The FRA2010 Remote Sensing Survey:
Better global data on forest area & change

work by FAO and partners

Adam Gerrand, E. Lindquist, M. Wilkie, FAO,
J. Latham, R. Cumani, A. Martucci, A. di Gregorio, FAO
F. Achard *et al.* EC Joint Research Centre
M. Hansen, P. Potapov, South Dakota State University,
C. Schmullius, R. Knuth, Jena University, Germany
Data provided by USGS and NASA

www.fao.org/forestry/fra2010-remotesensing/en/

SDSU

EUROPEAN COMMISSION

EuropeAid

JRC

USGS science for a changing world

seit1558

FRA-SAR

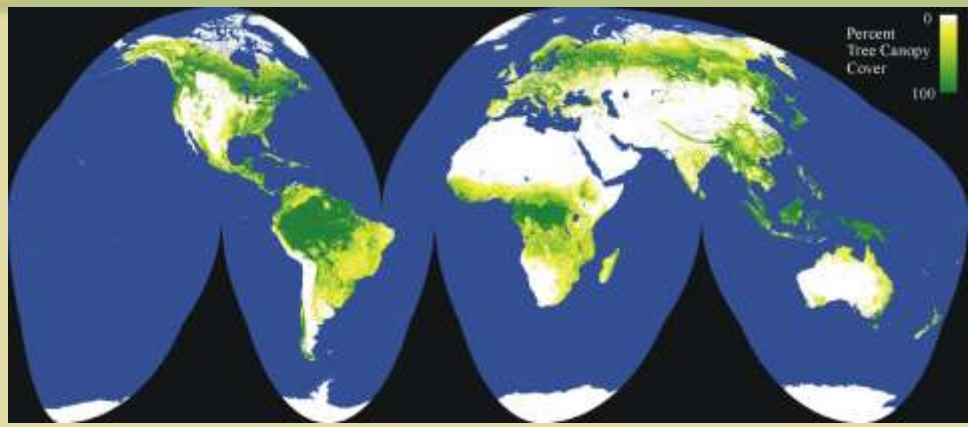
FAO FIAT PANIS

Why we are doing a Remote Sensing Survey

- **We need new updated global forest maps**
  - better data on forest area change (e.g. FRA, CBD etc)
- **Strong links between forests and climate change**
  - key data for climate analysis = forest area, type and change (deforestation / afforestation, natural expansion)
- **Remote sensing can:**
  - provide more consistent global forest area data
  - can be done in the same way for different time periods
  - generate better historical data for forest area & change

Expected outputs and benefits

1. **New global tree cover maps** (250 m resolution) from MODIS satellite, will be annual from 2000



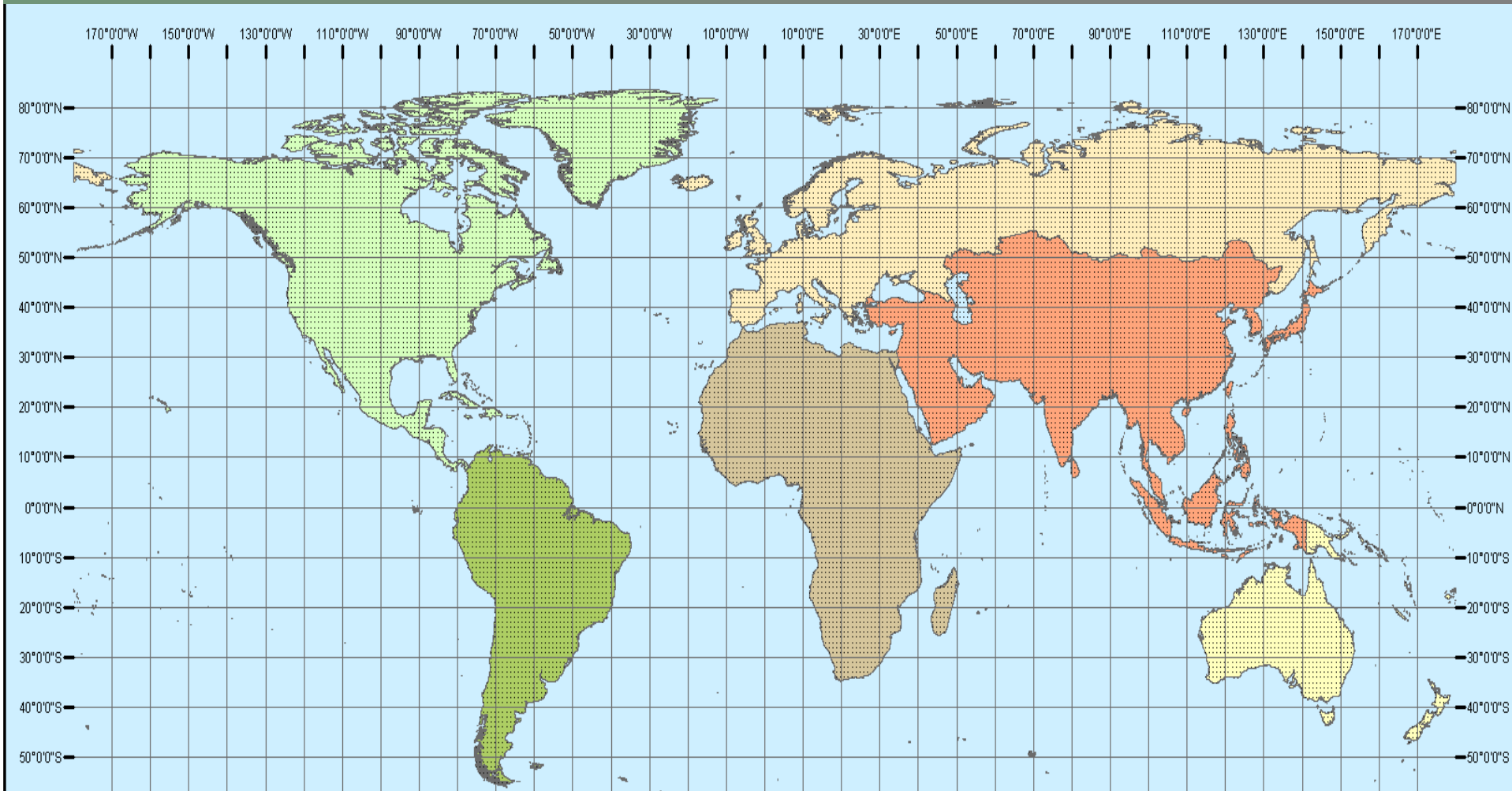
2. **Global and regional *trends* in forest extent for 1975(?) – 1990 – 2000 – 2005:**
   - area change stats (from Landsat samples 30m detail)
   - land use change (forest loss AND gain)
3. **A long-term monitoring framework for forests, land use and environment (e.g. can contribute to REDD)**
4. **Improve many countries forest reporting capacity**

The 1 degree lat-long sampling grid

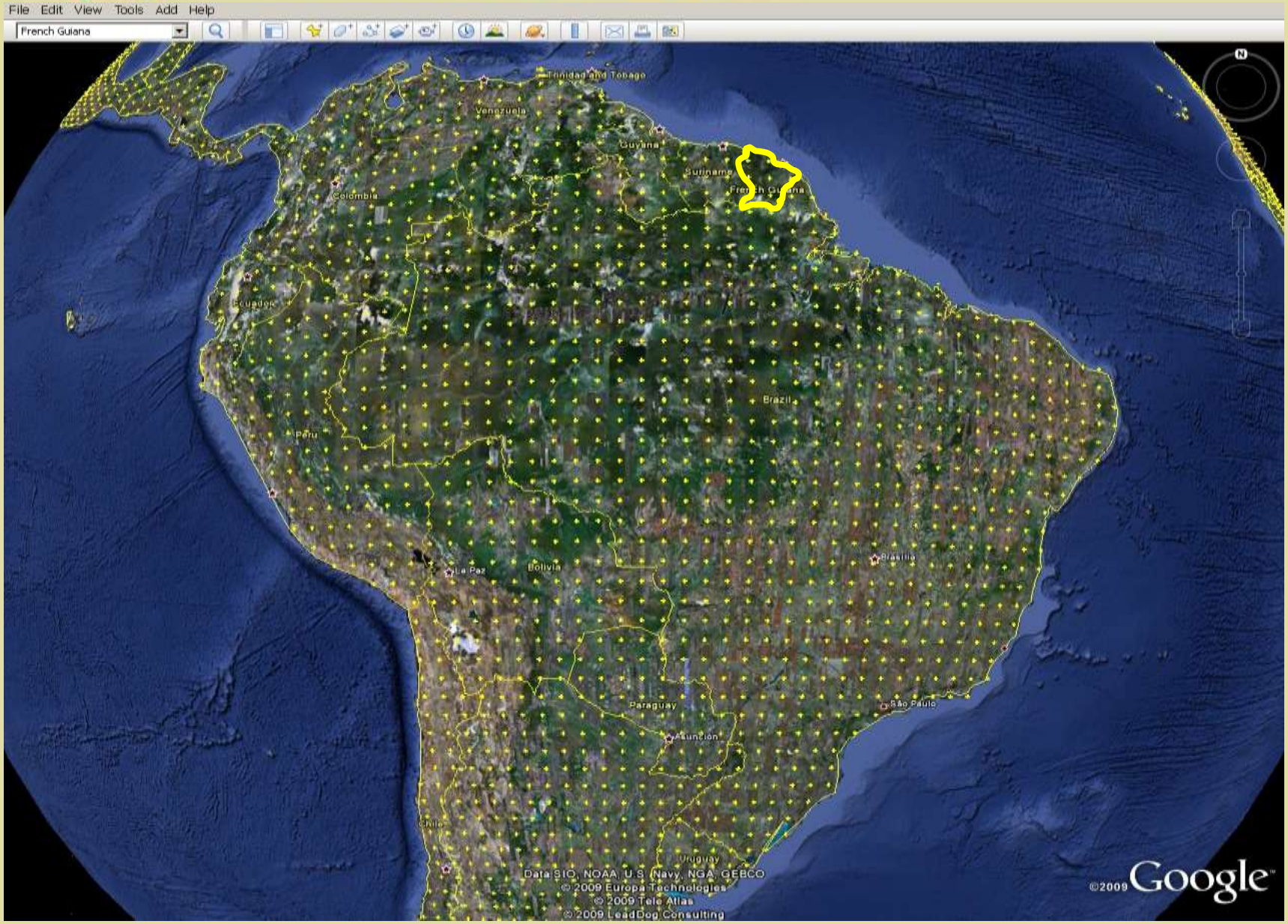
- LANDSAT imagery (30m resolution) every 1 degree lat-long: 10 km x 10 km

⇛ ~ 13 000 sampling sites (excluding poles and deserts)

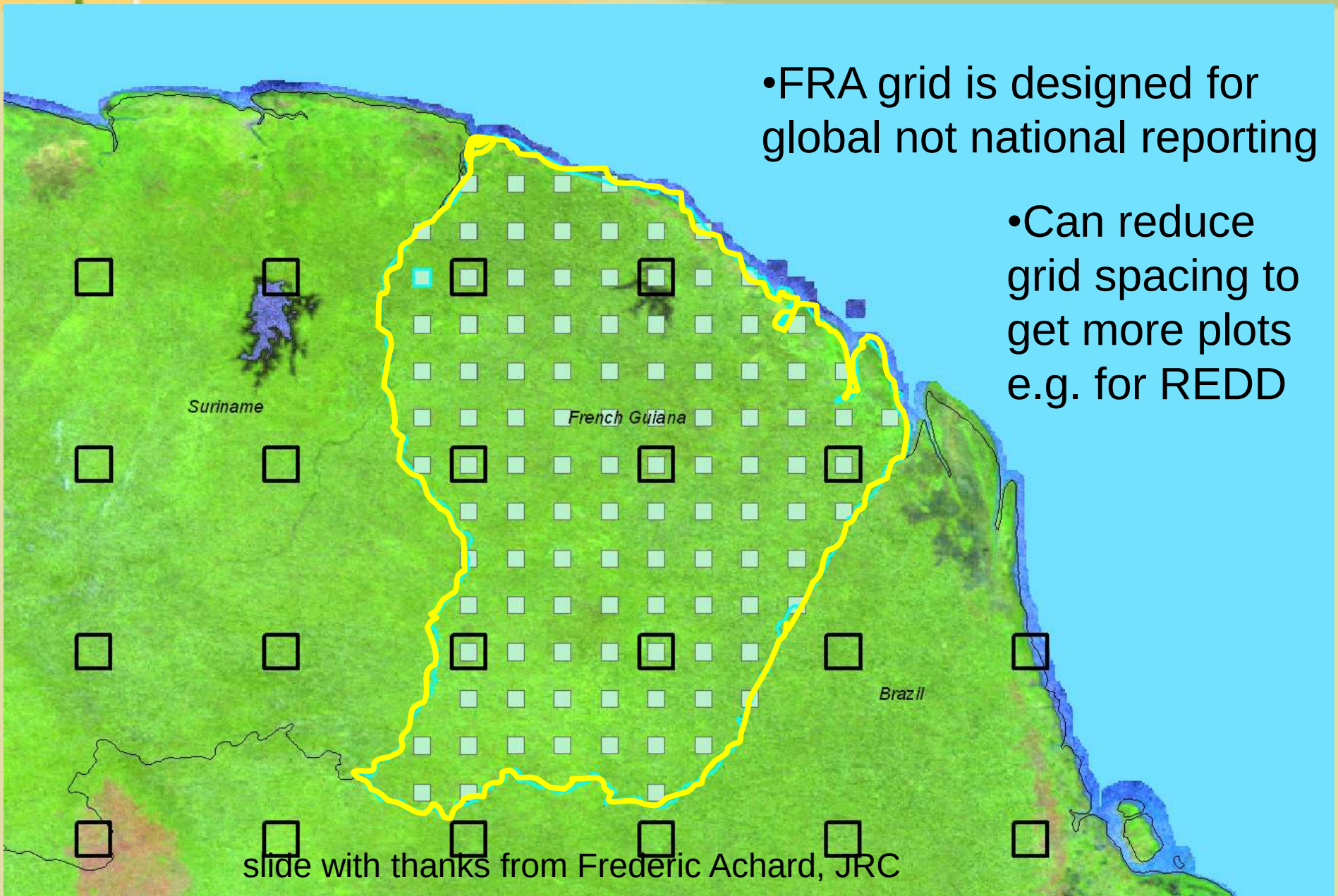
⇛ Sampling intensity: about 1 % of world's land surface



The 1 degree lat-long sampling grid



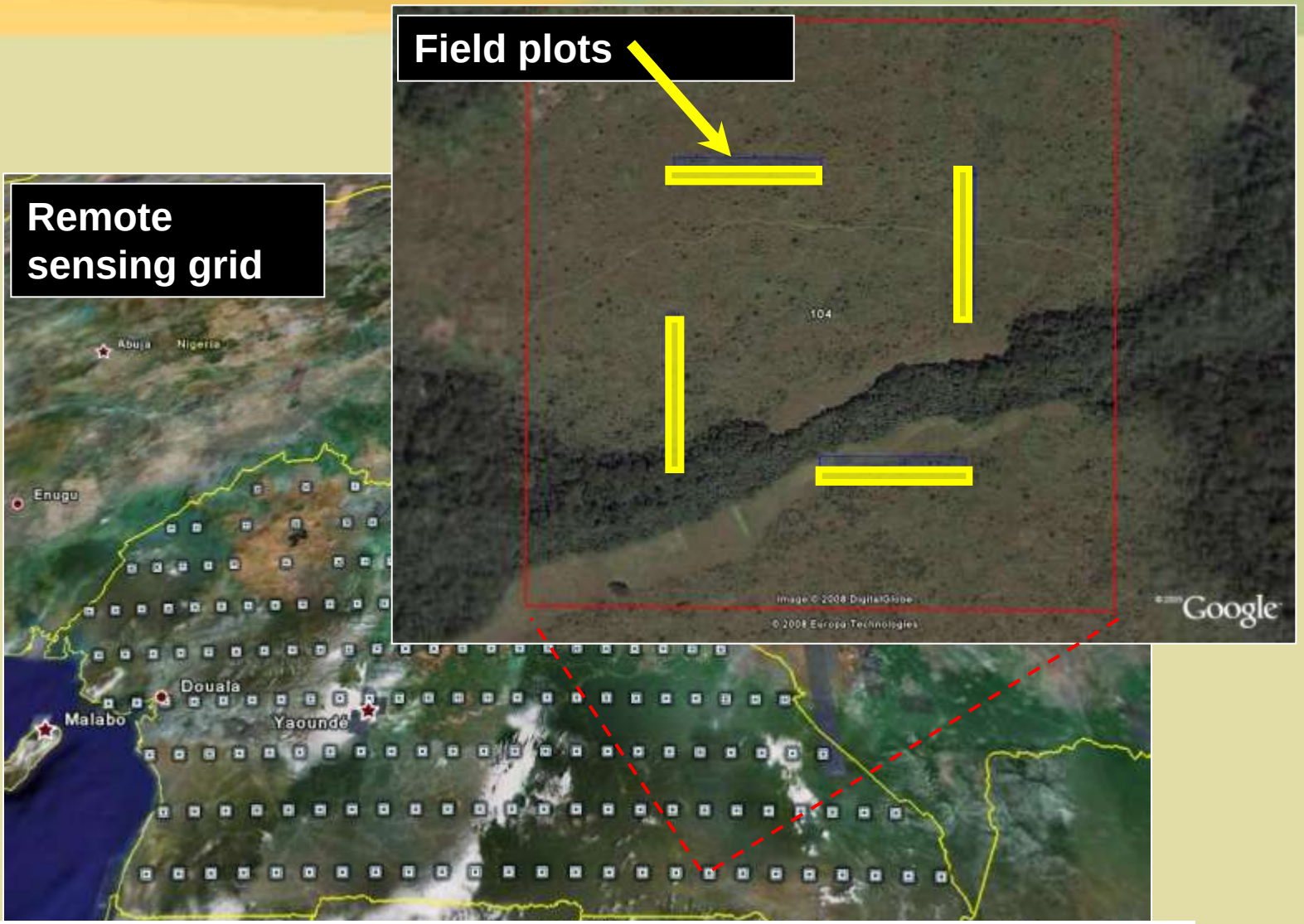
Countries can build on the global grid framework



- FRA grid is designed for global not national reporting
- Can reduce grid spacing to get more plots e.g. for REDD

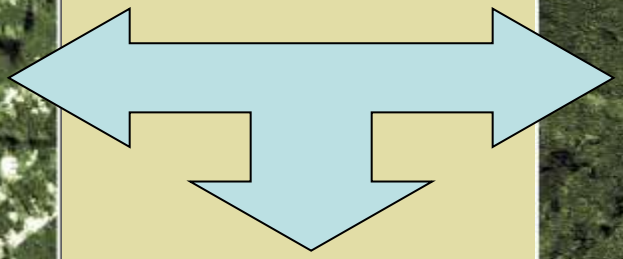
slide with thanks from Frederic Achard, JRC

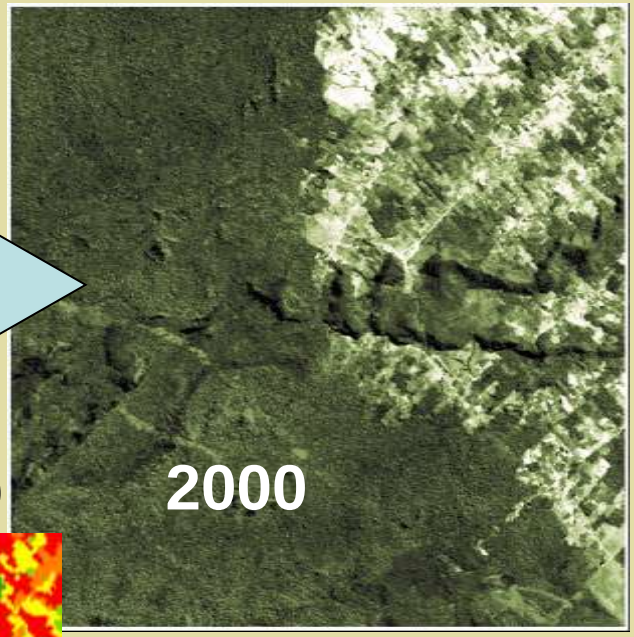
Linking remote sensing with ground surveys



Cameroon National Forest Monitoring and Assessment field plots

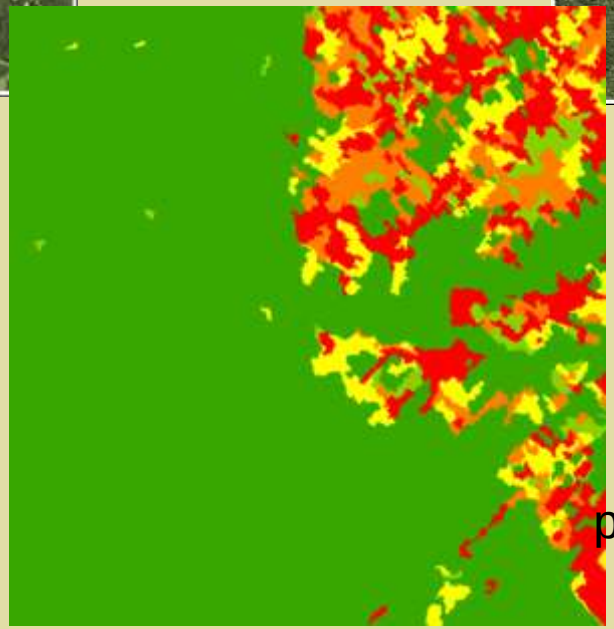
Remote sensing change detection





Landsat 1990

Landsat 2000

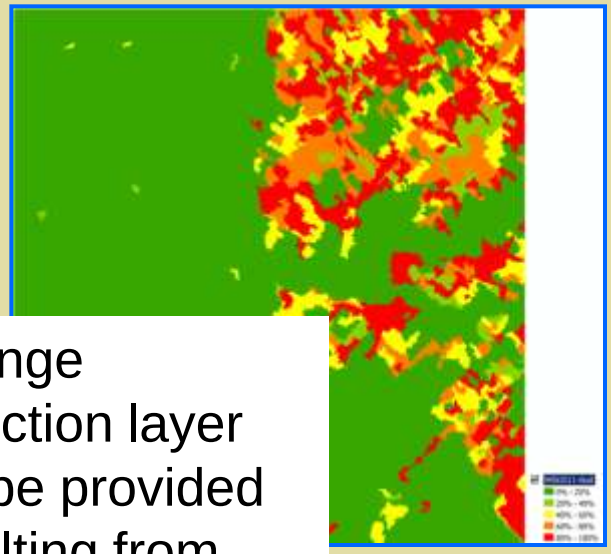


Change detection showing possible areas of change positive and negative

Land-cover and Land-USE

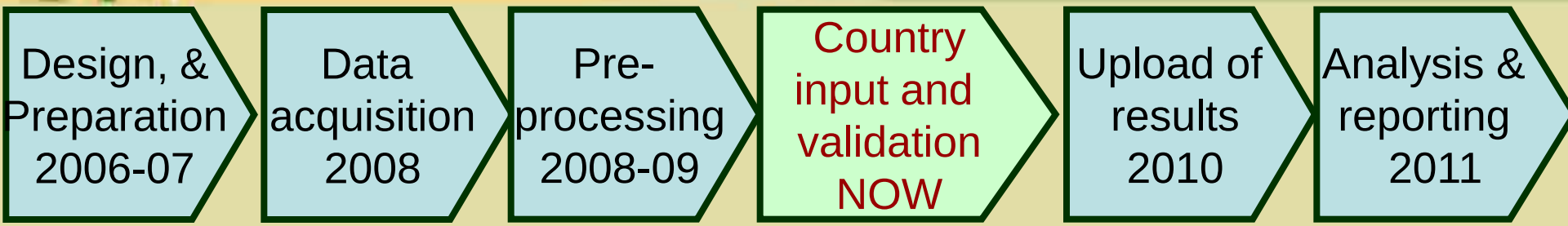
- Countries asked to label changes in forest area, focusing on red and yellow polygons where change is likely
- Simple legend based on the FAO Global Land Cover Classification System (LCCS)
- Where forest loss is identified, label with the new land use classes (e.g. most will be classes 4-7):

1. Forest
2. Other wooded land
3. Other land with tree cover
4. Grassland/range/herbaceous
5. Agricultural crops
6. Built-up area
7. Other non-vegetated areas
8. Water
9. No data



Change detection layer will be provided resulting from time series analysis

Implementation



- 2006 review of FRA2005 - countries supported implementation
- 2007 – COFO endorsed, FRA design (consultant, expert input)
- 2008 – FAO and partners doing most processing (blue)
- 2009 – Pilot study testing and refinement with 22 countries
- 2010 – Involvement of > 175 countries and national experts is vital step in 2009 and 2010 (green box) + training workshops
  - Support to countries to obtain and process imagery
  - Free computer software for processing images
- 2011 Analysis and final report in International Year of forests

FRA-RSS

Forest Management Team Meeting

29 September 2009

NRCE contribution to FRA-RSS

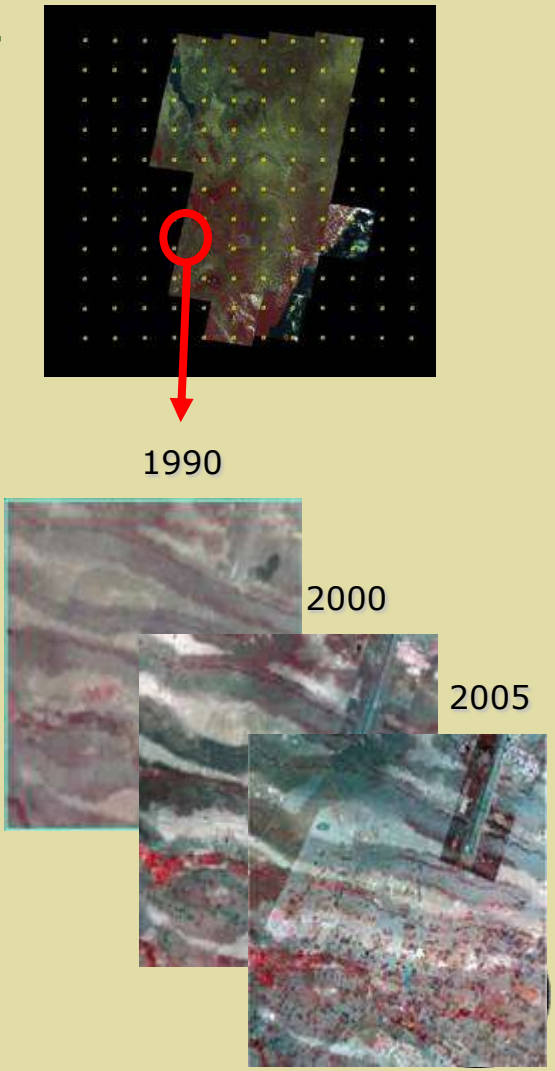
J. S.Latham, FAO

and

R. Cumani, A. Martucci, S. Giaccio, A. di Gregorio

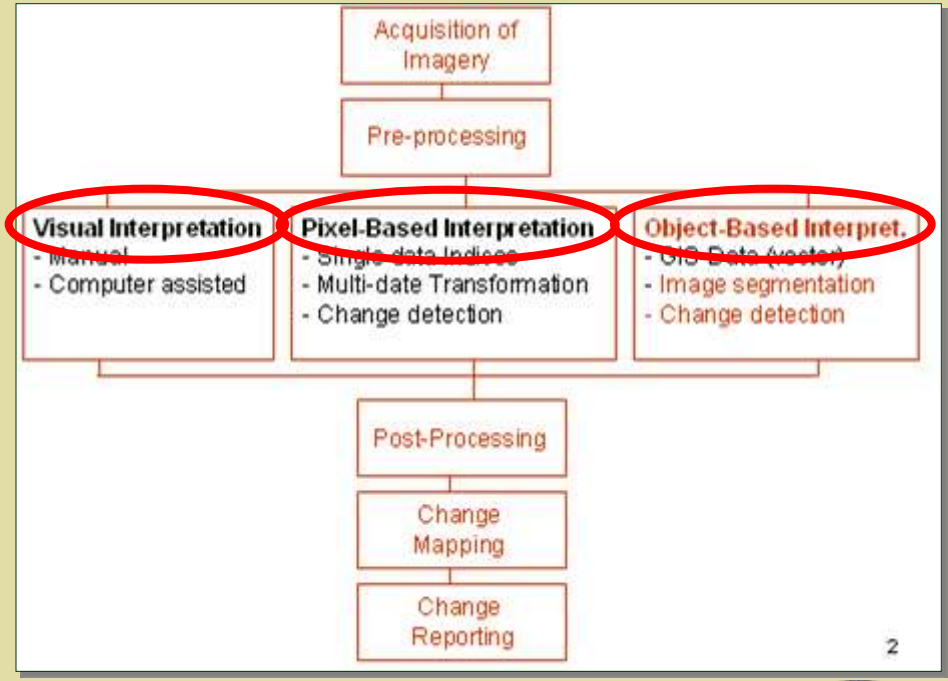
NRCE partner inputs

- Consultation and review with stakeholders
- Evaluation of approaches to land cover mapping and change detection
- Review requirements for source data, imagery, dissemination and reporting
- Develop methodology and testing of over 200 sample sites globally
- Develop image processing software
- Develop the FRA-RSS gateway



Evaluate approaches

- **Evaluation of different approaches to land cover mapping and change detection**
  - Sample images (96 tiles) acquired and prepared for analysis
  - Different classification methods were tested



Development of tools

- **MApping Device – Change Analysis Tool**

Output

- Segmentation (polygon objects)
- Change (polygons)
- Reports and statistics (maps and tables)

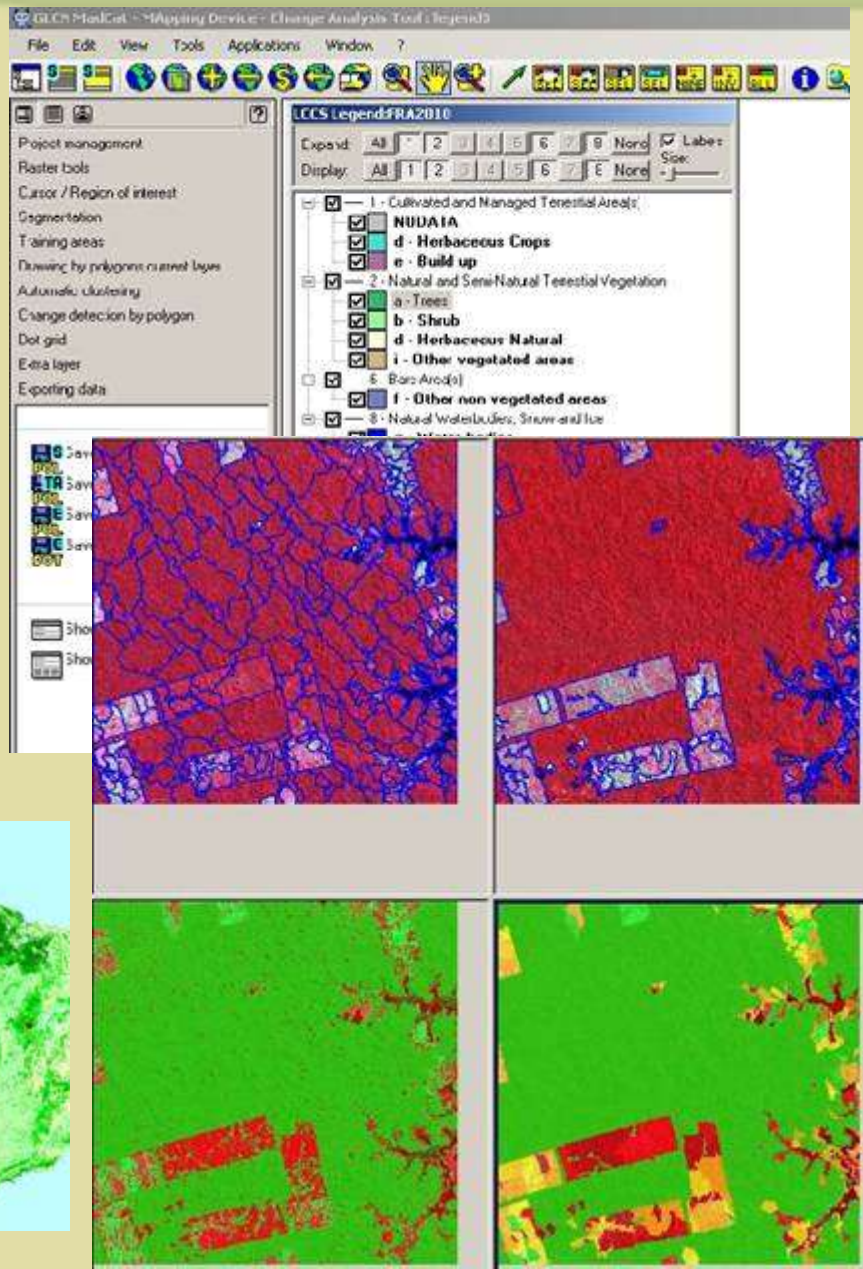
Distribution policy

- Free for FAO programmes

Capacity building

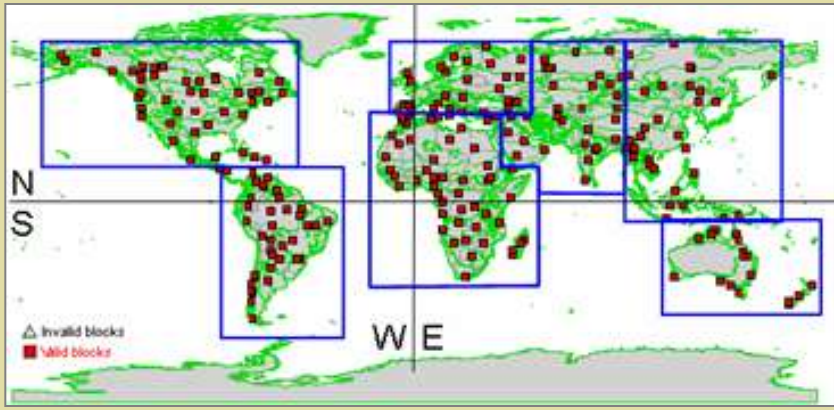
- Manual
- Tutorial
- Training

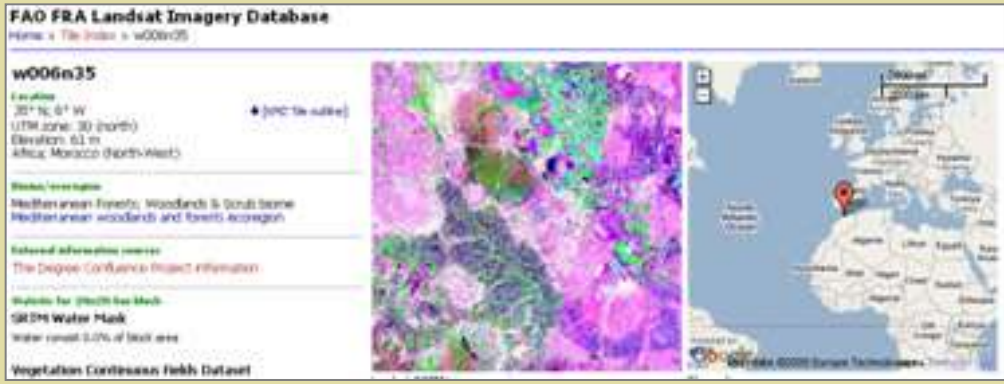
Brazil tropical rainforest



Information gateway

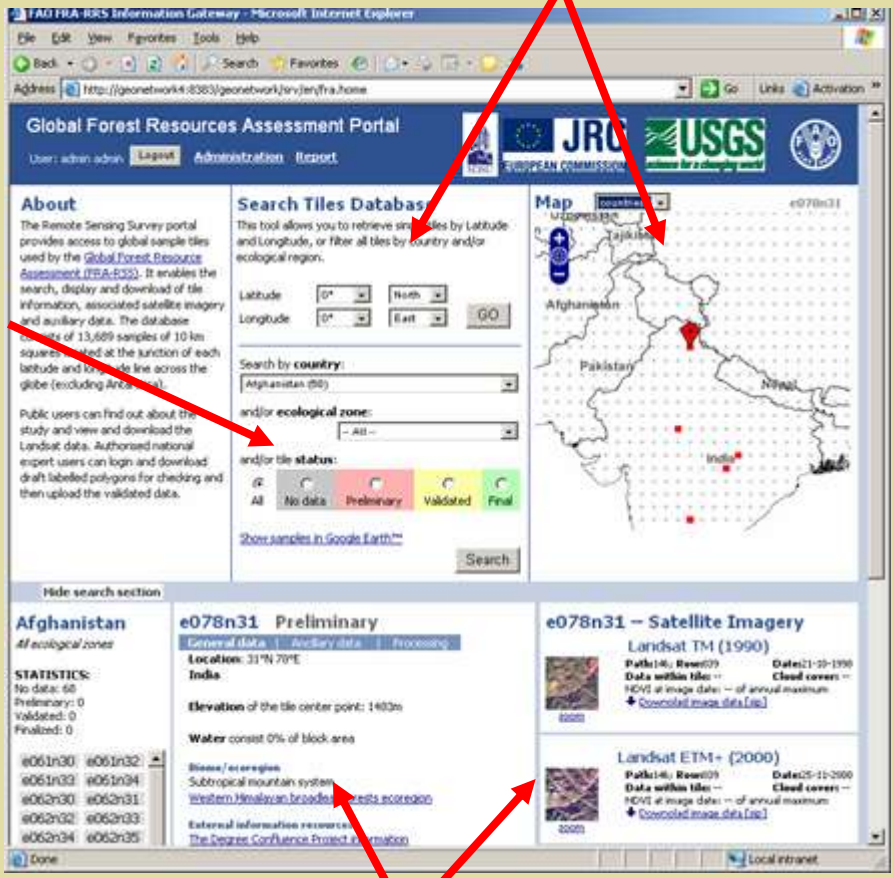
- **Design**
  - **User needs assessment**
    a. remote sensing and other geo-spatial data;
    b. Facilitate validation;
    c. Monitor progress.
  - **System requirements**
    a. Search/Visualization;
    b. Download/Upload ;
    c. Administration;
    d. Activities Tracking;
    e. Documentation / help
  - **Solutions**
    a. Web application built around FAO GeoNetwork technology





FRA RSS - gateway

- **Authorized users in countries can download data AND upload results, images, maps, documents etc.**
- **Web mapping data view**
- **Compliant with international standards (ISO & OGC)**



Next steps – NRCE inputs

- MadCat version 3.2
- Processing/analysis of all samples in NRCE area
- Training workshops
- Statistical analysis
- Maintenance/ enhancement of RSS information gateway
- Land cover conversion to Land use

Example of Region of Interest

FRA 2010

List of the country and number of samples

Afghanistan	63	Israel	2
Aksai Chin	2	Jammu Kashmir	17
Algeria	210	Japan	49
Armenia	3	Jordan	7
Azerbaijan	18	Kazakhstan	344
China	966	Kuwait	1
China/India	1	Kyrgyzstan	16
Dem People's Rep of Korea	13	Lebanon	1
Egypt	92	Libyan Arab Jamahiriya	149
Georgia	8	Mauritania	90
Iran (Islamic Republic of)	160	Morocco	39
Iraq	39	Oman	26

Samples that include more than one country	61	Total samples	2,839

Key Issues

- RSS results **WILL** be different from national statistics:
  - RSS will NOT report by country, (global, ecozone, & region)
  - RSS results will come out in 2011
  - Where differences are identified, will help us work to improve results of both methods
- FRA RSS and country reports to UNFCCC
  - FRA RSS can help contribute methods & analysed samples
  - FRA is sample based, can intensify (Cent. Africa ½ degree)
- Engagement of other groups – ag. & land degradation
- Funded to end 2011 at modest level (EC funds)
- Future monitoring for FRA 2015?
- Need to secure new funds and data soon

Conclusions

1. Robust design, partnerships with countries and high quality technical support
2. Providing data and tools to improve forest area and change estimates
3. Build capacity to improve future forest monitoring
4. Countries are encouraged to actively participate
   - validate sample analysis and contribute experience
   - may help improve national forest monitoring system
5. FRA2010 plus RSS will be the best global forest dataset so far

Thank you

- More information is available from:
- www.fao.org/forestry/fra
- fra@fao.org
- adam.gerrand@fao.org
- john.latham@fao.org

Seeing the forest... not just the trees

Remote sensing for global forest monitoring

The world's forests provide vital economic, social and environmental benefits. They help reduce climate change by storing carbon, provide wood and non-wood forest products, generate livelihoods, supply clean water and provide habitat for half the animal and plant species on the planet.

World leaders at the G8 Summit in 2008 encouraged the development of an international forest monitoring network as part of actions to reduce greenhouse gas emissions from deforestation and forest degradation in developing countries.

Under the umbrella of the Global Forest Resources Assessment, FAO, its member countries and partners are undertaking an ambitious remote sensing survey which will form the basis for a long-term global forest monitoring system.

We need reliable information on forests

Deforestation continues at an alarming rate of about 13 million hectares annually worldwide. It is responsible for about 17 percent of human-produced greenhouse gas emissions. To tackle this issue we need better information on deforestation: where is it occurring, at what rate and why – for conversion to what other land uses?

Quantitative information on progress in maintaining and expanding forests is also vital, particularly for realizing systems of payment for the environmental benefits that forests provide.

The remote sensing survey

The primary aims of the new global survey are to obtain information on the distribution of forests and on changes in forest area over time at regional, biome and global levels. It will complement, build on and in some cases strengthen national inventory systems but will not replace them.

The survey has two main components:

- Generating a new, validated global tree cover map using time-series imagery from MODIS satellites at 250 m resolution.
- Gathering and analysing the best existing global imagery (Landsat images at 30 m resolution) from 1975, 1990, 2000 and 2005 for improved estimates of forest area and forest area change.

Leading experts in over 150 countries will analyse the satellite data for the best possible results.

Why remote sensing?

- To obtain more consistent maps of the world's forests by using the same data and techniques globally
- For better estimates of trends and changes in forest area because data can be collected in the same way over time

Remote sensing does not replace the need for good field data. But combining remote sensing with field data collection provides better results than either method alone.

www.fao.org/forestry/fra2010-remotesensing/en/