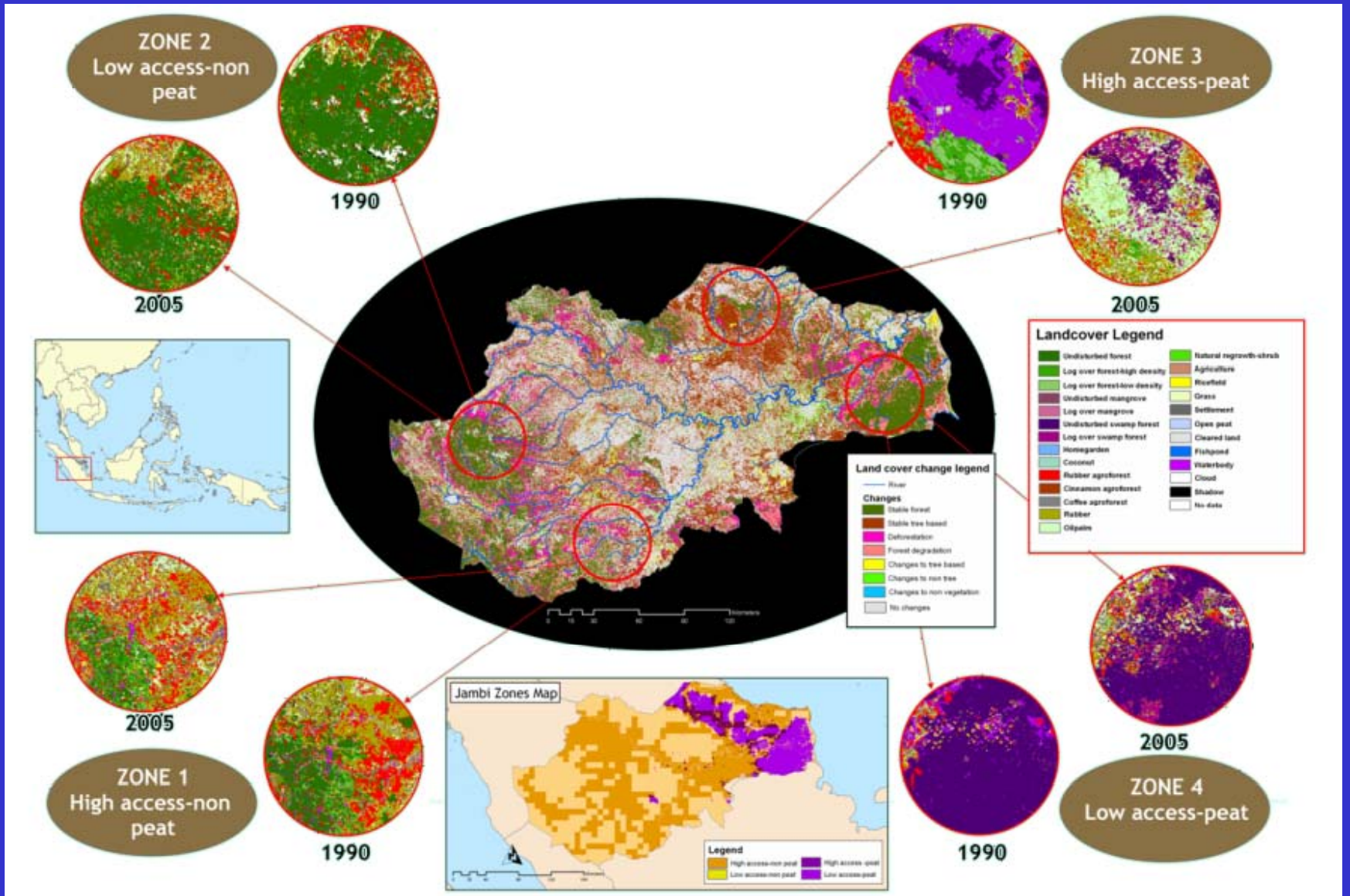
Vu Tan Phuong, Hoang Viet Anh, RCFEE



- Time series of Landsat and Aster images
- Groundtruthing fieldwork: 70 points
- Image processing ongoing
- Collection of secondary data on population and land use

# Indonesia – Study area

A. Ekadinata, M. Van Noordwijk, ICRAF



# Cross-country comparison

P. Meyfroidt, UCLouvain

## Objectives:

- Is there an association between forest transition and displacement of land use abroad?

## Data & Methods

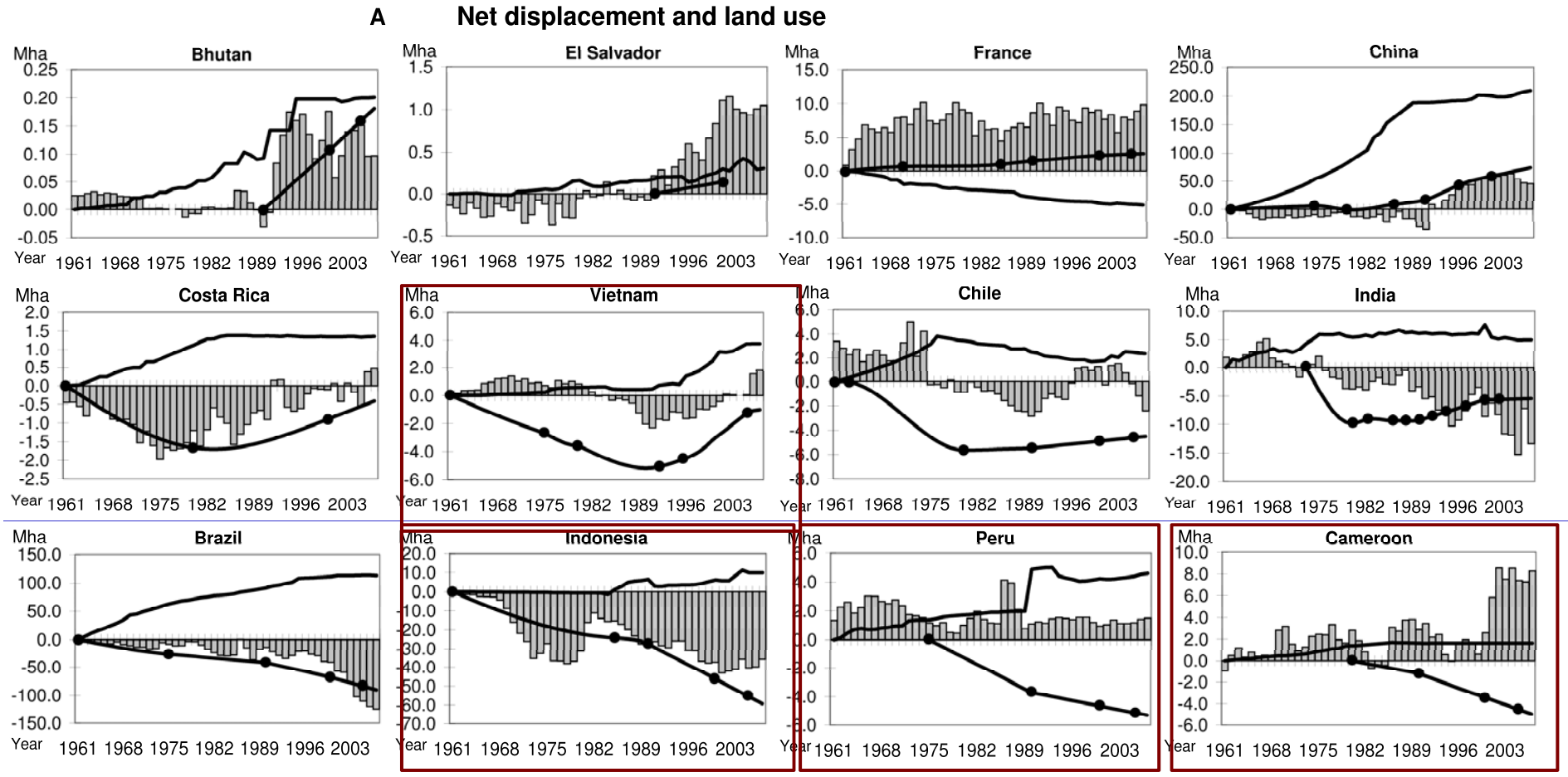
- 4 Redd-Alert countries + recent FT countries (Bhutan, Costa Rica, Chile, China, El Salvador, India) + France + Brazil
- Trade data from FAOSTAT & COMTRADE

- Calculation, for 3 sectors: crop, animal & wood products :

Gross displacement from imports
Gross absorption from exports
Net displacement / absorption

- Panel & country regressions of forest cover on net displacement
- Net balance of accumulated reforestation and net displacement

# Results - graphs



# Results – net balance

| | Net displacement | Net accumulated land sparing | Association between net displacement and forest cover | Description |
|---|---|---|---|---|
| Bhutan | > 0 | < 0 | + | Increasing net displacement, with negative net land sparing |
| El Salvador | | | + | |
| China | > 0 | > 0 | + | Increasing net displacement, with positive net land sparing |
| Chile | | | | |
| Costa Rica | | | | |
| Vietnam | < 0 | > 0 | + | Decreasing net absorption, with positive net land sparing |
| India | < 0 | > 0 | - | Increasing net absorption, with positive net land sparing |

# Conclusion

- In FT countries, significant association bw reforestation and displacement of land use abroad
  - Yet, various situations (e.g. India)
  - For many: increased wood imports, partly compensated by agricultural exports

- Net balance positive, but decreasing over time:

Since onset of FT : displacement = 22% of the reforestation
Last 5 years : displacement = 52% of reforestation

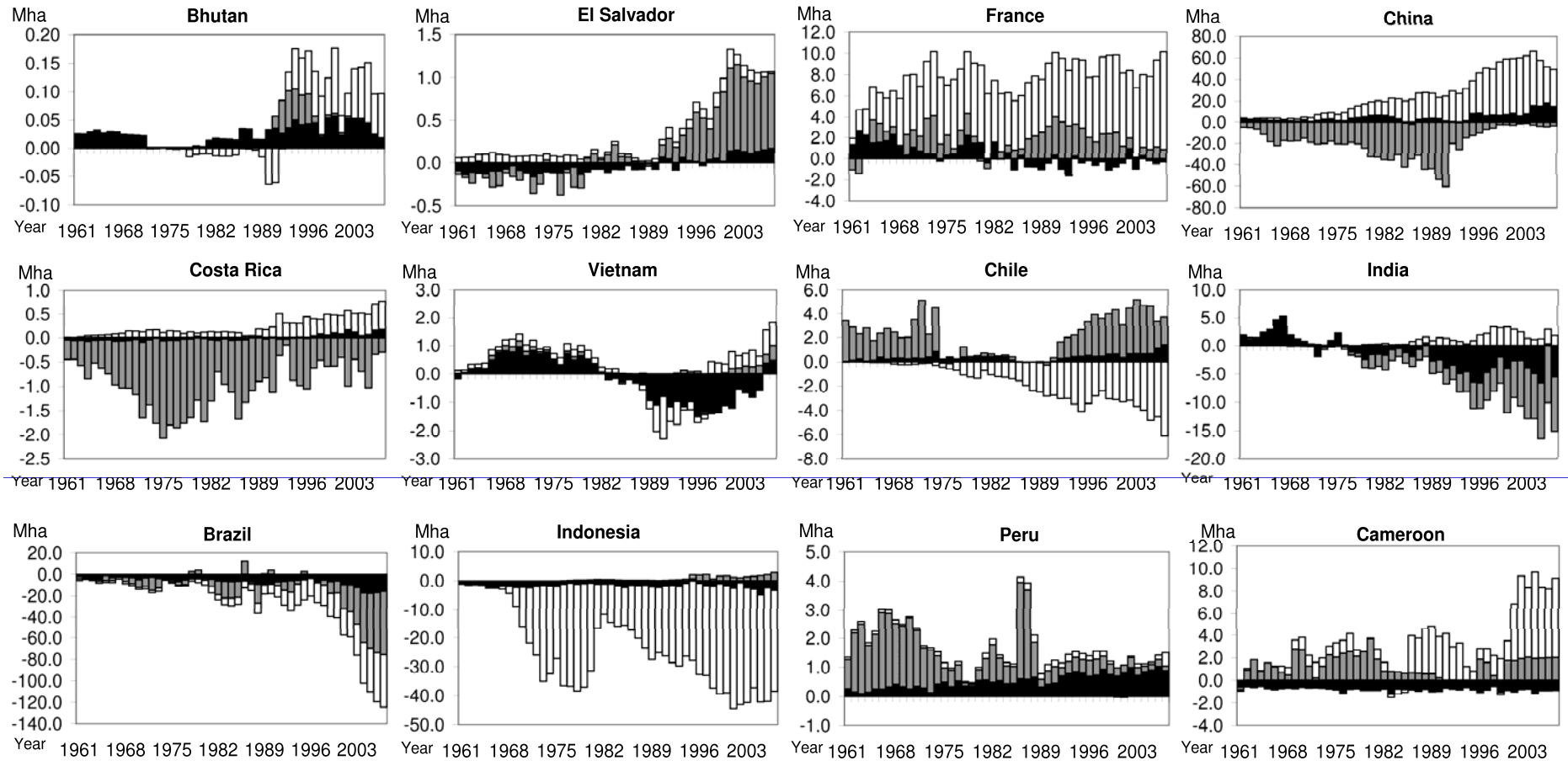
- Policies:
  - Payments for reduced deforestation is OK, but compensated farmers or final consumers will have to buy food from somewhere

# Thank you

# Slide reserve

# Results - sectors

**B Net displacement by sectors**



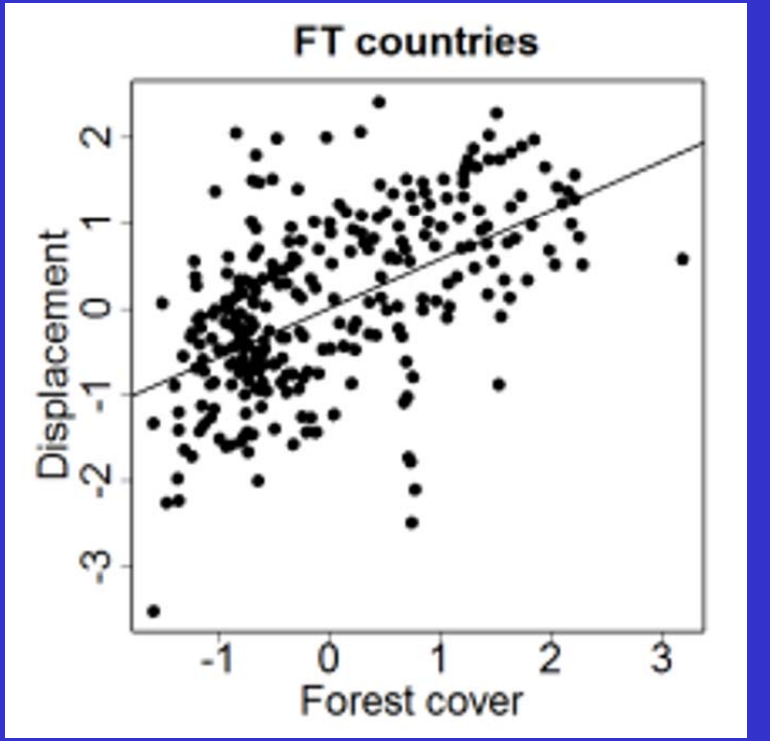

**Legend for net displacement by sectors**

- Net displacement for wood products (Mha)
- Net displacement for animal products (Mha)
- Net displacement for crop products (Mha)

# Results - regression

| Panel regressions | Estimate |
|---|---|
| **Countries with a forest transition** | **0.556*** ** |
| Countries without forest transition | 0.332 |

| Regressions by country | Estimate |
|---|---|
| Forest transition countries | |
| **France** | **0.464†** |
| Bhutan | 0.313 |
| **China** | **0.928*** ** |
| India | -0.0961 |
| **Vietnam** | **0.668*** |
| **Costa Rica** | **0.564†** |
| **El Salvador** | **0.624**** |
| **Chile** | **0.713*** ** |
| Non-forest transition countries | |
| **Cameroon** | **-0.835**** |
| **Indonesia** | **0.781*** ** |
| **Brazil** | **0.841*** ** |
| Peru | -0.0607 |




*** p<0.0001;

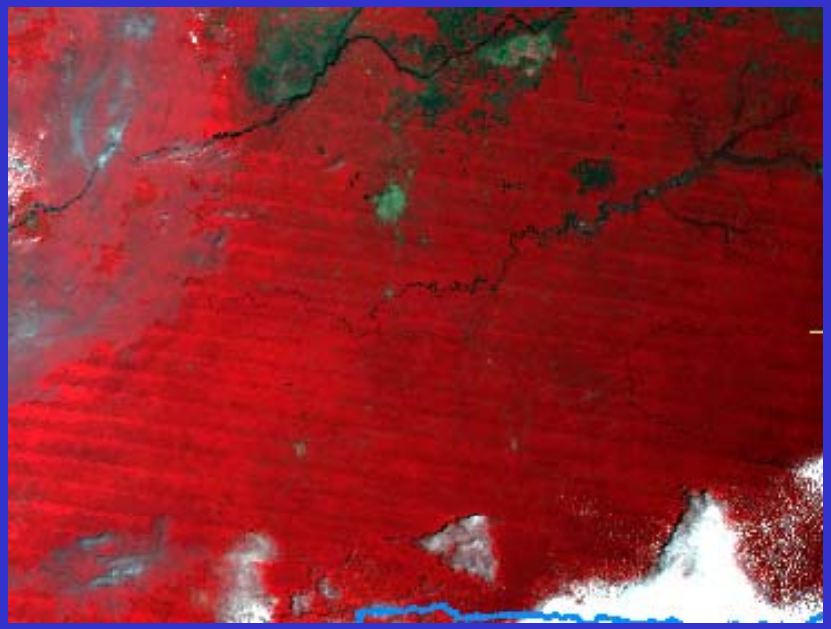
** p<0.001;

* p<0.01;

† p<0.05.

# Methodological issues

- Differences in seasonality between images
- Almost permanent cloud cover (especially in the west)  3 pairs of images
- Band 6 (SWIR) of MODIS/Aqua unusable
- Linear artifacts on the MODIS/Terra surface reflectance product



# Cameroon – Selection of study areas

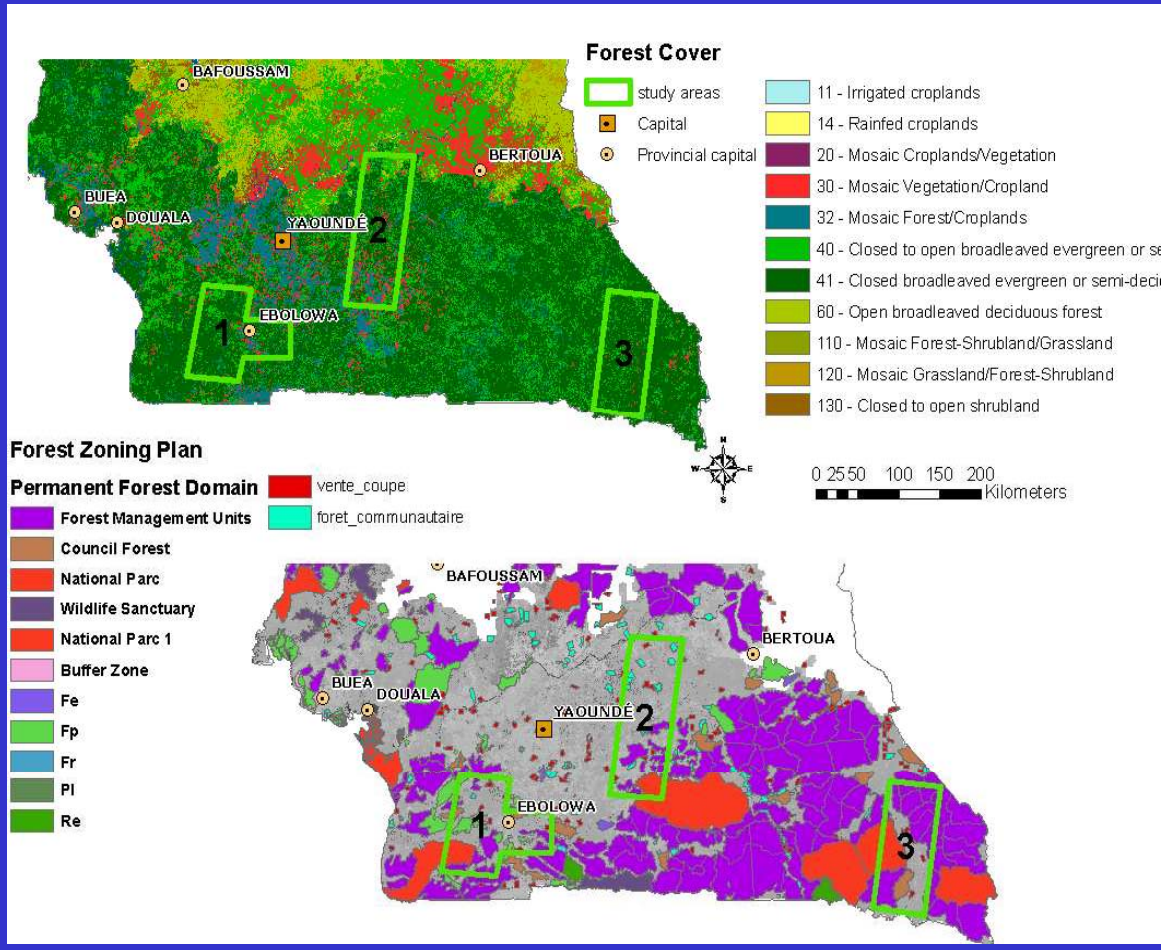
V. Robiglio, R. Assoumou, M. Tchienkoua, IRAD & IITA

## Site selection

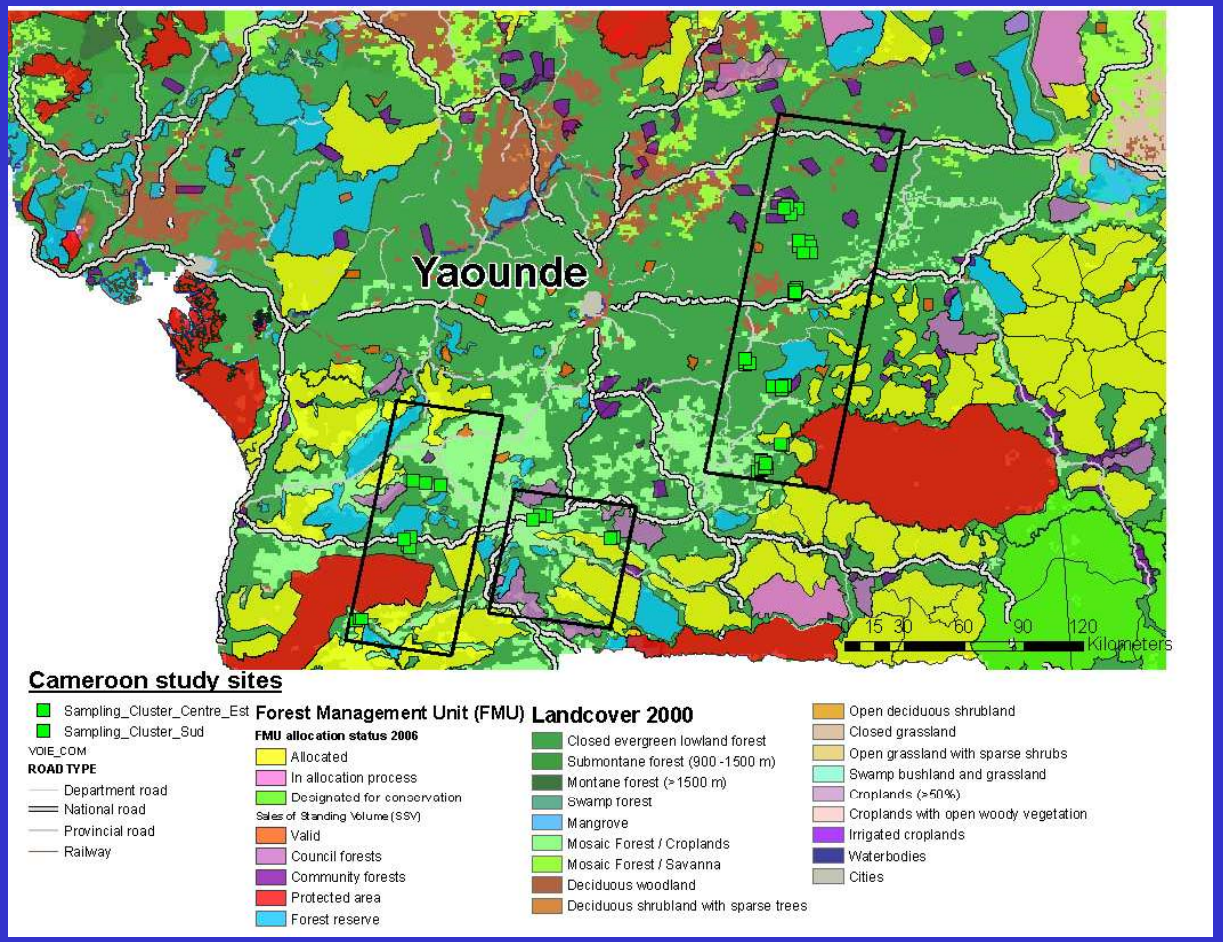
1) Identification of six candidate areas with good satellite image coverage

2) Selection of 2 “cluster” study area in the centre and south (1 and 2).

3) Identification of study sites



# Cameroon – Study area 1 South/Central Cameroon

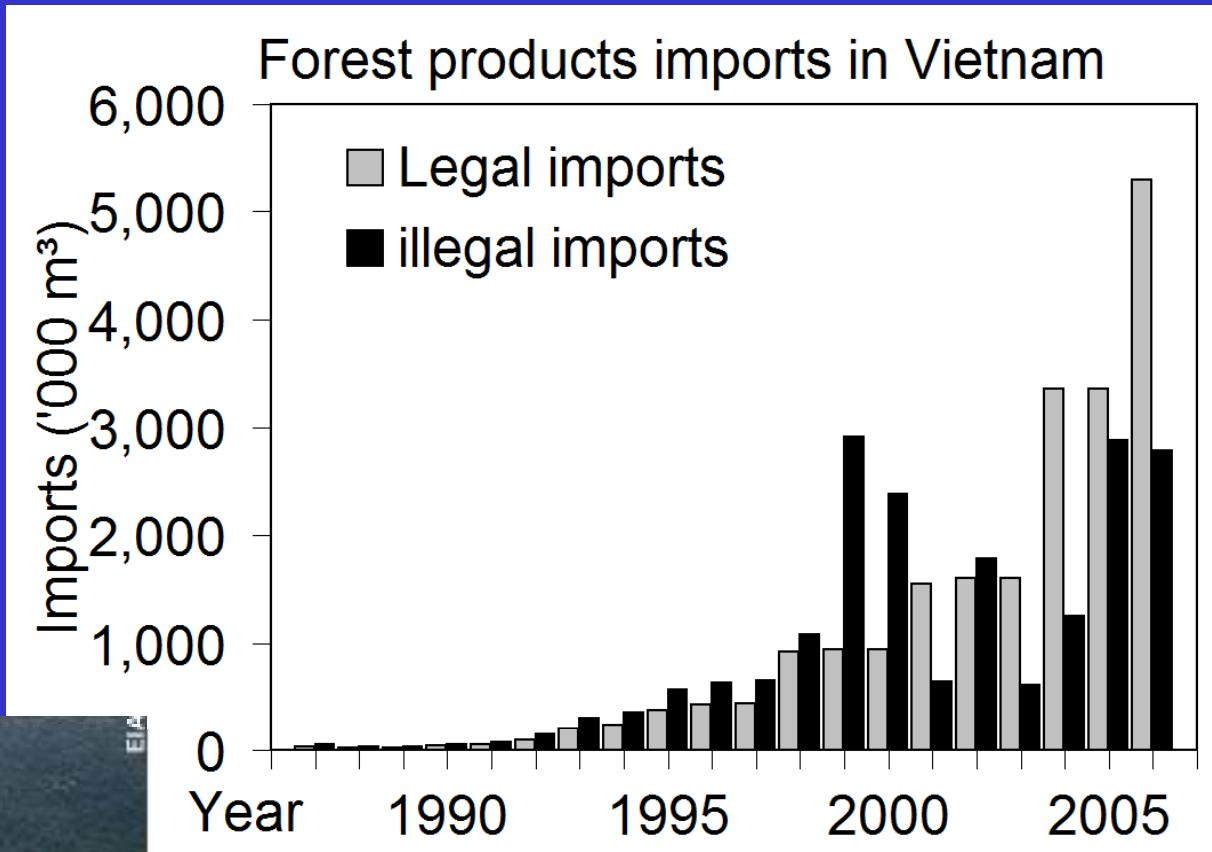


# WP 1:
# Land cover legend

- Standardized land cover legend for the study areas (using FAO LCSS)

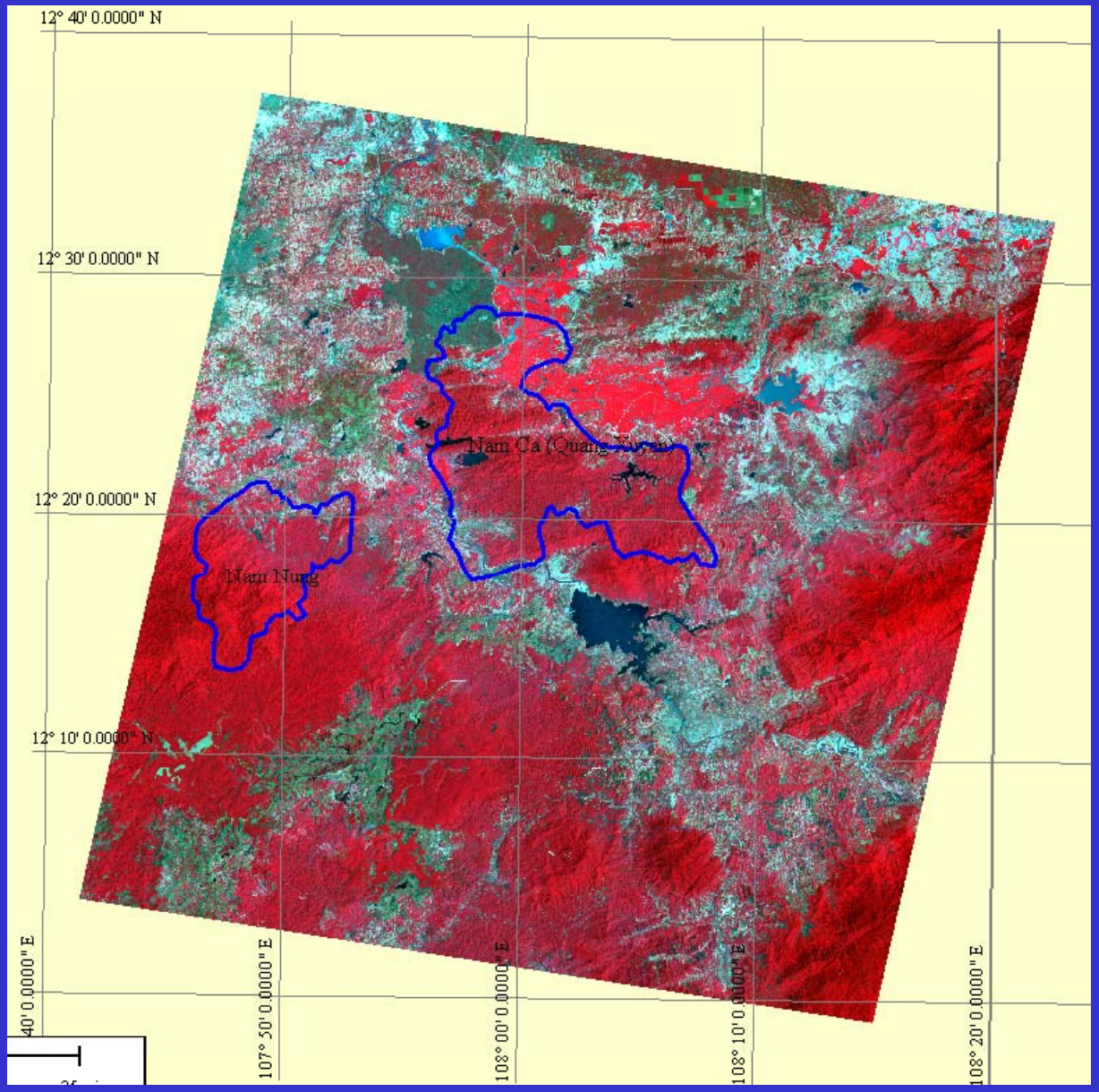
-

# Displacement and illegal trade of wood

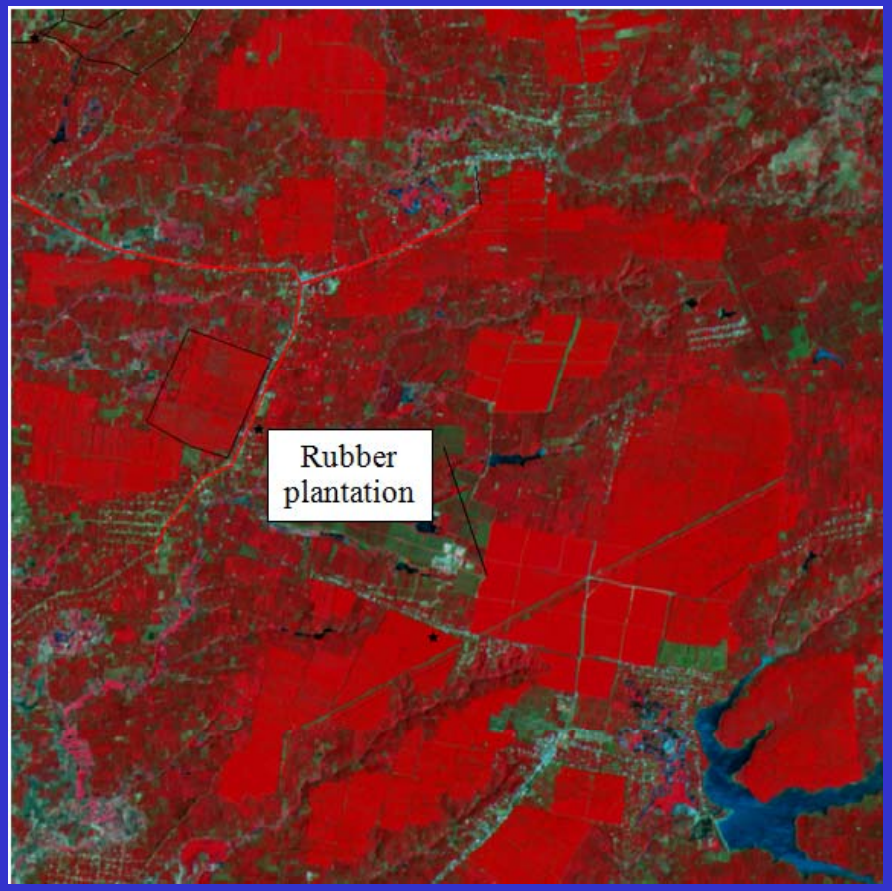



*Adapted from Meyfroidt and Lambin, 2010, PNAS*

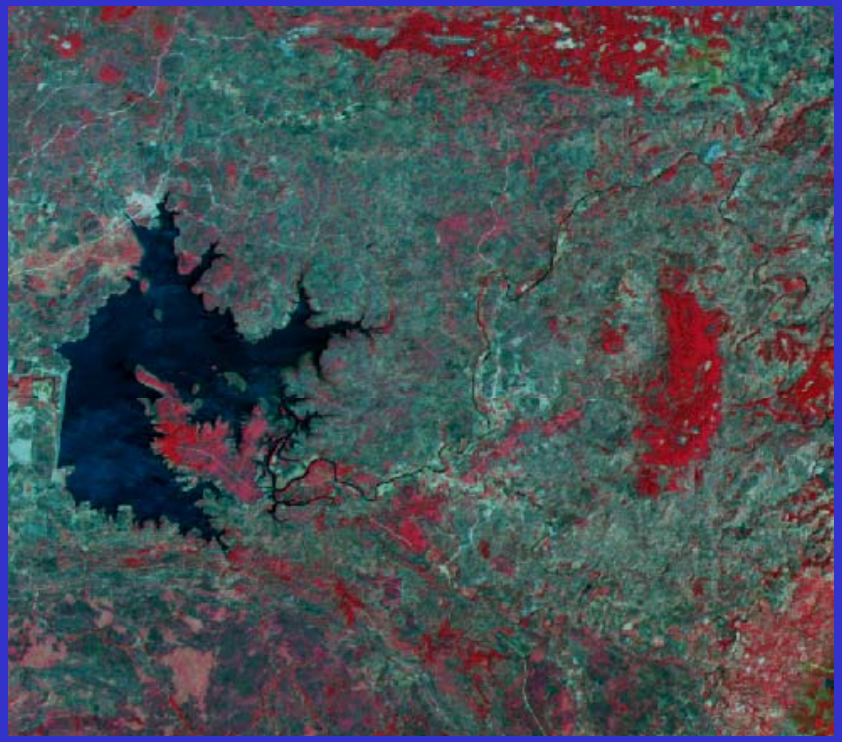
*From EIA / Telapak*




**Southern Aster image and boundary of Nam Nung and Nam Ca Natural reserve**




| Rubber plantation pattern on ASTER image | Rubber plantation on the ground |
| --- | --- |

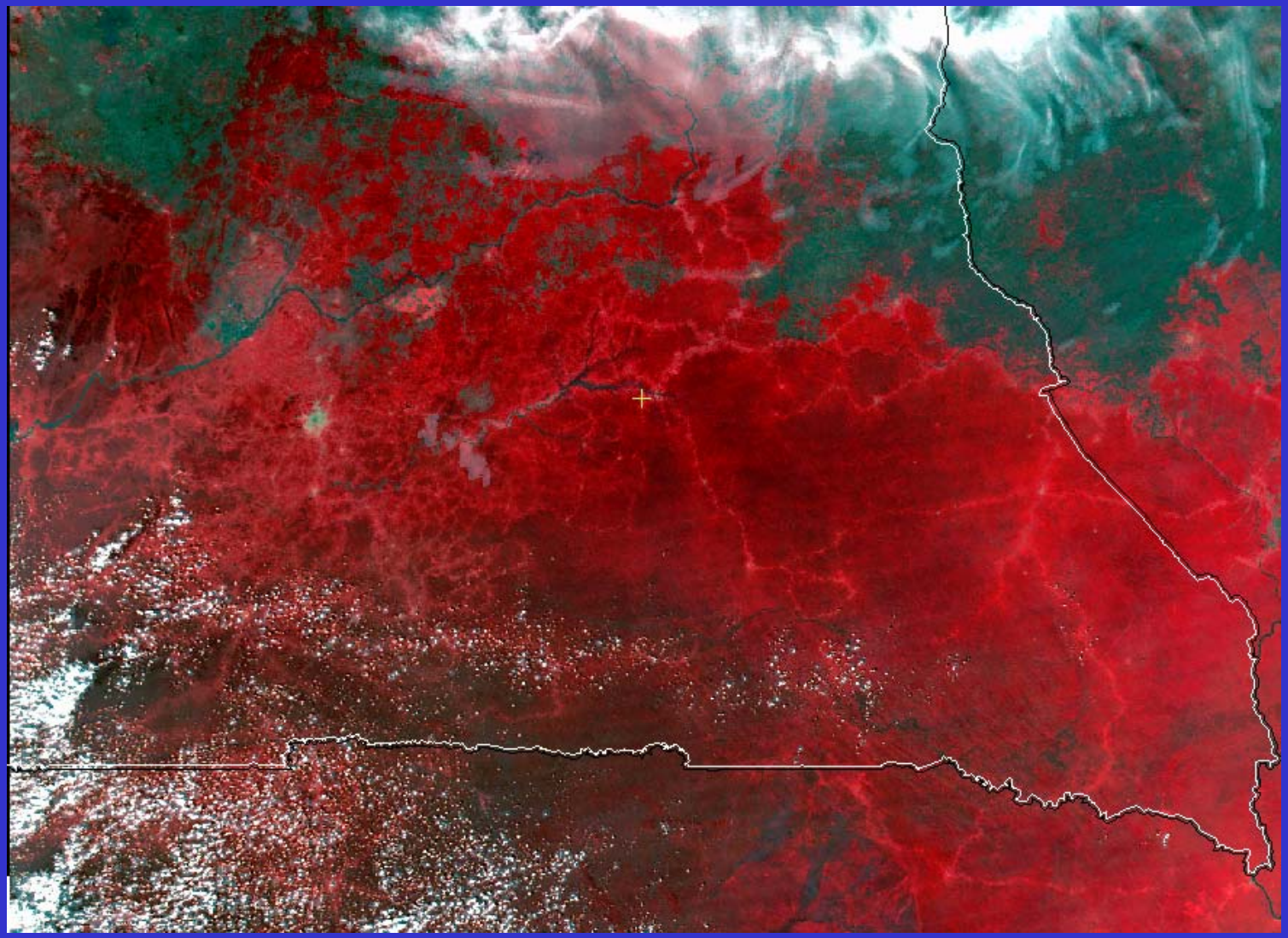


| (a) | (b) |
|---|---|

**Figure 4. Open deciduous forest. (a) ASTER image RGB:321, (b) picture taken on the field March 2010**

# Slide reserve

# Input data



MODIS/AQUA 27 December 2008 (bands: 2/1/4)