Remote sensing in the REDD+ context lessons learned and way forward

Dr. Inge JONCKHEERE
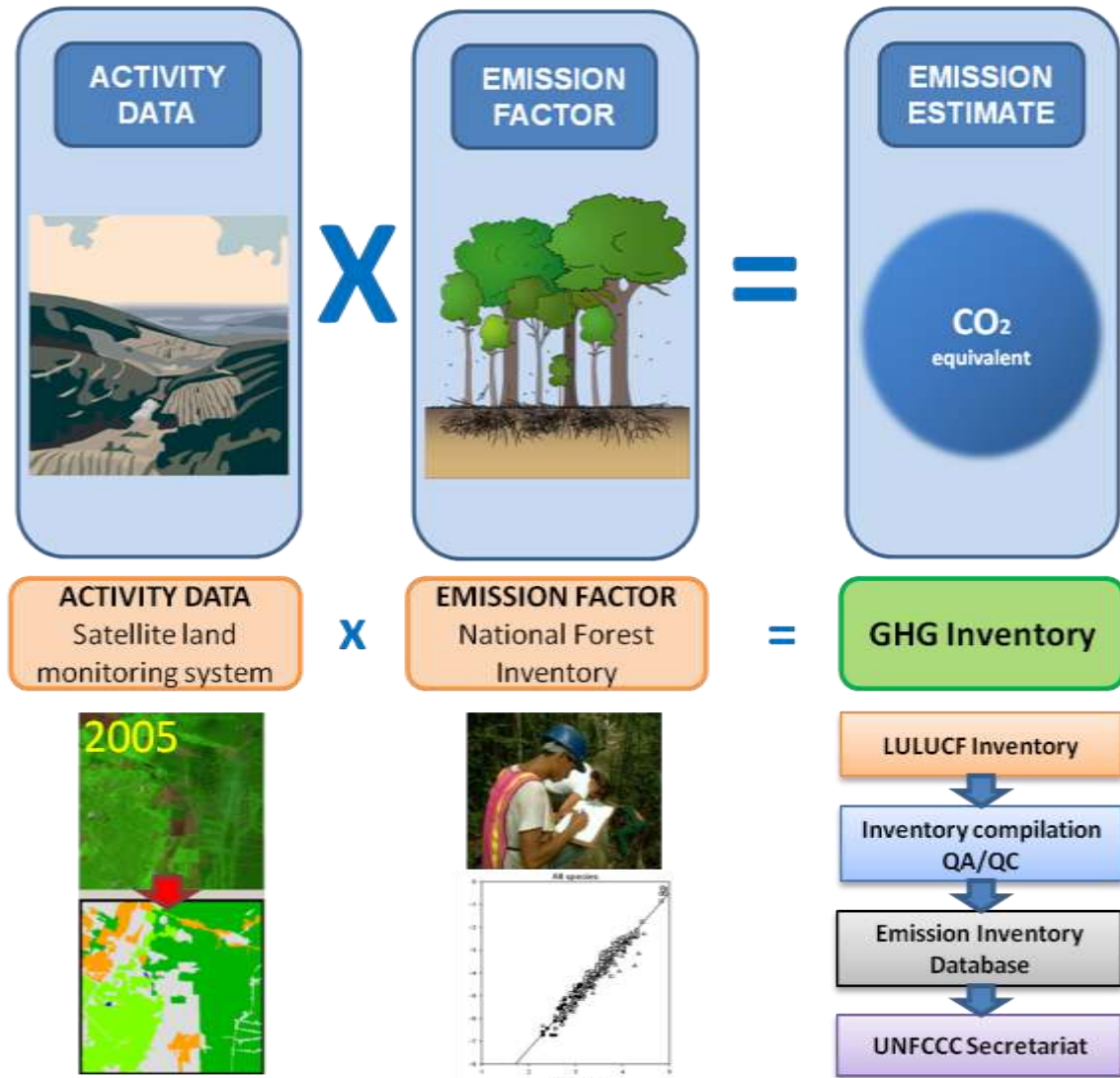
UN-REDD Team (FAO HQ Rome, Italy)

Forest Monitoring Systems and Reference Levels for REDD+

October 2014

Hanoi, VietNam

MRV: Measurement

The IPCC's methodological approach to calculate anthropogenic GHG emissions by sources and removals by sinks related to forest land.

MRV: Measurement, reporting, verification

- Measurements of area change (Activity Data) and forest carbon stock changes (Emission Factors)

- This information provides the basis to compile a GHG inventory

- Activity data
  - Area / forest cover change data (hectares per year)
  - Achieved using a satellite land monitoring system (SLMS)

- Emission factors
  - Forest carbon change
  - Assessment of biomass, carbon stocks and emission factors
  - Data are obtained from a national forest inventory (NFI)

- GHG Inventory
  - GHG assessment to determine national mitigation performance
  - Based on the data collected from the NFI and SLRS
  - UNFCCC templates available

ACTIVITY DATA
Satellite Land Representation System

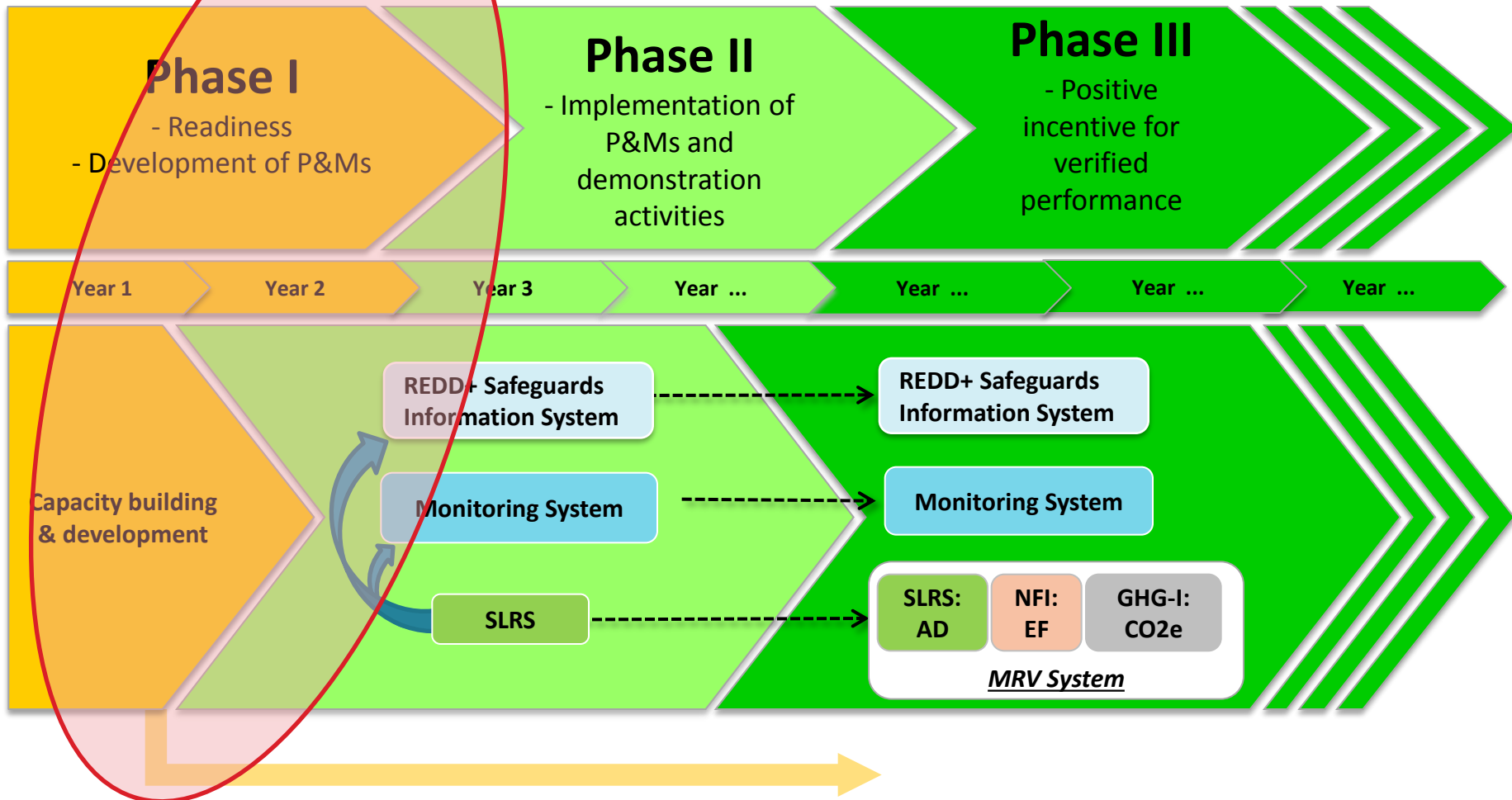2005

X

EMISSION FACTORS
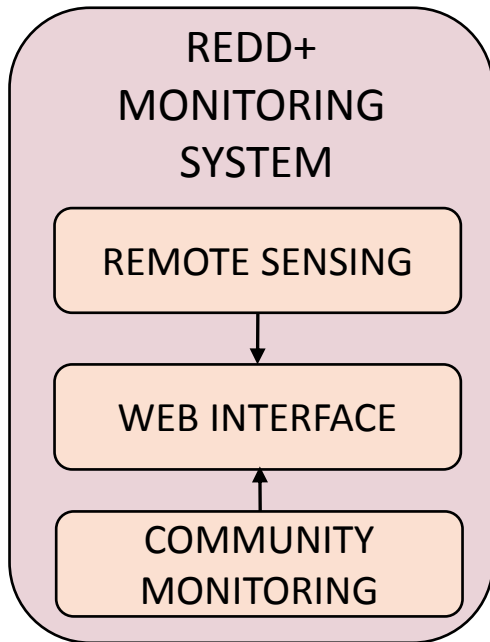National Forest Inventory

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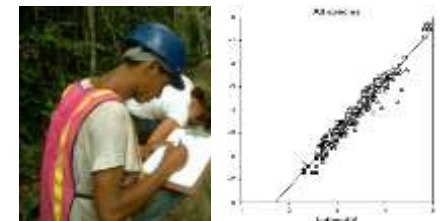
GHG Inventory

Information, Monitoring and MRV Development through the 3 REDD+ Phases

REDD+ PHASES

Phase I
- Readiness
- Development of P&Ms

Phase II
- Implementation of P&Ms and demonstration activities

Phase III
- Positive incentive for verified performance

Year 1 | Year 2 | Year 3 | Year ... | Year ... | Year ... | Year ...

Capacity building & development

REDD+ Safeguards Information System → REDD+ Safeguards Information System

Monitoring System → Monitoring System

SLRS →

SLRS: AD | NFI: EF | GHG-I: CO2e

MRV System

National forest monitoring systems

REDD+
MONITORING
SYSTEM

REMOTE SENSING

WEB INTERFACE

COMMUNITY
MONITORING

ACTIVITY DATA
Satellite Land
Representation System

2005

- Satellite data to monitor REDD+ activities at sub-national (demonstration) and national level

- Disseminated over internet through a web-GIS interface

- Measurements of area change (Activity Data)

Forest monitoring system : Brazil

- **PRODES – Amazon Deforestation Monitoring Project**
  (Annual Deforestation Assessment)

- **DETER – Near real-time Deforestation Detection with MODIS**
  (Support for Law Enforcement for Deforestation Control)

- **DEGRAD – Amazon Degradation Monitoring Project**

- **DETEX - Selective logging activities**

- **TerraClass - Land use monitoring of deforested area (2008)**

www.dpi.inpe.br/prodesdigital/prodes.php
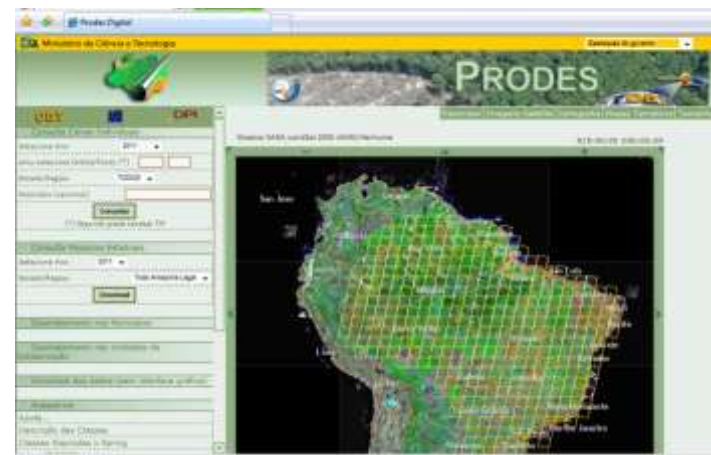
Remote Sensing support UN-REDD

- Lots of requests: both NP and TS in three regions
- OpenForis widely used in-country
  Launched in IUFRO: www.openforis.org

- Use of global products and linkages with other initiatives (WWF, GFOI, WRI, USAID, Silvacarbon)
- Other tools and software mostly country-tailored/dependent
- So far optical data, considering radar
- Small but very competent team
- Strong link with INPE/CRA
- In-country trainings and central trainings in Rome and Belem
- Coordination and collaboration for RS capacity building
- Use of Methods and Guidance document (MGD) of GFOI as standard

RS using MGD document

- Easy-to-understand language and exercices package: no one fits all approach

- Overview methodologies and data requirements for RS using OpenForis and other open source initiatives

- Advantages and disadvantages methodologies

- Use of global products and linkages with other initiatives (WWF, WRI, USAID, Silvacarbon)

- Coordination and collaboration for RS capacity building

- Manual can be downloaded at www.gfoi.org

Issues and plans

- Coordination with in-house activities: channeling of requests
- Prioritization of country support: selection and minimal criteria?
- More user-friendly version of OpenForis needed and on its way
- Follow-up in-country
- Sustainability of training/trainees
- LCCS and data accuracy assessment
- Use top-down approach vs bottom-up
- Link with SDMS (Space Data Management System project)
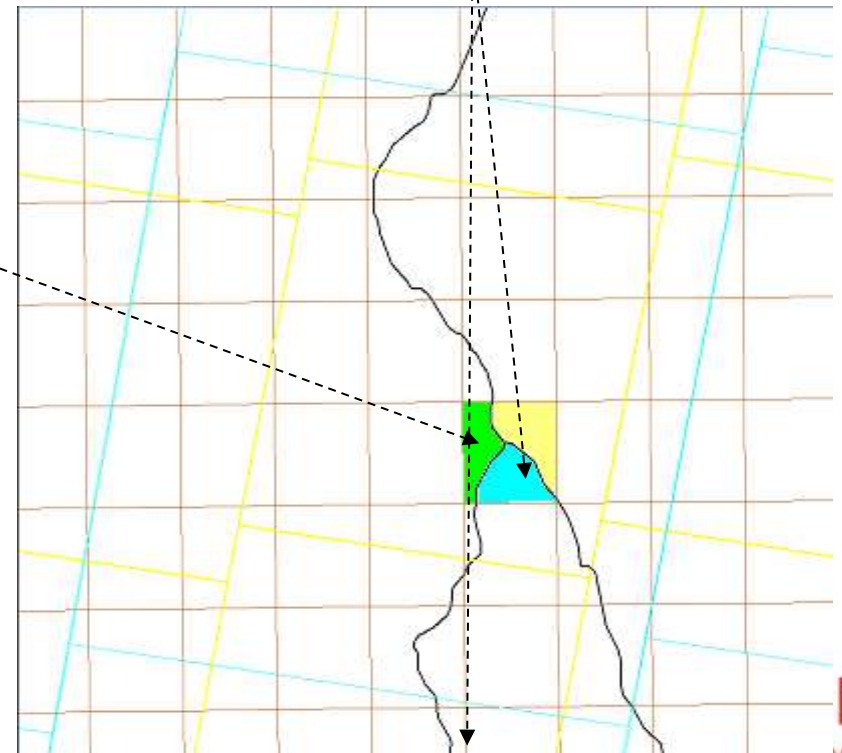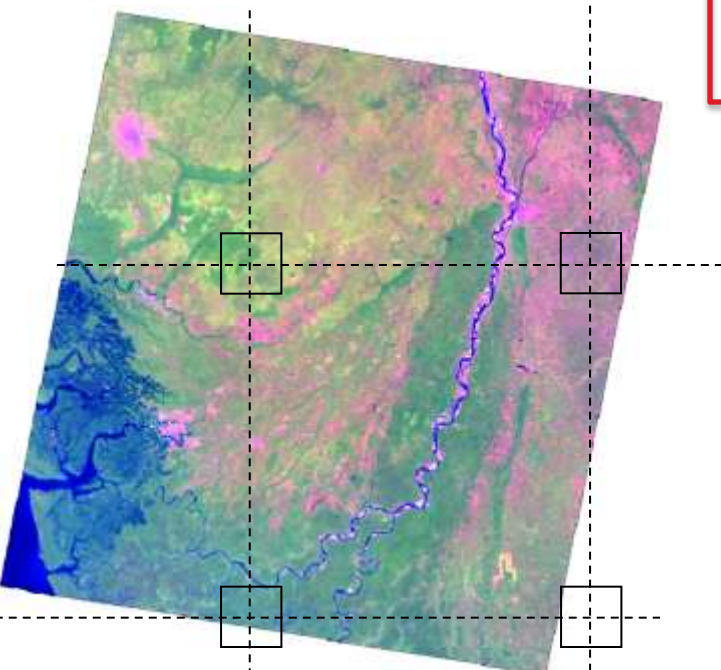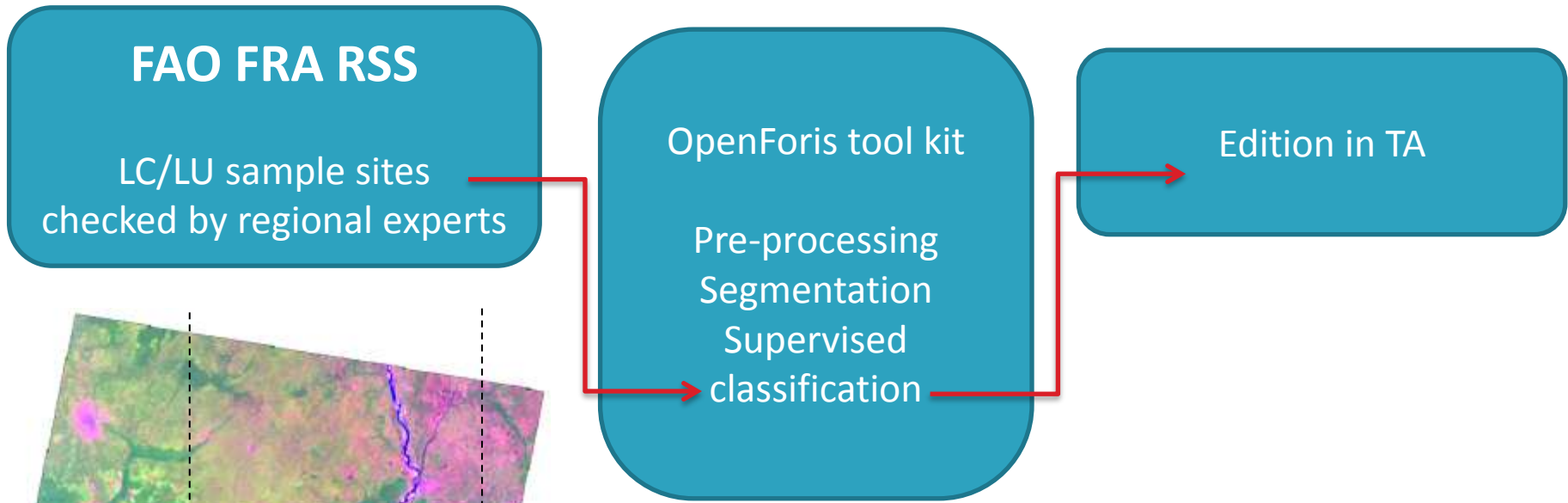
Multidata approach
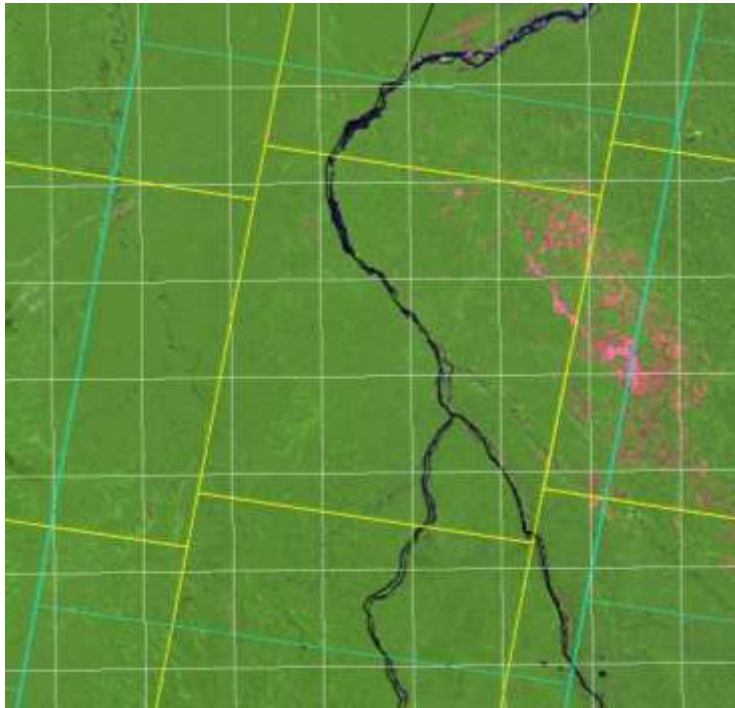
DMC/RapidEYe

CCD/CBERS

LANDSAT

────	LANDSAT
────	CBERS
────	SISPRODES
────	State boundaries

Processing chain:
FRA RSS,FAO-FIN,UN-REDD collaboration

FAO FRA RSS

LC/LU sample sites
checked by regional experts

OpenForis tool kit

Pre-processing
Segmentation
Supervised
classification

Edition in TA

RS data used in countries

- RS data (mainly satellite data) used in

-**training**: both in-country, HQ and INPE (so free access needed)
-**AD**: forest area detection (changes)
-**NFI** design (multisource inventory design and stratification)
-**Other**: R(E)L, Location of households for surveys (HR), Use of HR for field plot location, Mapping of co-benefits, Biodiversity mapping

- Main RS data needs from countries:
-time series needed (historical data? Sensor interoperability?)
-data availability and cost analysis
-data acquisition (actual purchase)
-data preprocessing
-data processing
-generation of statistics
-accuracy assessment: using national and global products
-web dissemination

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OpenForis Toolkit

| page | discussion | view source | history |

Open Foris Geospatial Toolkit

(Redirected from Open Foris Toolkit)

Open Foris Geospatial Toolkit is a a collection of **prototype** command-line utilities for processing of geographical data. The tools can be
been tested mainly in Ubuntu Linux 🔗 environment although can be used with other linux distros, Mac OS, and MS Windows (Cywgin) as
many of the scripts rely heavily on GDAL 🔗 command-line utilities.

Please find below drafts of pages we are developing to document the utilities and their usage. The documentation is work in progress and

You can find us also in Google+ 🔒 and Facebook 🔗

Paginas de Wiki en Español

Pages wiki en français

OPENFORIS

navigation
- Main Page
- Community portal
- Current events
- Recent changes
- Random page
- Help

search

[Go] [Search]

toolbox
- What links here
- Related changes
- Special pages
- Printable version
- Permanent link

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2 How to get it?
3 What do I get?
4 How to start?
5 Acknowledgements
6 Links

www.openforis.org

License

Open Foris Geospatial Toolkit is released under GNU GPLv3 license. More details here

How to get it?

UN-REDD
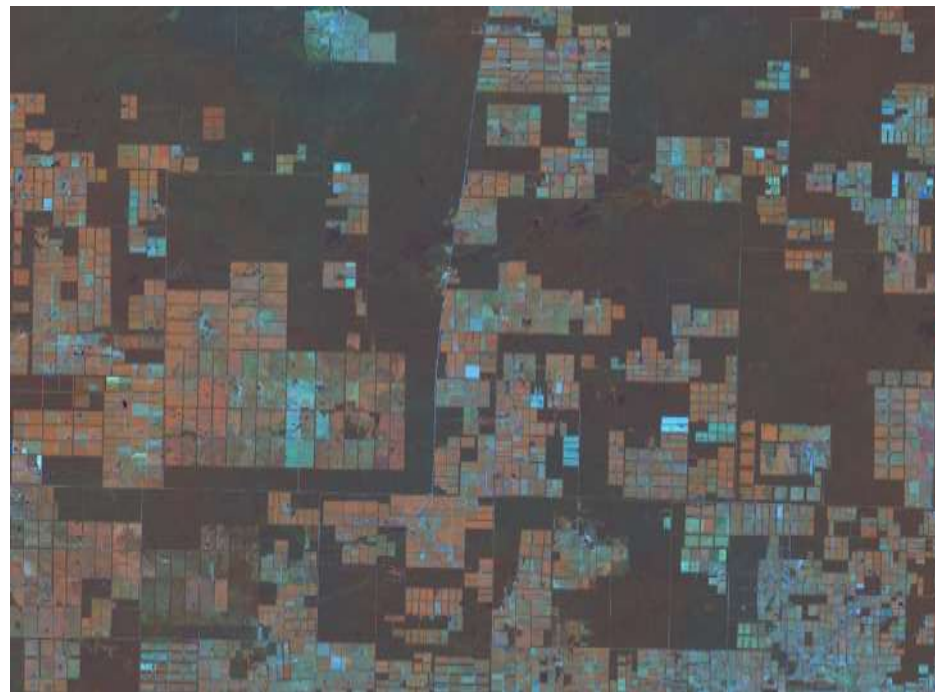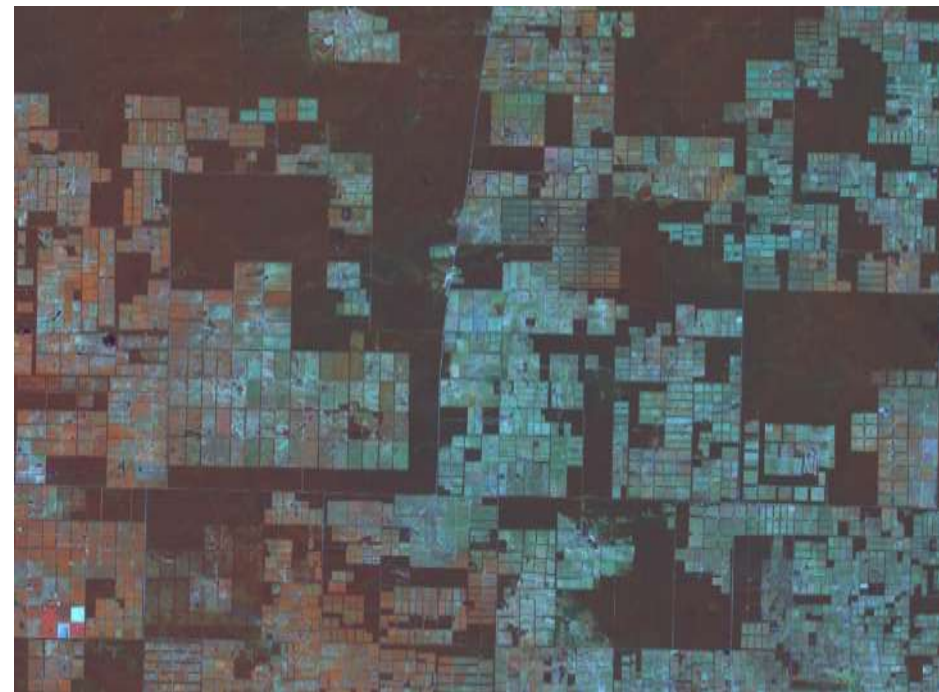PROGRAMME

OpenForis Toolkit

Segmentation of images and classification

Time 1

Time 2

FAO Forestry

http://km.fao.org/OFwiki/index.php/Main_Page

UN-REDD
PROGRAMME

OpenForis Toolkit

Forest cover
Time 1

UN-REDD
PROGRAMME
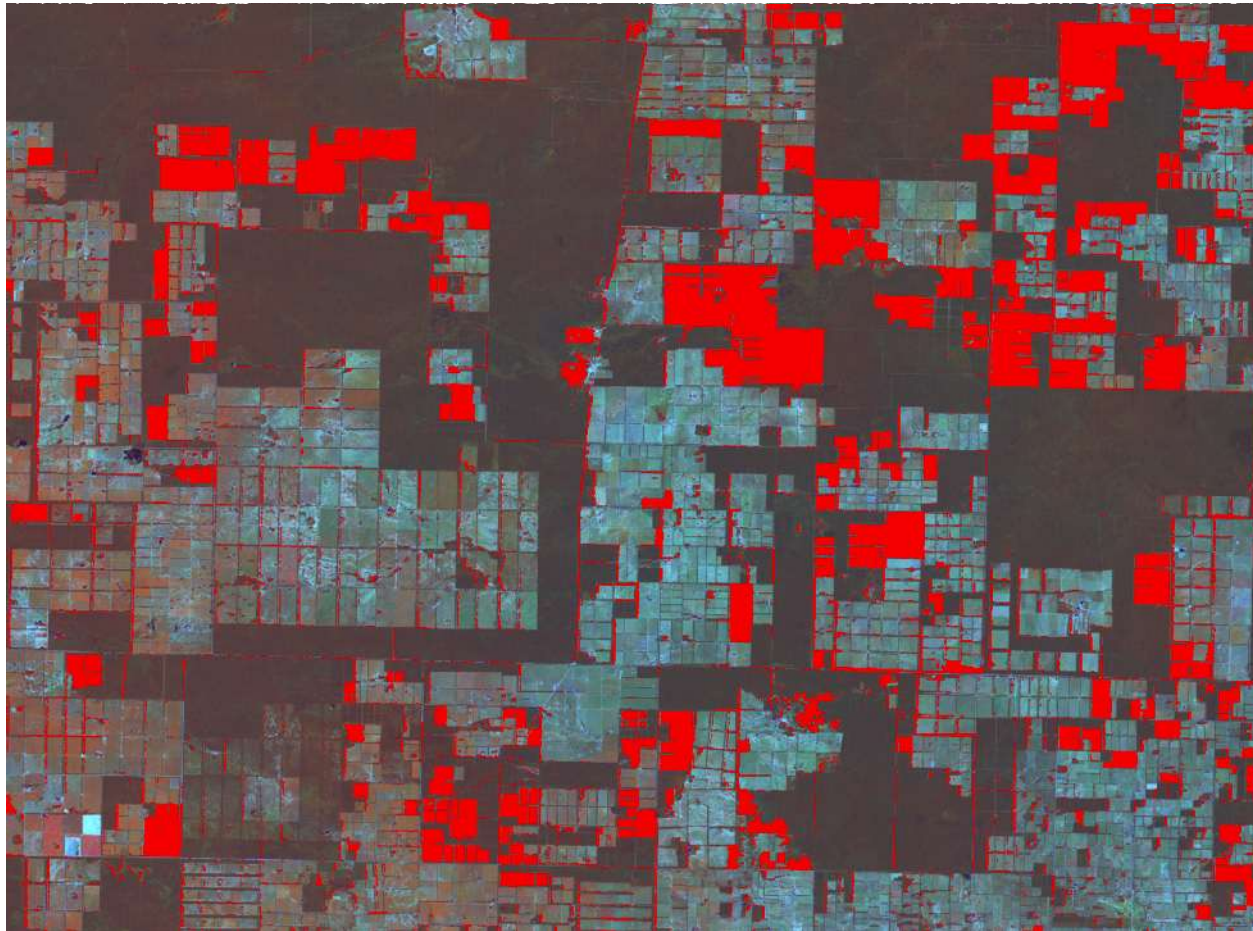
OpenForis Toolkit

Change in forest cover
T 1 - T 2

Automatic change detection

FAO Forestry

http://km.fao.org/OFwiki/index.php/Main_Page

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PROGRAMME

OpenFORIS Toolkit
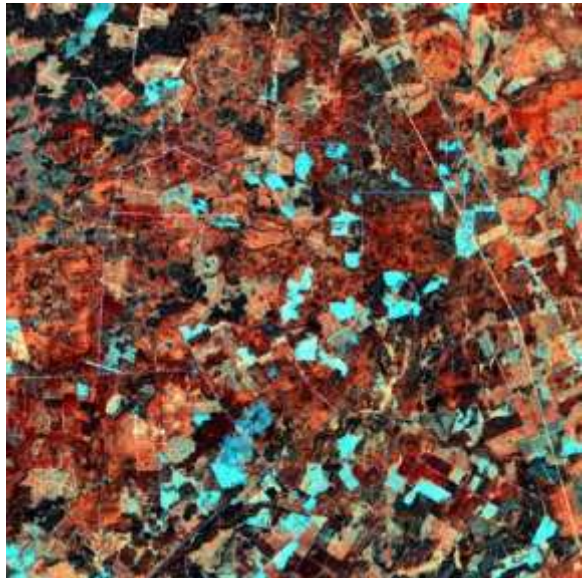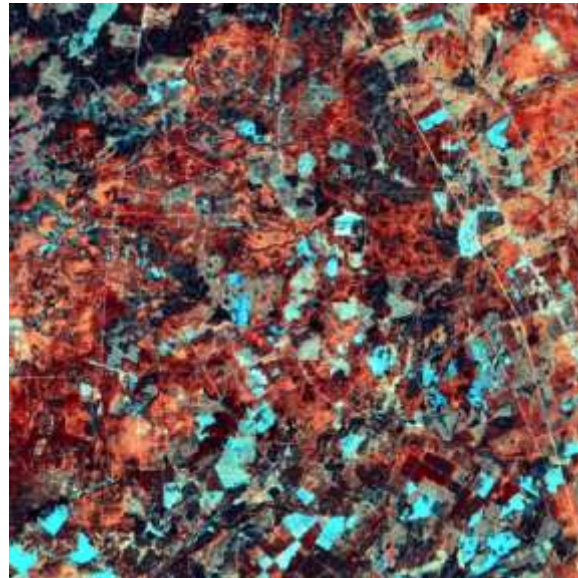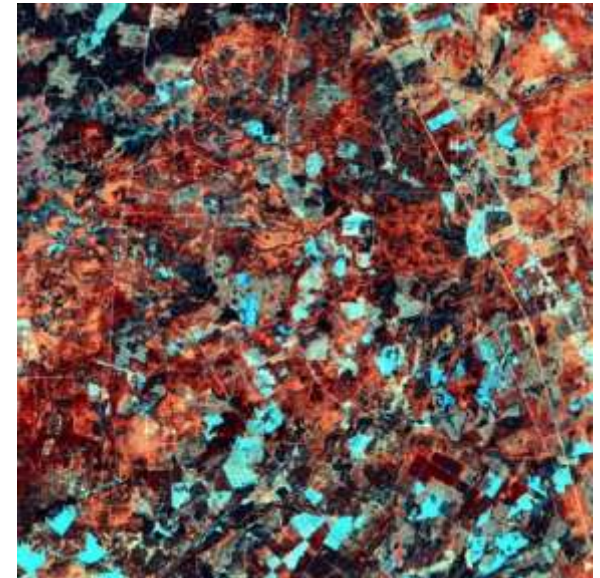
Time 1   Time 2   Time 2 Normalized

Automatic image normalisation

FAO Forestry   http://km.fao.org/OFwiki/index.php/Main_Page
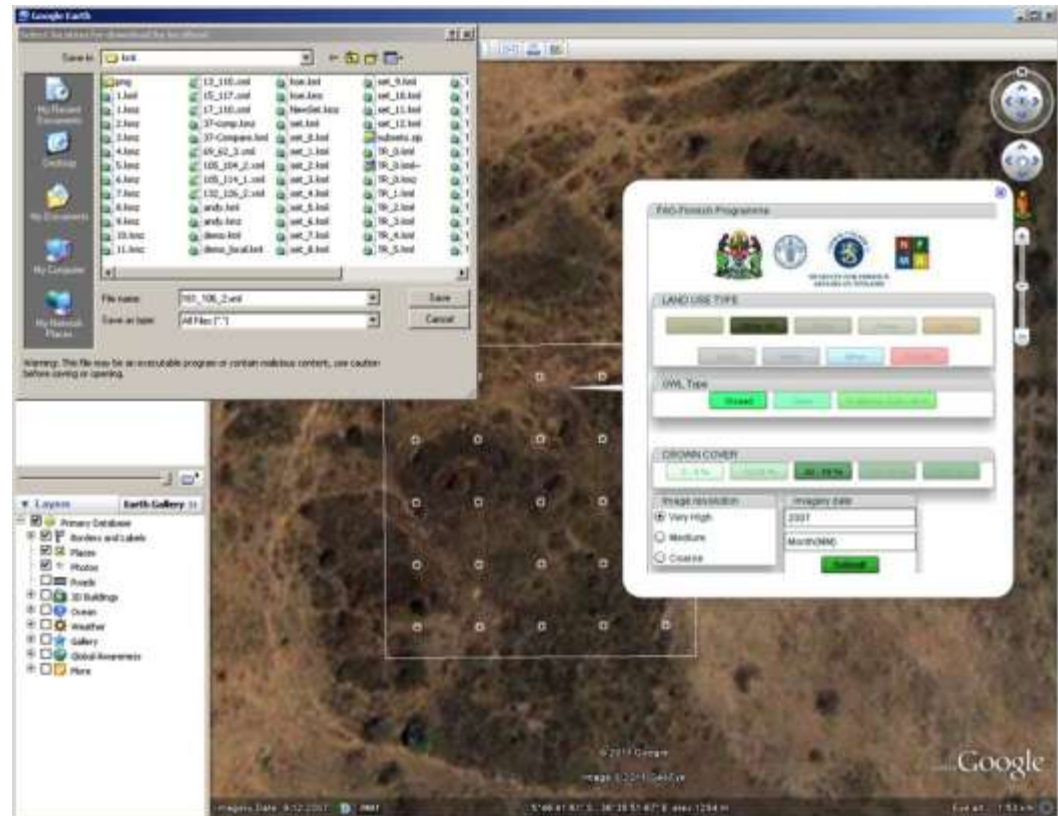
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PROGRAMME

Other example: Tanzania

Data collection through Google Earth

Quick estimation of forest cover inTanzania

Easy interface simple and quick to use
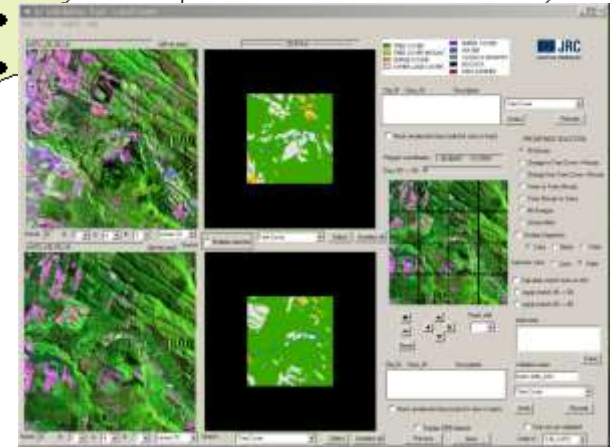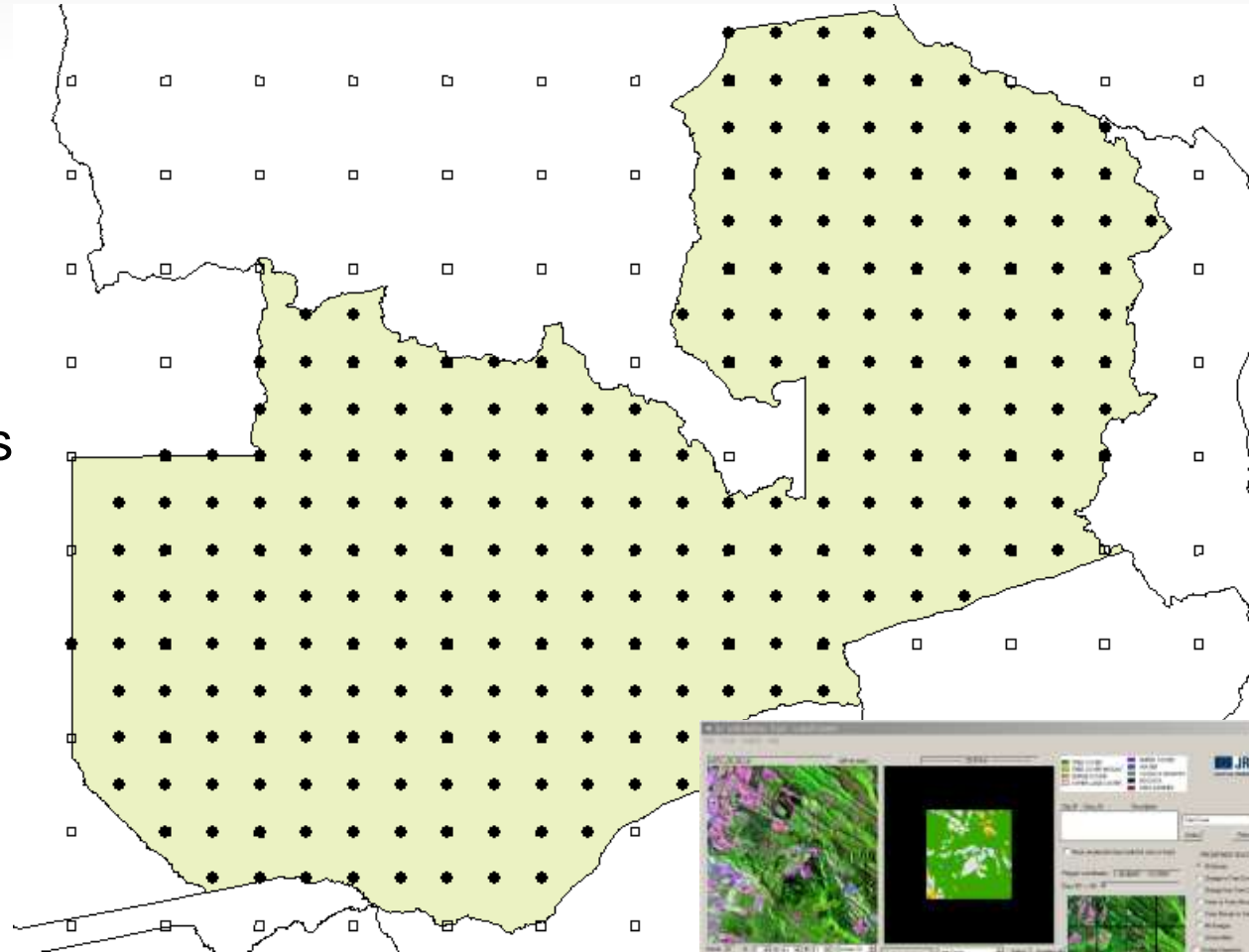
Data can be exported in DB

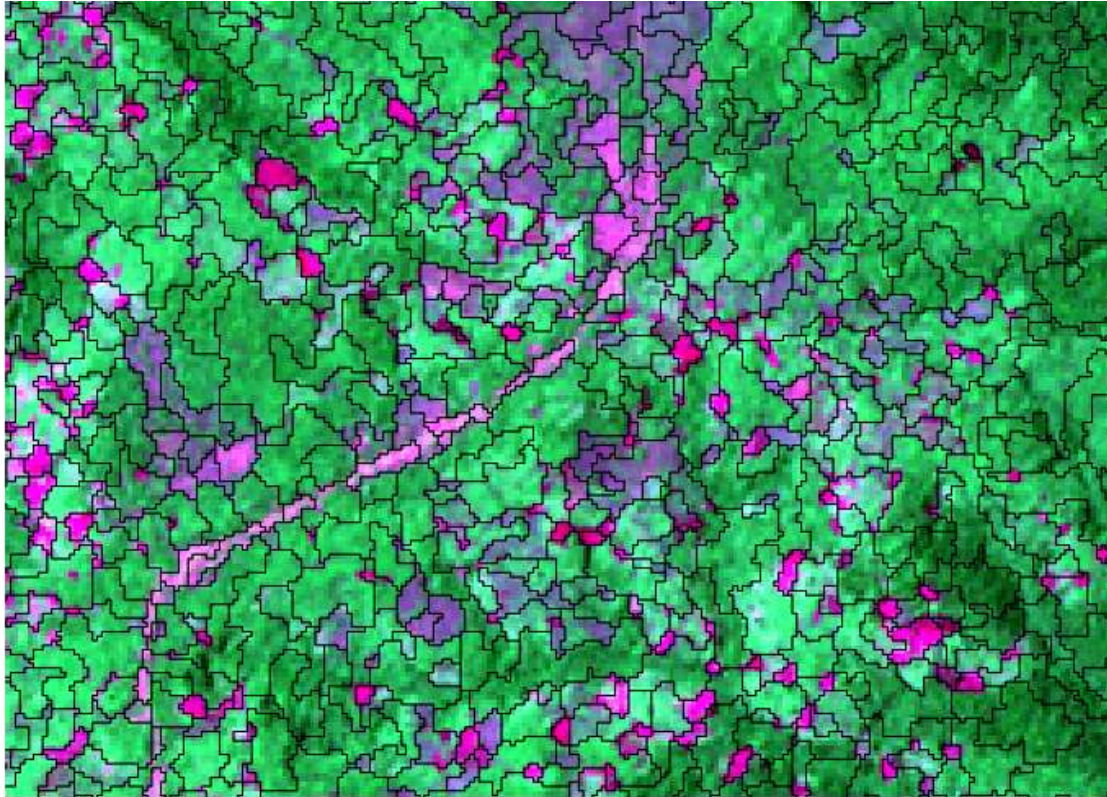# Other examples: Zambia

Intensification of the automatic grid (FRA)

Estimation of the forests and the changes at national level

Visual interpretation for the land use

FAO Forestry

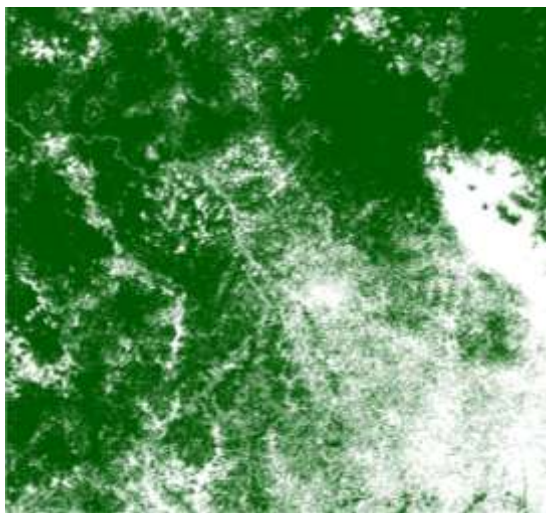# TerraCongo project suite: data pre-processing
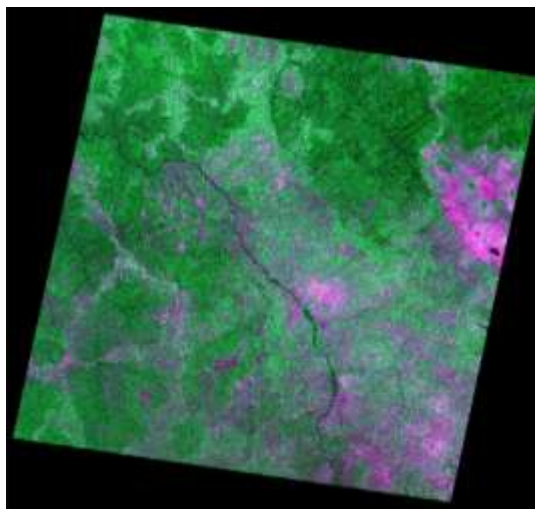
Example : image segmentation

TerraCongo project suite: data pre-processing
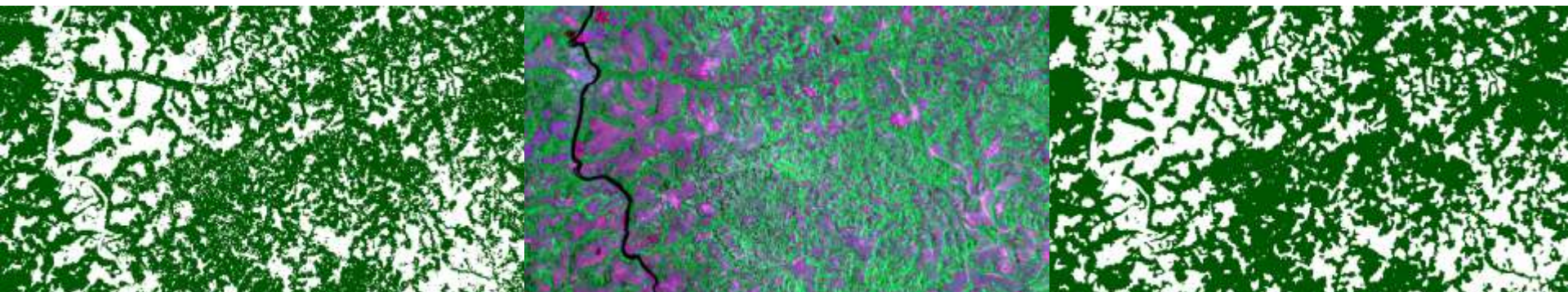
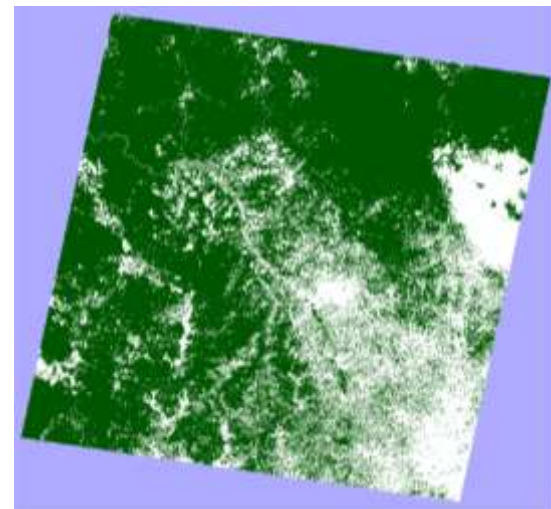Example: segment classification based on existing data

Country-adopted
Forest Mask

New image

New Forest Mask
(vectorised)

Methodologies and technology for NFMS and MRV

Countries require easy and inexpensive access to technology and tools to develop their NFMS

Experience

- Access to technology is sometime quite limited, particularly for remote-sensing technologies and data

- The basics are often missing (e.g. steady electricity, high-speed internet, performing computers, software packages)

- Certain technologies are costly (e.g. HR images, Lidar wall-to-wall, commercial software packages), limiting large-scale deployment and sustainability

Lessons learned

- Not promote specific tools/data sets but provide overview of available options

- Help governments make informed decisions

- Support country decisions and tailor best available approaches while maintaining consistency and comparability of results

- Heavy reliance on complex & costly technology may not be in all developing countries' best interest

- Open source, free software and data set that meet REDD+ requirements are available. If not, new tools can be developed

What we've learned

- **A few dedicated individuals can make all the difference**
  - Use of international advisors hand-in-hand with national technicians
- **Need to see capacity building in broader terms**
  - Training of resilient national institutions and consultants
  - Mandate of institutions should be clear
- **Integration NFI and RS**
- **On-the-job training is key**
  - Trainings are geared towards producing results
  - Essential to get faster delivery
- **Sharing data and data access is crucial and key**
- **Near-real time monitoring for early warning (e.g. Global Forest Watch), not for reporting**
- **Resilience is often at risk**
  - Easy to develop quickly elements of NFMS, but resilience will be lacking
  - Long-term commitment is required by government and partners in order to secure sustainability

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Way forward

- Integration of existing data pre-processing and change detection algorithms for different ecosystems

- Approach of 'modules' which allows the countries to pick and chose dependent on the country needs (data bulk downloading ,preprocessing (geometric/radiometric), cloud masking, change detection, statistics, mapping)

- All open-source applications are more than welcome to work with us!

UN-REDD
PROGRAMME

Thank you for your attention!

Contact: inge.jonckheere@fao.org

www.un-redd.org

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